

02/03/2020

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Dear Andrew

Offset Site Report: Condition of the Golden Sun Moth offset site, Muncktons Lane, Glenaroua, 3764

Project no. 29865

Introduction

A habitat assessment was undertaken to quantify the extent and condition of Golden Sun Moth *Synemon plana* (GSM) habitat on part of the property at 235 Muncktons Lane, approximately 20 km north of Kilmore (Section C Lots 4, 5 & 18, Section F Lots 68h & k, Section E Lots 6 & 16c and parts of Section F Lots 3a & b of TP 307153B, Glenaroua (Figure 1). Approximately 120 hectares of this 285 hectare property (PFIs 45019147, 45019110 - 13, 45019116, 45018062 & 45019129) has been identified as a potential offset site for impacts to GSM associated with the development Lindum Vale, Mickleham (Referral EPBC 2015/7516). The property is within the Mitchell Shire, is zoned as Farming Zone (FZ) and is variously covered by a Bushfire Management overlay (BMO), Environmental Significance overlay (ESO3) and an Erosion Management overlay (EMO).

The purpose of the survey was to confirm the presence of GSM habitat and conduct a condition assessment to provide input into the offset management plan required to be developed for the site. The assessment also provides input into the scoring of GSM habitat within the EPBC Act offsets calculator as part of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Offsets Policy.

Methods

The irregular shaped area surveyed is bounded by to the east by Muncktons Lane and is otherwise east of Mollison's Creek, and south of John Road, Glenaroua (Figure 2).

Existing information on the native vegetation of the site was sourced from the publicly available DELWP datasets (i.e. NatureKit).

The site was surveyed by Stephen Mueck (accredited DELWP vegetation quality assessor HH173 – current until 19/4/2020) on 31 October 2019. Data was collected to provide a general assessment on the condition of the vegetation present and the overall structure of the vegetation present. Notes were taken as to the location and extent of pest plants and animals, with a focus on target weeds such as woody weeds.

Species names follow those provided by DELWPs Victorian Biodiversity Atlas and threatened species are defined as per DEPI (2014).

Photos were taken to provide a visual indication of the site condition (Appendix 2).

Results and observations

A total of 80 indigenous and 49 introduced species were recorded during the site inspection (Appendix 1).

While substantial areas of groundcover vegetation observed would satisfy the Victorian definition of a patch of native vegetation, the assessment was not designed to map the extent of native vegetation (as defined by DELWP 2017) nor to provide a habitat hectare assessment of these areas.

The site does not support any current wetlands as defined by DELWP mapping. DELWPs mapping of ecological vegetation classes (EVCs) indicates the pre-1750 vegetation of the site was dominated by Grassy Woodland (EVC 175) within the Goldfields Bioregion.

The property drains largely to the south and is dissected by minor headwater sub-catchments which flow into Mollisons Creek and includes about three small farm dams.

The site supports a scattered cover of small patches of eucalypts and individual trees. Lower lying areas in the east are dominated by River Red-gum *Eucalyptus camaldulensis*, and Yellow Box *Eucalyptus melliodora*. Elsewhere the most common tree is Grey Box *Eucalyptus macrocarpa* with other trees including Bundy *Eucalyptus goniocaylx*, Red Stringybark *Eucalyptus macrorhyncha* and Red Box *Eucalyptus polyanthemus*.

The site supports an open cover of scattered eucalypt regeneration and medium shrubs including a variety of wattles *Acacia* spp.. Scattered small shrubs include species such as Grey Guinea-flower *Hibbertia obtusifolia* and Thin-leaf Wattle *Acacia aculeatissima*.

The ground cover is typically grassy and mostly dominated by native grasses such as Wallaby-grasses *Rytidosperma* spp., Tussock-grasses *Poa* spp., Common Wheat-grass *Anthosachne scabra*, Weeping-grass *Microlaena stipoides*, Five-awned Spear-grass *Pentapogon quadrifidus* and Spear-grasses *Austrostipa* species. This grassy ground cover is locally species rich with common herbaceous species including Grassland Wood-sorrel *Oxalis perennans*, Slender Dock *Rumex brownii*, Bluebells *Wahlenbergia* spp., Smooth Solenogyne *Solenogyne dominii*, Common Onion-orchid *Microtis unifolia*, Sun-orchids *Thelymitra* spp., Wattle Mat-rush *Lomandra filiformis*, Small St John's Wort *Hypericum gramineum*, Common Raspwort *Gonocarpus tetragynus*, and Sheep's Burr *Acaena* species.

The site supports an average cover of weeds estimated at between 20% and 30%, although small scattered areas support a cover of weeds approaching 50%. The weediest areas are restricted to narrow bands along the ephemeral drainage lines.

Woody weeds are typically rare within this property although a small infestation of Horehound *Marrubium vulgare*, Gorse *Ulex europaeus* and Sweet Briar *Rosa rubiginosa* were observed across the site.

Perennial grassy weeds such as Toowoomba Canary-grass *Phalaris aquatica* are relatively rare, although Brown-top Bent *Agrostis capillaris* is ubiquitous and generally has a cover of between 5% and 10%. Other perennial weeds are relatively uncommon and include Yorkshire Fog *Holcus lanatus* and Sweet Vernal-grass *Anthoxanthum odoratum*.

Common geophyte weeds include Onion Grass *Romulea rosea* which is ubiquitous but has a low cover. The introduced South African Orchid *Disa bracteata* is present and locally common. This species has the potential to become problematic.

The most common weeds on the site are annual grasses such as Hair-grasses *Aira* species, Fescue *Vulpia* species, Quaking-grasses *Briza* species, Wild Oats *Avena* spp. and Bromes *Bromus* spp.. While common and locally providing a visually obvious cover of up to about 10%, these annuals are not high threat weeds in this environment.

Estimated habitat scores for open grassy areas are provided in Table 1.

Table 1 Vegetation condition results for the Glenaroua offset site

Site ID		1	
Habitat Zone ID		A	
EVC Name - #		Grassy Woodland (EVC 175)	
		Max Score	Score
Site Condition	Large Old Trees	10	3 (scattered large trees are present)
	Canopy Cover	5	0
	Lack of Weeds	15	6
	Understorey	25	15
	Recruitment	10	3
	Organic Matter	5	3
	Logs	5	0
	Site Score		
Landscape Value	Patch Size	10	8
	Neighbourhood	10	4
	Distance to Core	5	4
	Landscape Score		
HABITAT SCORE		100	46
Habitat points = #/100		1	0.46
Habitat Zone area (ha)			120.1
Habitat hectares (Hha)			55.2

Wallaby-grasses and Spear-grasses are relatively abundant across all parts of the site which is assessed as good quality habitat for GSM.

A number of GSM were also observed during the site inspection and these were widely distributed across the area inspected.

Soil erosion is a significant feature of this site with tunnel erosion being a significant feature of many drainage lines.

Discussion

The areas of 'pasture' observed was considered structurally suitable for GSM as they occur as an open grassland or woodland with an open grassy understorey which is dominated by tussock grasses. The sedimentary slopes supported scattered to abundant GSM food plants and even areas with a relatively dense cover of trees, still supported some GSM food plants. In general the floor of ephemeral drainage lines supported the highest cover of weeds while still providing GSM habitat.

The vegetation supports a small infestation of woody weeds (Gorse, Horehound and Briar Rose) which otherwise do not appear to be prevalent in the landscape. The local elimination of these species is therefore a plausible management outcome.

Herbaceous noxious weeds such as Spear Thistle *Cirsium vulgare* and Saffron Thistle *Carthamus lanatus*, may be seasonally prevalent but were only observed at low levels during this assessment. Control works should allow for these regionally common noxious species to be maintained at very low levels. Low levels of the noxious Spiny Rush *Juncus acutus* were observed along drainage lines. Again these occurred at low levels and management would be able to target local elimination.

The balance of the weed cover within the area is dominated by annual grasses. While this cover tends to fluctuate with seasonal conditions, a significant effort would be required to lower the cover of species such as Hair-grasses *Aira* species, Fescue *Vulpia* species, Quaking-grasses *Briza* species and Bromes *Bromus* spp..

Perennial species such as Toowoomba Canary-grass do not appear to have been actively sown into this site and management should be able to remove this species. However, Brown-top Bent will require significant

management inputs to reduce its abundance. Targeting this perennial weed in conjunction with grazing management would likely encourage the expansion of the cover of perennial native grasses.

Assessable components of the habitat score for GSM are provided in Table 2.

Table 2 GSM habitat Quality score

Parameter	Score	Justification
Site context	2/3	The Offset area is larger than 10 hectares and is a shape which is appropriate for reducing edge effects. The site does not otherwise satisfy the criteria required to score 3/3.
Site condition	1/3	The Offset area supports moderate quality native vegetation over most of the site.. As a mostly treeless version of a woodland community the VQA site condition score for the offset area is calculated as 30/75 (Table 1). Both annual and perennial weeds were present throughout noting however that the offset area and the property as a whole does not have Chilean Needle Grass <i>Nassella neesiana</i> such that none of the weeds present are known food plants for GSM. Therefore the offset area cannot qualify for a score of 3/3 and just fails the criteria for 2/3.
Species stocking rate	2/4	A total of 968 GSM were recorded from three surveys (704, 145, 119 & 0) over the 120.1 ha site. As the fourth survey did not record GSM it was excluded as being out of the flight season for this area. This gives a stocking rate of 9 moths per hectare. This places the survey area within the 5-20 moths per hectare category.
Quality score	5/10	

Areas of active tunnel and sheet erosion need to be subject to significant stabilisation works to prevent the future destruction of a significant proportion of this site. This could involve significant engineering and/or revegetation works. Areas suffering significant erosion and considered likely to degrade without intervention works had the margins of existing erosion buffered by five metres and these areas were excluded from the potential offset area.

Conclusion

The current survey confirms the suitability of this property as an offset site for EPBC Act offset requirements associated with impacts to GSM at Lindum Vale. The survey also provides relevant information to provide management targets and objectives.

The owner has indicated the site can provide about 120 hectares of GSM habitat as offsets contributing to the offset prescription required for the development of Lindum Vale. This assessment confirms the suitability of this area to provide offsets for GSM and that the nominated area can be improved by active ecological management to maintain the population of GSM in the longer term.

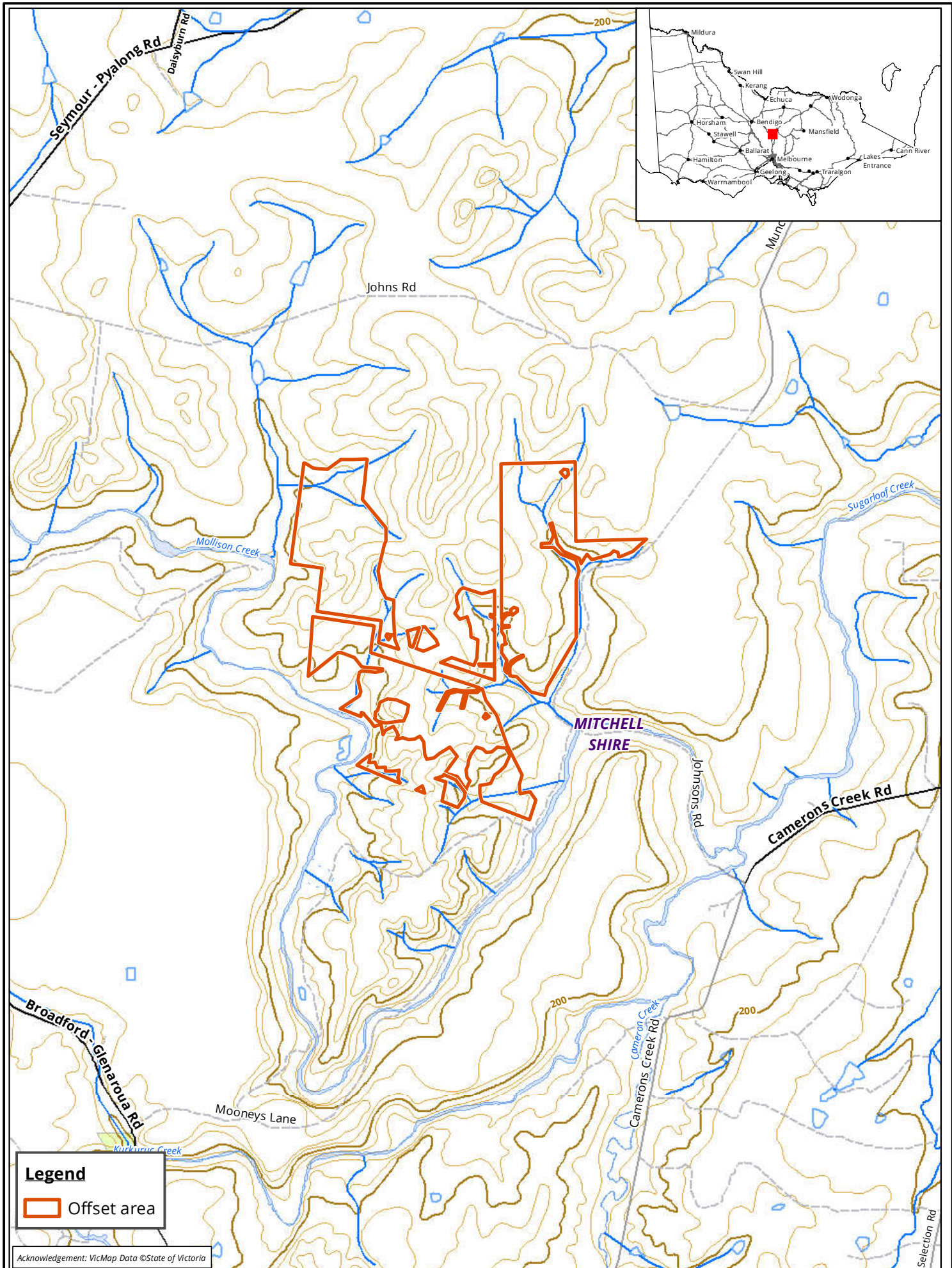
Please contact me on 8686 4800 if you would like to discuss further.

Yours sincerely

Steve Mueck
Senior Consultant Botanist

References

DEPI 2014. Advisory list of rare or threatened plants in Victoria. Department of Sustainability and Environment, Melbourne.



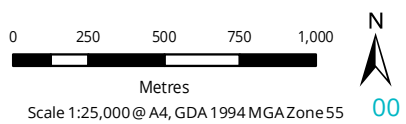
Legend
 Offset area

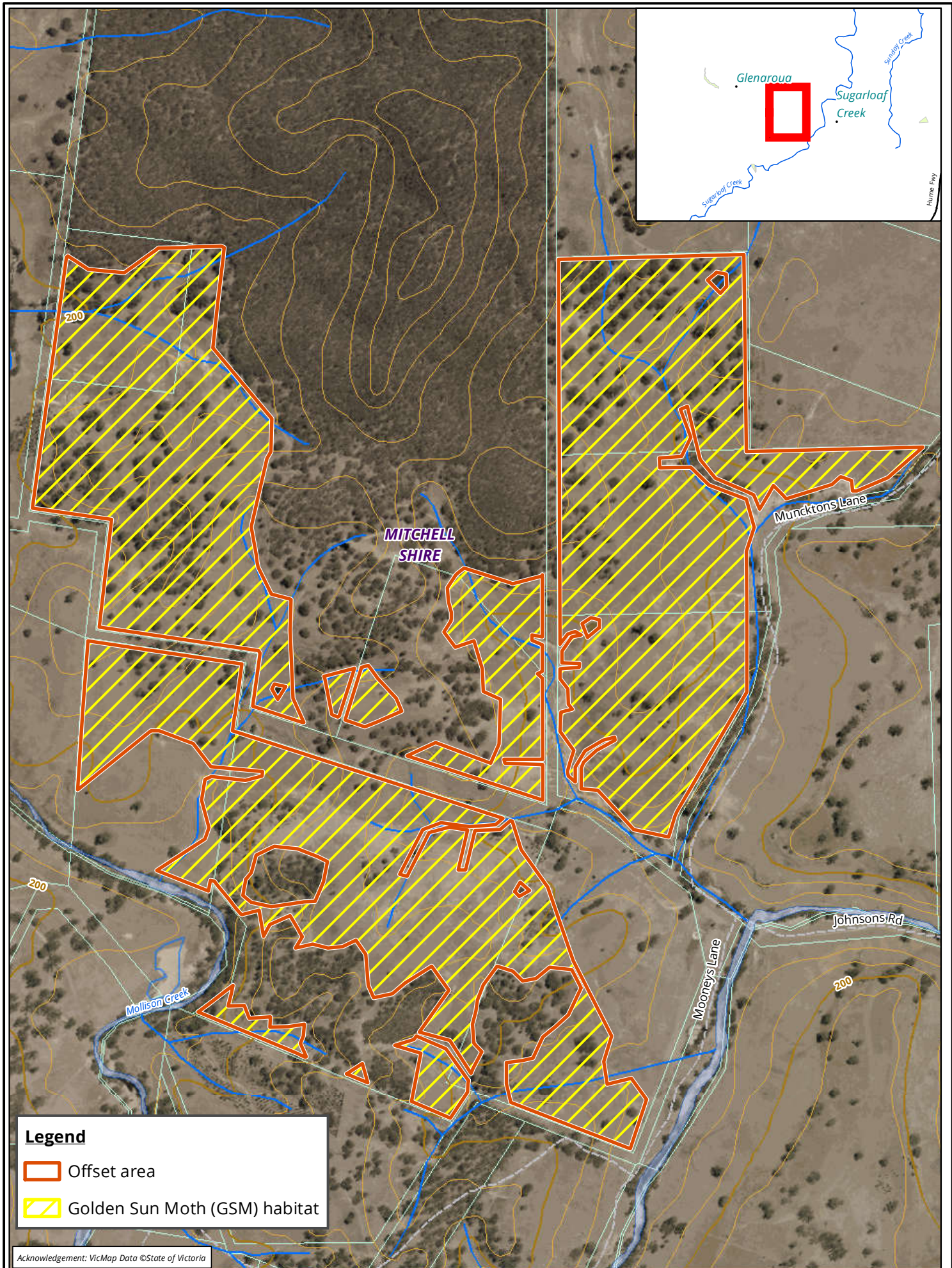
Acknowledgement: VicMap Data ©State of Victoria



Figure 1 Location of the Muncktons Lane Offset area, Glengaroua, Victoria

Matter: 29865/31287,
 Date: 03 April 2020,
 Checked by: SGM, Drawn by: SKM, Last edited by: smitchell
 Location: F:\29800s\29865\Mapping\29865_F1_Glengaroua.mxd



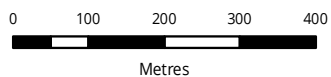


Acknowledgement: VicMap Data ©State of Victoria



Figure 2 The extent of GSM habitat, Munccktons Lane Offset area, Glenaroua, Victoria

Matter: 29865/31287,
 Date: 03 April 2020,
 Checked by: SGM, Drawn by: SKM, Last edited by: smitchell
 Location: F:\29800s\29865\Mapping\29865_F2_GSM_habitat_Glenaroua.mxd



Scale 1:10,000 @ A4, GDA 1994 MGA Zone 55

Appendix 1: Plant species (80 native, 49 weeds) recorded from the property, Muncktons Lane, Glenaroua.

Status	Scientific Name	Common Name
Indigenous species (80 spp.)		
P	<i>Acacia aculeatissima</i>	Thin-leaf Wattle
	<i>Acacia implexa</i>	Lightwood
P	<i>Acacia mearnsii</i>	Black Wattle
	<i>Acacia melanoxylon</i>	Blackwood
	<i>Acacia paradoxa</i>	Hedge Wattle
P	<i>Acacia pycnantha</i>	Golden Wattle
	<i>Acaena echinata</i>	Sheep's Burr
L, P, e	<i>Amphibromus pithogastrus</i>	Plump Swamp Wallaby-grass
	<i>Amyema pendula</i>	Drooping Mistletoe
	<i>Anthosachne scabra</i> s.s.	Common Wheat-grass
	<i>Aphanes</i> spp.	Piert
	<i>Aristida behriana</i>	Brush Wire-grass
	<i>Arthropodium strictum</i> s.s.	Chocolate Lily
	<i>Asperula conferta</i>	Common Woodruff
	<i>Austrostipa mollis</i>	Supple Spear-grass
	<i>Austrostipa nodosa</i>	Knotty Spear-grass
	<i>Austrostipa scabra</i> subsp. <i>falcata</i>	Rough Spear-grass
	<i>Austrostipa</i> spp.	Spear Grass
	<i>Burchardia umbellata</i>	Milkmaids
r	<i>Callitriche umbonata</i>	Winged Water-starwort
	<i>Carex inversa</i>	Knob Sedge
P	<i>Cheilanthes austrotenuifolia</i>	Green Rock-fern
	<i>Convolvulus</i> spp.	Bindweed
	<i>Crassula decumbens</i> var. <i>decumbens</i>	Spreading Crassula
	<i>Crassula peduncularis</i>	Purple Crassula
	<i>Crassula sieberiana</i> s.s.	Sieber Crassula
	<i>Dichondra repens</i>	Kidney-weed
	<i>Drosera hookeri</i>	Branched Sundew
	<i>Drosera peltata</i>	Pale Sundew
	<i>Drosera auriculata</i>	Sundew
	<i>Eleocharis acuta</i>	Common Spike-sedge
	<i>Epilobium billardierianum</i>	Variable Willow-herb
	<i>Eucalyptus camaldulensis</i>	River Red-gum
	<i>Eucalyptus goniocalyx</i> s.s.	Bundy
	<i>Eucalyptus macrorhyncha</i>	Red Stringybark
	<i>Eucalyptus melliodora</i>	Yellow Box
	<i>Eucalyptus microcarpa</i>	Grey Box
	<i>Eucalyptus polyanthemos</i>	Red Box
P	<i>Euchiton involucratus</i> s.s.	Star Cudweed

Status	Scientific Name	Common Name
P	<i>Euchiton japonicus</i> s.s.	Creeping Cudweed
	<i>Geranium retrorsum</i> s.s.	Grassland Crane's-bill
	<i>Geranium</i> sp. 2	Variable Crane's-bill
	<i>Gonocarpus tetragynus</i>	Common Raspwort
	<i>Hibbertia obtusifolia</i>	Grey Guinea-flower
P	<i>Hyalosperma demissum</i>	Moss Sunray
	<i>Hydrocotyle laxiflora</i>	Stinking Pennywort
	<i>Hypericum gramineum</i> spp. agg.	Small St John's Wort
	<i>Juncus amabilis</i>	Hollow Rush
	<i>Juncus bufonius</i>	Toad Rush
	<i>Juncus homalocalis</i>	Wiry Rush
	<i>Juncus subsecundus</i>	Finger Rush
	<i>Lobelia pedunculata</i> s.s.	Matted Pratia
	<i>Lomandra filiformis</i>	Wattle Mat-rush
	<i>Lomandra nana</i>	Dwarf Mat-rush
	<i>Luzula meridionalis</i> var. <i>densiflora</i>	Common Woodrush
	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass
P	<i>Microtis unifolia</i>	Common Onion-orchid
	<i>Montia australasica</i>	White Purslane
	<i>Myriophyllum crispatum</i>	Upright Water-milfoil
	<i>Oxalis perennans</i>	Grassland Wood-sorrel
	<i>Pauridia glabella</i> var. <i>glabella</i>	Tiny Star
	<i>Pelargonium</i> spp.	Stork's Bill
	<i>Pentapogon quadrifidus</i> var. <i>quadrifidus</i>	Five-awned Spear-grass
P	<i>Pleurosorus rutifolius</i> s.s.	Blanket Fern
	<i>Poa labillardierei</i>	Common Tussock-grass
	<i>Poa morrisii</i>	Soft Tussock-grass
	<i>Rumex brownii</i>	Slender Dock
	<i>Rytidosperma auriculatum</i>	Lobed Wallaby-grass
	<i>Rytidosperma caespitosum</i>	Common Wallaby-grass
	<i>Rytidosperma erianthum</i>	Hill Wallaby-grass
	<i>Rytidosperma setaceum</i> var. <i>setaceum</i>	Bristly Wallaby-grass
	<i>Schoenus apogon</i>	Common Bog-sedge
P	<i>Solenogyne dominii</i>	Smooth Solenogyne
	<i>Spergularia</i> spp.	Sand Spurrey
P, k	<i>Thelymitra exigua</i>	Short Sun-orchid
P	<i>Thelymitra peniculata</i>	Trim Sun-orchid
	<i>Themeda triandra</i>	Kangaroo Grass
	<i>Tricoryne elatior</i>	Yellow Rush-lily
	<i>Wahlenbergia multicaulis</i>	Branching Bluebell
	<i>Wahlenbergia</i> spp.	Bluebell

Status	Scientific Name	Common Name
Introduced species (49 spp.)		
	<i>Acetosella vulgaris</i>	Sheep Sorrel
	<i>Agrostis capillaris</i>	Brown-top Bent
	<i>Aira caryophylla</i> subsp. <i>caryophylla</i>	Silvery Hair-grass
	<i>Aira cupaniana</i>	Quicksilver Grass
	<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass
	<i>Arctotheca calendula</i>	Cape Weed
	<i>Avena barbata</i>	Bearded Oat
	<i>Briza maxima</i>	Greater Quacking-grass
	<i>Briza minor</i>	Lesser Quaking-grass
	<i>Bromus diandrus</i>	Great Brome
	<i>Bromus hordeaceus</i> subsp. <i>hordeaceus</i>	Soft Brome
	<i>Bromus rubens</i>	Red Brome
RC	<i>Carthamus lanatus</i>	Saffron Thistle
	<i>Cassinia</i> spp. (?sifton)	Cassinia
	<i>Centaurium erythraea</i>	Common Centaury
	<i>Cerastium glomeratum</i> s.s.	Sticky Mouse-ear Chickweed
RR	<i>Cirsium vulgare</i>	Spear Thistle
	<i>Crassula natans</i> var. <i>minus</i>	Water Crassula
	<i>Cynodon dactylon</i> var. <i>dactylon</i>	Couch
	<i>Disa bracteata</i>	South African Orchid
	<i>Erodium botrys</i>	Big Heron's-bill
	<i>Erodium cicutarium</i>	Common Heron's-bill
	<i>Erodium moschatum</i>	Musky Heron's-bill
	<i>Galium murale</i>	Small Goosegrass
	<i>Holcus annuus</i>	Annual Fog
	<i>Holcus lanatus</i>	Yorkshire Fog
	<i>Hypochaeris glabra</i>	Smooth Cat's-ear
	<i>Hypochaeris radicata</i>	Flatweed
	<i>Isolepis hystrix</i>	Awed Club-sedge
	<i>Isolepis levynsiana</i>	Tiny Flat-sedge
RC	<i>Juncus acutus</i> subsp. <i>acutus</i>	Spiny Rush
	<i>Leontodon taraxacoides</i> subsp. <i>taraxacoides</i>	Hairy Hawkbit
	<i>Lolium rigidum</i>	Wimmera Rye-grass
	<i>Lysimachia arvensis</i>	Pimpernel
RC	<i>Marrubium vulgare</i>	Horehound
	<i>Parentucellia latifolia</i>	Red Bartsia
	<i>Petrorhagia nanteuillii</i>	Childling Pink
	<i>Phalaris aquatica</i>	Toowoomba Canary-grass
	<i>Poa annua</i>	Annual Meadow-grass
	<i>Romulea rosea</i>	Onion Grass

Status	Scientific Name	Common Name
RC	<i>Rosa rubiginosa</i>	Sweet Briar
	<i>Sonchus oleraceus</i>	Common Sow-thistle
	<i>Spergularia villosa</i>	Hairy Sand-spurrey
	<i>Stellaria media</i>	Chickweed
	<i>Trifolium dubium</i>	Suckling Clover
	<i>Trifolium subterraneum</i>	Subterranean Clover
RC	<i>Ulex europaeus</i>	Gorse
	<i>Urtica urens</i>	Small Nettle
	<i>Vulpia bromoides</i>	Squirrel-tail Fescue

Notes to tables:

<p>EPBC Act: CR - Critically Endangered EN - Endangered VU - Vulnerable</p> <p>PMST – Protected Matters Search Tool</p>	<p>DEPI 2014a: e - endangered v - vulnerable r - rare k - poorly known</p>
<p>FFG Act: L - listed as threatened under FFG Act P - protected under the FFG Act (public land only)</p>	<p>Noxious weed status: SP - State prohibited species RP - Regionally prohibited species RC - Regionally controlled species RR - Regionally restricted species</p> <p># - Native species outside natural range</p>

Appendix 2: Photos from 235 Muncktons Lane, Glenaroua.



Photo 1 The property supports extensive broad open grassy areas largely dominated by native Wallaby-grasses. This photo is from the southern portion of the property.



Photo 2 The ground cover on exposed ridges is mainly Wallaby-grass with scattered herbs



Photo 3 Some drainage lines have been partially stabilised by revegetation.



Photo 4 The slopes are largely dominated by native grasses with increased weed levels along the ephemeral drainage lines.



Photo 5 larges areas of open grassy vegetation support scattered old trees



Photo 6 Areas of active tunnel erosion need management and have generally been buffered and excluded



Photo 7 Areas under trees still support GSM habitat in good condition



Photo 8 Open grassy habitat in the north west of the property



Photo 9 Open grassy habitat in the north west of the property



Photo 10 Open grassy understorey in Grey Box woodland in the north west of the offset site.



Photo 11 Scattered Spiny Rush along minor drainage lines.



Photo 12 Collapsed tunnels excluded from the central portion of the offset area.



Photo 13 Central portion of the offset site looking north into the north eastern portion of the site. Note the mid-distance erosion excluded from this site



Photo 14 Typical ground cover showing abundant wallaby-grass, weedy annual grasses and scattered herbaceous weeds