FLORA AND VEGETATION SURVEY

of the

Comet Vale Project

Prepared for

MLG Oz Ltd.

Prepared by

Goldfields Landcare Services

April 2022

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLES

MAPS

TABLE OF CONTENTS (continued)

FIGURES

PLATES

TABLE OF CONTENTS (continued)

PLATES (continued)

APPENDICES

1. SUMMARY

Goldfields Landcare Services (GLS) conducted a Reconnaissance Flora and Vegetation Survey for MLG Oz Pty Ltd (MLG) on the Companies Exploration Lease, E 29/742, at Comet Vale, approximately 21 kilometres south-east of Menzies, over two areas covering 374 Ha. An additional 138 Ha was also surveyed within the adjacent Unoccupied Crown Land (UCL) making the total area surveyed 512 Ha. That survey was carried out between 04.10.2017 and 29.07. 2018.

A Detailed Flora and Vegetation Survey was subsequently commissioned and carried out between 17.09.2021 and 14.11.2021. This survey covered an area of 774 Ha. It excluded the previously surveyed UCL and included two proposed haulage corridors linking the surveyed areas to the Goldfields Highway.

Two Botanists conducted the fieldwork which consisted of quadrat surveys, traverses, a releveˊ and opportunistic sampling, as well as recording the locations of the Priority plant species in and around the survey area.

Two hundred and fifteen vascular plant species have been recorded from within the survey areas. The most prevalent family was *Fabaceae* with 35 species.

No plant species gazetted as "Threatened" pursuant to Part 2 of the *Biodiversity Conservation Act 2016* Western Australia (W A) (The Conservation Codes for Western Australian Flora and Fauna) and no plant species listed as "Critically Endangered" under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999, Commonwealth) have been recorded within the surveyed areas.

Nine plant species of conservation significance were recorded within the survey areas: *Persoonia leucopogon* (**P1**); *Apatelantha insignis* (**P2**); *Thryptomene eremaea* **(P2**); *Acacia eremophila* var. *variabilis* (**P3**); *Alyxia tetanifolia* **(P3**); *Homalocalyx grandiflorus* (**P3**); *Hysterobaeckea ochropetala* subsp. *cometes* **(P3).** *Eucalyptus jutsonii* subsp. *jutsonii* (**P4)** and *Grevillea secunda* (**P4**).

No Threatened Ecological Communities (TEC) or Priority Environmental Communities (PEC) were encountered during the survey.

No non-native introduced species were recorded within the survey areas.

Six vegetation types were recorded and described within the survey area.

The vegetation condition was rated as "Good" based on the Vegetation Condition Scale adapted from Keighery (1994) and Trudgen (1998) (Appendix B).

2. INTRODUCTION

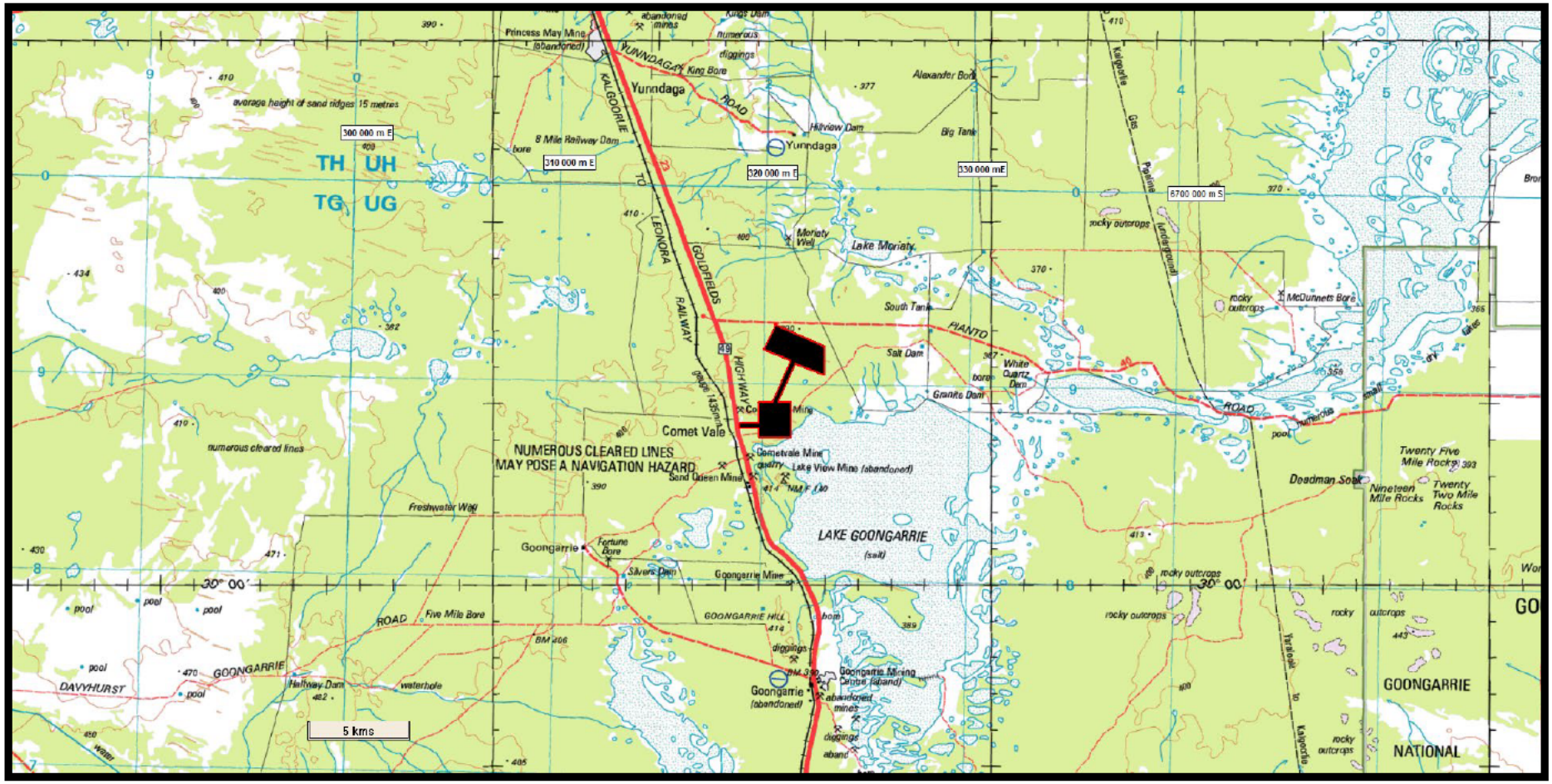
2.1 Location

The area surveyed is located 100 kilometres north of Kalgoorlie in Western Australia. It sits within the Shire of Menzies local government area and is 21 kilometres south-east of the town of Menzies. The area lies within MLG Oz Ltd.'s Exploration Lease E 29/742 where it is situated between the Goldfields Highway on the western side and Lake Goongarrie on the eastern.

The now abandoned townsite of Comet Vale, 1.5 kilometres south of the survey area, was gazetted shortly after the discovery of gold there in 1894, More recently, gold and sand have been mined locally, and extensive nickel and base metal exploration conducted throughout the area.

The pre-European vegetation mapped by Beard et al (2013) shows the vegetation type, within which this survey area lies, to have been Hummock grassland,(Triodia spp.) which is described as scattered low trees over dwarf shrubs or mixed short grass and spinifex mixed species. This vegetation type covers an area of 1.6 million hectares or 6.3% of the total area of WA. (Beard 2013, p.14)

Map 1: Location Map 2021 Detailed Survey Area



2.2 Objective

Following the 2017/18 Reconnaissance Survey, Goldfields Landcare Services (GLS) conducted a Detailed Flora and Vegetation Survey, together with Targeted surveys to delineate the boundaries of Priority plant species, over an area of 774 Ha on MLG's Exploration Lease E 29/742, as part of the company's assessment of a potential sand mining operation.

The surveys were conducted in compliance with EPA Technical Guidance Statement, December 2016, guidelines.

2.3 Survey Categories

Reconnaissance Survey

"A reconnaissance survey is undertaken to verify the information obtained from the desktop study, to characterise the flora and to delineate the vegetation units present. In some instances, a reconnaissance survey is necessary to determine the type of survey required. A reconnaissance survey generally involves a site visit by an experienced botanist to undertake low intensity sampling of the flora and vegetation, to describe the general vegetation characteristics and condition at an appropriate scale. The reconnaissance survey should clarify whether the area may support any significant flora or vegetation. If significant flora or vegetation is located or considered likely to be present during a reconnaissance survey, a targeted or detailed survey may be required." (EPA 2016, p. 5)

Targeted Survey

"A targeted survey is used to gather information on significant flora and/or vegetation. A targeted survey aims to determine the size and extent of all significant flora populations or vegetation in the survey area and to place any impacts into context" (EPA 2016, p. 5)

Detailed Survey

"A detailed survey is necessary for significant proposals to adequately address the EPA's objective for Flora and Vegetation, as a preliminary or key environmental factor of assessment." (EPA 2016, p.5)

2.4 Background Research

The purpose is to gather background information on the target area (usually at the locality scale). This involves a search of available sources of literature, data, and map-based information.

In the WA Department of Agriculture's *Technical Bulletin, No 87 An inventory and condition survey of the north-eastern Goldfields, Western Australia*, authors H. Pringle *et.al*. 1994 describe land systems according to their topography, soils and vegetation, reference to which, has provided the basis for the identification of the vegetation types described in this survey.

The other relevant survey report reviewed was Goldfields Landcare Services. (2017) "*Flora and Vegetation survey of the Comet Vale Project"* prepared for MLG Oz Ltd.

2.4.1 Rare and Priority Flora Searches

In WA, under the *Biodiversity Conservation Act 2016* WA (BC Act), all plants are protected. Some, which are under threat of extinction, are classified as Threatened Species. Others which are either under consideration to be declared as Threatened Species or still require monitoring are classified as Priority Flora species. The definitions of the five different classifications of Priority Species and that of Threatened Species and Presumed Extinct Species are shown in Appendix D.

A database search for Rare and Priority Flora potentially occurring within 50 kilometres of the centre of the survey area was carried out by the WA Department of Biodiversity Conservation and Attractions (DBCA) on 29.09.21, (Ref. No. 12-0921FL).

The search results were cross-checked against the results of a search of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) list of Threatened Flora.

A Protected Matters Report was generated from the Department of Environment and Energy's online search facility on 07.03.2022. The report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act. The search area was located approximately at the centre of the survey area with a 40-kilometre buffer. Four plant species were listed as Endangered within the search area and three species as Vulnerable. See Appendix A.

There are 23 species classified as Threatened or Priority species recorded in the DBCA searches.

The W.A. Department of Parks and Wildlife (DPaW) Threatened and Priority Flora Database (TPFL) contained five species.

The West Australia Herbarium Database (WAHerb) contained 23.

A DBCA NatureMap Species Report was generated on 26.08.21 covering an area with a 40-km radius from the survey area which revealed 20 priority plant species occurring within it.

Some species occurred in more than one of the searches resulting in a total of 28 species of conservation significance from five searches, potentially occurring in the area (See Appendix A).

- Four species were listed as Threatened (Rare)
- Six plant species were listed as Priority 1
- Four plant species were listed as Priority 2
- Eleven plant species were listed as Priority 3
- Three plant species were listed as Priority 4

2.4.2 Threatened and Priority Ecological Communities Searches

Listed threatened species and ecological communities are recognized as a matter of national environmental significance. Consequently, any action that is likely to have a significant impact on listed threatened species and ecological communities under the *EPBC Act* must be referred to the Minister. The different categories of threatened species and threatened ecological communities and their respective definitions are shown in Appendices D.

The Australian Government Department of Environment and Energy's (DoEE) List of Threatened Ecological Communities (TEC) viewed online shows that the TEC nearest the survey area is Depot Springs stygofauna community, 237 kilometres north-west of the survey area.

A database search was conducted by the DBCA of TEC's and PEC's endorsed by the minister for the environment on 09.09 21 (Ref: 49-0821EC)

The search revealed that the nearest TEC to the survey area is the Depot Springs stygofauna complex which is located approximately 273 kilometres north-west.

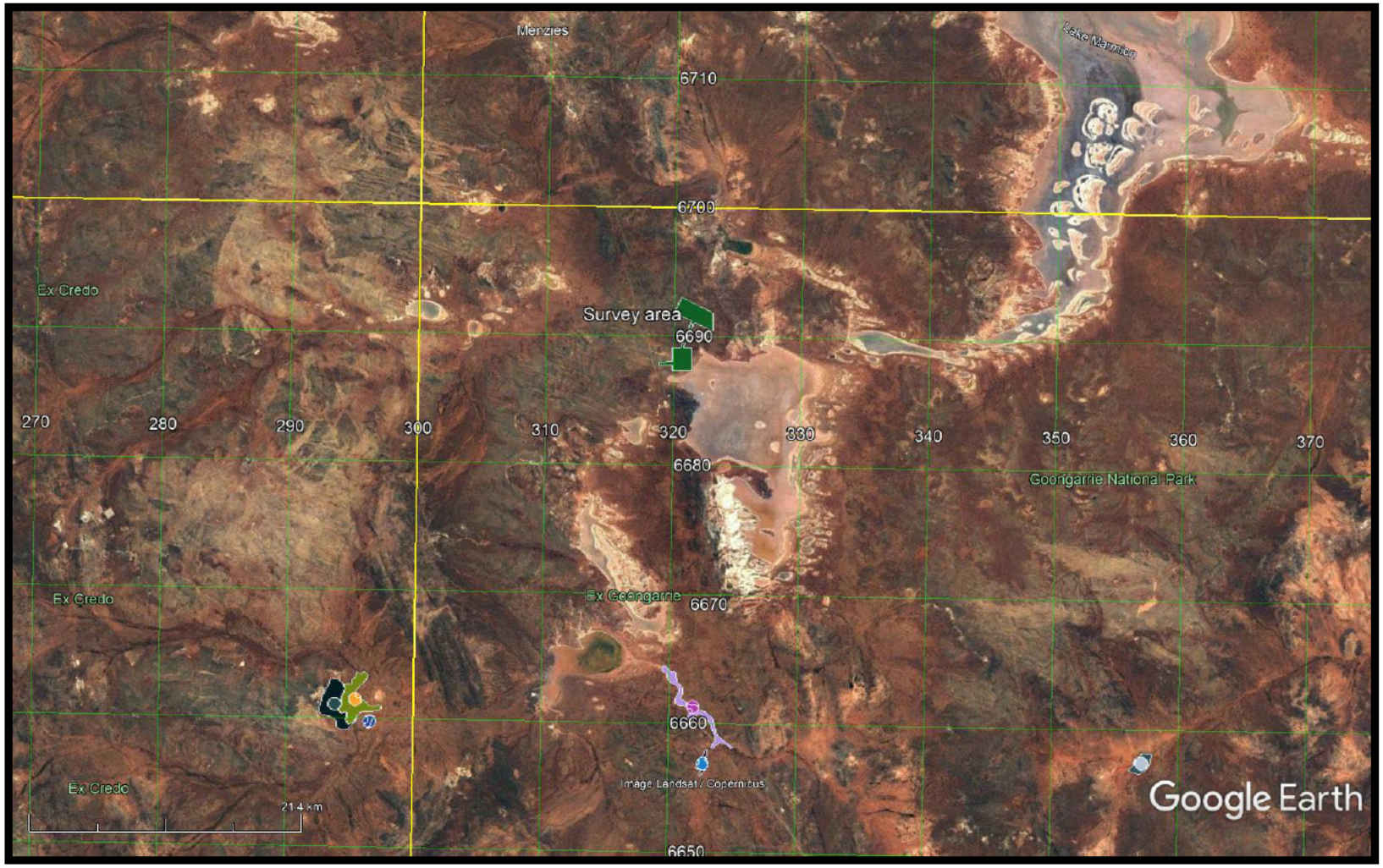
Ten areas within 50 kilometres of the survey area were identified as PEC's. All were designated as Emu Land System (P3) threatened by overgrazing.

The nearest PEC to this survey area is located approximately 23 kilometres south of the survey area. (See map on page 13)

Table 1: TEC and PEC's Nearest the Survey Area.

Community Name	**Status**
Depot Springs stygofauna complex **(TEC)**	Vulnerable (B)
Emu Land System (405) **(PEC)**	P3

Map 2: PEC Search Results



NB: Coloured areas south of the survey area represent individual locations designated as Emu Land System (P3)

2.4.3 Climate

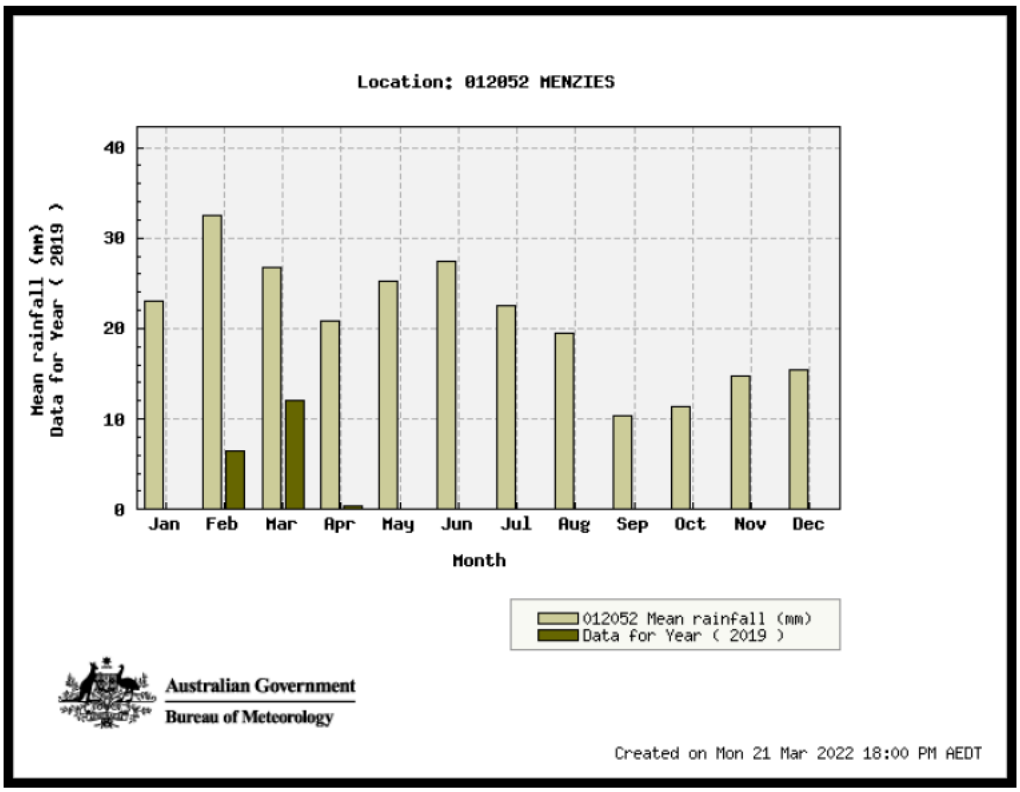
Beard described the climate of the Murchison Region, (Austin Botanical District) in Plant Life of Western Australia, within which the survey area lies, as "Arid with summer and winter rains; annual precipitation 200 mm". (Beard 1990, p. 186)

The nearest Bureau of Meteorology (BOM) weather station, number 12052, is located at Menzies, which lies approximately 23 kilometres north-north-west of the survey area.

Records from the station for 105 years from 1896 to 2018 show that the mean annual rainfall is 254 mm with almost 80% of that normally falling within the eight months of January to August. The four months of September to December receive a combined total of just 52 mm constituting 20% of the annual total. The wettest month is February with a mean of 32.5 mm.

For 95 years from 1898 to 1996 the mean annual maximum temperature was 26.3° C, and the mean annual minimum temperature was 12.6° C (Bureau of Meteorology 2022).

Figure 1: Menzies Mean Rainfall Graph.



(BOM 2022)

2.4.4 Land Systems

Although lying within 30 kilometres of the northern boundary of the South West Interzone, the surveyed areas fall entirely within the Eastern Murchison (MUR01) sub-region of the Murchison (MUR) region as classified under the Interim Biogeographic Regionalisation of Australia (IBRA) Version 7, which states:

> "Under the Convention of Biological Diversity, Australia has worked towards a target of 17 per cent of our continent to be protected as part of the National Reserve System. In building the National Reserve System, priority is given to under-represented bioregions that have less than 10 per cent of their remaining area protected in reserves." (Department of Environment and Energy (DEE) 2021).

The Murchison Bioregion is classed as Underrepresented with less than 1% protected in reserves (DWER 2021d). It is described as:

> "Mulga low woodlands, often rich in ephemerals, on outcrop and fine-textured Quaternary alluvial and eluvial surfaces mantling granitic and greenstone strata of the northern part of the Yilgarn Craton. Surfaces associated with the occluded drainage occur throughout with hummock grasslands on Quaternary sandplains, saltbush shrublands on calcareous soils and Halosarcia low shrublands on saline alluvia. Areas of red sandplains with mallee-mulga parkland over hummock grasslands occur in the east." (Thackway and Cresswell 1995, p. 68)

In *Plant Life of Western Australia*, Dr. John Beard described and mapped the vegetation in the Austin Botanical District, now recognised as The Murchison Region which covers 316,239 square kilometres. He characterised the vegetation as "Predominantly mulga low woodland (*Acacia aneura*) on plains, reduced to scrub on hills. Tree steppe of *Eucalyptus* spp. and *Triodia basedowii* on sand plains." Referring to the Eastern half of the region he wrote that it has "catenas comprising sandplains on the higher ground, loam soils on the slopes and plains, and salt lakes in the valley bottoms. In some case there are "low level sandplains" in the valleys formed of sand transported from the upper parts of the landscape." (Beard 1990, p. 187)

In the WA Department of Agriculture's *Technical Bulletin, No. 87 An inventory and condition survey of the north-eastern Goldfields, Western Australia*, authors H. Pringle *et.al*. (Technical Bulletin No. 87) describe land systems according to their topography, soils and vegetation. The 1: 250 000 scale map of the land systems accompanying the report shows the areas surveyed for this project lie

almost entirely within the Marmion Land System with a portion of lake edge lying within the Carnegie Land System.

These land systems are described as follows:

> "**Marmion Land System:** Extensive gently undulating sand plains (mixed spinifex, acacia, heath and mallees). (Pringle et al. p. 240)
>
> **"Carnegie Land System:** Salt lakes with fringing saline flats and dunes." (Pringle et al. p.186)

2.4.5 Vegetation

Technical Bulletin No. 87 identifies six different landform units which may exist within the Marmion Land System and ten within the Carnegie Land System.

Each landform unit hosts a number of different vegetation types.

3. METHODS

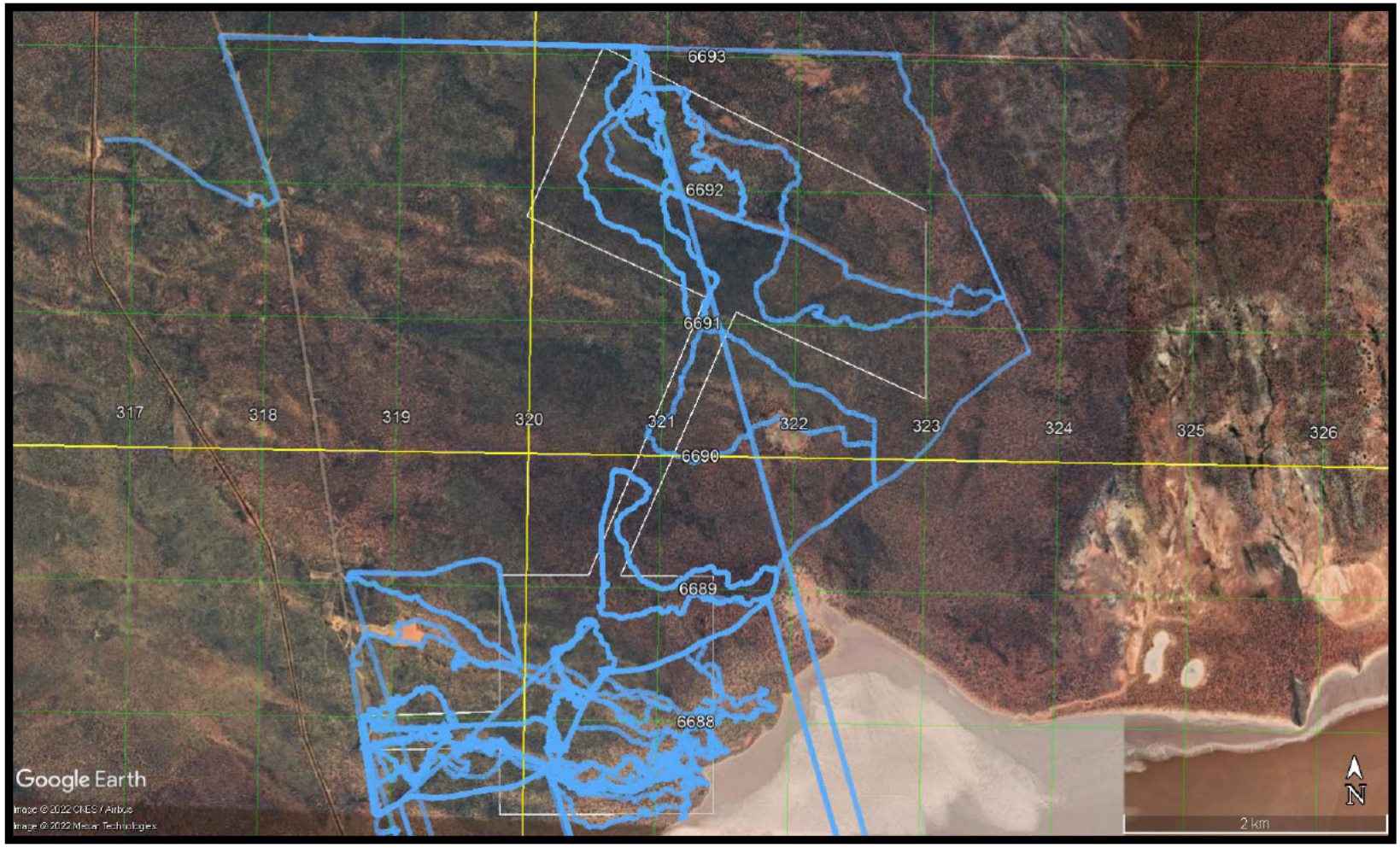
The field surveys were designed to provide data to facilitate the characterisation of the vegetation types present and produce a map depicting those units. Also, to search for Threatened or Priority plants species likely to occur in the area.

The fieldwork for the Reconnaissance Survey was carried out between 04.10.2017 and 29.07.2018 and for the Detailed and Targeted surveys from 17.09.21 to 14.11.22. They were designed to confirm the validity of the imagery interpretations made from satellite data of the area, to record and collect plant samples from traverses, and quadrat surveys, to determine the presence or otherwise of potential PEC's and flora of conservation significance and to record the condition of the vegetation.

Land Systems and associated Landform units were identified from the WA Department of Agriculture's *Technical Bulletin, No. 87 An inventory and condition survey of the north-eastern Goldfields, Western Australia.* Vegetation Types were interpreted from quadrat surveys and vegetation type boundaries defined using satellite imagery.

The survey areas were accessed from an existing track running north- east from the Goldfields Highway to Pianto/Tonkin Road and from fence line tracks. Traverses were conducted on foot within the survey areas.

Map 3: 2021 Detailed Survey Tracks



Key: **tracks**

Twenty-one quadrat surveys were conducted in 2017/18, and seven in 2021

Each 20m x 20m quadrat survey recorded descriptions of: Landscape, Surface, Rock Type, Soils, Overall Vegetation Type, Fire Age, Condition/Disturbances, Vegetation Stratum Height, Total Percentage Cover and Dominant Species from which a vegetation description was deduced using the Vegetation Classification System shown at Appendix E. A list of species together with their height and percentage foliar cover was also recorded.

Plant species were recorded or sampled, and locations were recorded using a Garmin GPSmap76csx device and a Garmin g66i device. Photographs were taken from the north – west corner of each quadrat. Opportunistic samples, notes, photographs, and GPS coordinates were also taken to aid the mapping and reporting.

Specimens collected in the field were subsequently identified using appropriate text references, plant keys and web sites.

Nine specimens collected during the reconnaissance survey and four from the Detailed and Targeted surveys were sent to the WA Herbarium for positive identification,

The methods adopted for the Targeted Surveys of the Priority plant species were determined by the abundance and distribution of each of the nine species. This varied from relatively few. spread over a large area e.g., *Persoonia leucopogon* (**P1**), where individual stems were recorded and boundaries mapped to extremely abundant and widespread, e.g., *Hysterobaeckea ochropetala* subsp. *cometes* (**P3**) where locations of stems were recorded in traverses and density estimates derived from that data.

3.1 Definitions of Survey Limitations

According to the EPA Guidance Statement June 2016 for Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, flora and vegetation surveys may be limited by the following:

- sources of information and availability of contextual information (i.e. pre-existing background versus new material);
- the scope (i.e. what life forms, etc., were sampled);
- Proportion of flora collected and identified (based on sampling, timing and intensity);
- completeness and further work which might be needed (e.g. was the relevant area fully surveyed);
- mapping reliability;

- timing, weather, season, cycle;
- disturbances (fire, flood, accidental human intervention etc.);
- intensity (in retrospect, was the intensity adequate);
- resources;
- access problems; and
- experience levels (e.g. degree of expertise in plant identification to taxon level). (EPA, pp.13-15)

An assessment of these aspects is detailed in the table below:

3.2 Survey Limitations

TABLE 2: Survey Limitations

ASPECT	CONSTRAINT	COMMENT
Sources and availability of contextual information	No	The WA Department of Agriculture's *Technical Bulletin, No. 87 An inventory and condition survey of the north-eastern Goldfields, Western Australia,* provides extensive reference material for the area. The 2017/18 survey provided data for the 2021 Detailed and Targeted Surveys
Scope	No	The project comprised reconnaissance, detailed and targeted surveys and covered all aspects of flora and vegetation assessment and requirements for IBSA data submission. For practical purposes, the extent of the populations of some widely distributed Priority plant species, beyond the survey area, was not determined.
Proportion of flora collected and identified	No	Traverses and quadrats covered the six vegetation types encountered. Sampling was

		detailed and identification to species level was 99% complete.
Completeness	No	Twenty eight quadrat surveys and extensive foot traverses deemed sufficient.
Mapping reliability	No	Detail considered adequate for this level of survey in this region.
Timing	No	The recommended timing for the Eremaean botanical province is March-June, however the proximity of this survey area to the South-West Interzone influences flowering times and favours a Spring survey.
Disturbances	No	No impediments encountered.
Intensity	No	Survey intensity considered to be adequate.
Resources	No	Resources were adequate with 53-person days devoted to botanical survey work.
Access Problems	No	Survey areas accessible by foot and four-wheel drive vehicle.
Experience Levels	No	Personnel have combined over 32 years field surveying experience in the Eastern and North-Eastern Goldfields and Murchison Region.

4. RESULTS

4.1 Flora

Twenty-eight quadrats, each 20m x 20m were surveyed.

A total of 161 separate plant specimens (including duplicates) were collected from within and around the survey areas.

Two hundred and fifteen different species, including sub-species and varieties have been identified from 40 families and 102 genera.

NB These figures do not include the eight additional species located in a saline depression, outside the survey area, which are noted in the Discussion, Section 5, but were not included in the statistical analysis of the data shown in Section 4.3.

The most abundant genera were *Acacia* with 28 species followed by *Eremophila* with 14, *Eucalyptus* with 12 and *Grevillea* with 11 species.

A complete list of species recorded is shown in the attached Appendix C.

No non-native introduced species were recorded within the survey areas.

A database search was conducted by the DBCA of TEC's and PEC's endorsed by the minister for the environment on 09.09 21 (Ref: 49-0821EC)

The search revealed that the nearest TEC to the survey area is the Depot Springs stygofauna complex which is located approximately 273 kilometres north-west.

The nearest PEC to this survey area is the Emu Land System located approximately 23 kilometres south of the survey area.

No TEC's or PEC's were encountered during the survey.

No plant species gazetted as Declared Rare Flora pursuant to Part 2 of the *Biodiversity Conservation Act 2016* (W. A.) and no species listed as Threatened pursuant to the List of Threatened Flora of the *EPBC Act* (Department of Agriculture, Water and the Environment) has been recorded from within the survey area.

Nine plant species of conservation significance were recorded within and around the survey area. They are: *Persoonia leucopogon* (**P1**); *Apatelantha insignis* (**P2**); *Thryptomene eremaea* (**P2**); *Acacia eremophila* var. *variabilis* (**P3**); *Alyxia tetanifolia* (**P3**); *Homalocalyx grandiflorus* (**P3**) *Hysterobaeckea ochropetala* subsp *cometes* (**P3**); *Eucalyptus jutsonii* subsp. *jutsonii* (**P4**) and *Grevillea secunda* (**P4**). (See Maps 9-26)

4.2 Vegetation Classification

The Vegetation types described occur within different landforms, which, in turn, occur within different land systems as described below:

Land Systems

As mentioned in Section 2.4 above, two land systems were identified during the background research from the Department of Agriculture's Technical Bulletin 87 which covered the survey areas:

> "**Marmion Land System:** Extensive gently undulating sand plains (mixed spinifex, acacia, heath and mallees)." (Pringle et al. p. 240)
>
> **"Carnegie Land System:** Salt lakes with fringing saline flats and dunes." (Pringle et al. p. 186)

An additional land system, "Yilgangi", was found during the reconnaissance survey to be represented in a relatively small area (< 8 Ha), fringing the north-western corner of Lake Goongarrie, which was not identified on the 1:250 000 scale map accompanying the bulletin, probably due to the fact that it would have been too small to depict at that scale.

The **Yilgangi Land System** is described as: "Low breakaways with saline, gravelly lower plains, supporting predominantly halophytic low shrublands." (Pringle et al. p. 288)

Landforms

Six different **landform units** may occur within the Marmion Land System, eight within the Yilgangi Land System and ten within the Carnegie Land System.

Marmion Land System Landforms:

Three of the six Landform units were identified within the Marmion Land System:

Unit 1-Sand sheet – gently undulating sandplain. The vegetation was described as: " Scattered to moderately close acacia tall shrubland with occasional small mallees, a heath stratum, and spinifex and wanderrie grasses, each occasionally dominant." (Pringle et al. p. 241)

Unit 5-Dunes – occasional low (<10m) dunes occurring in the more extensive areas of Unit 1. The vegetation was described as: "Variable, often moderately close tall shrublands consisting of acacias, mallees, *Callitris collumelaris* (native pine), *Grevillea* spp. *Hakea* spp. with a heath stratum and spinifex." (Pringle et al. p. 241)

Unit 6 – Narrow drainage tracts- occasional narrow (<500 m wide), linear zones receiving concentrated run-on from Unit 2. The vegetation was described as: "Close *Acacia aneura* tall shrublands, understory may contain heath species, hardpan low shrubs, and wanderrie grasses." (Pringle et al. p. 241)

Although Unit 2, referred to above, barely encroached into the survey area, its influence in providing run-off, together with a lower elevation in the landscape, provide the conditions and vegetation consistent with that described in Unit 6.

Unit 2 was described as, "Stripped surfaces – exfoliating low (5 m) outcrops of granite with narrow fringing plains." (Pringle et al. p. 241)

Carnegie Land System Landforms

Of the ten different Landform units which may occur in the Carnegie Land System**,** two were identified:

Unit 1- Lake beds – lake floors. Unvegetated.

Unit 3- Saline plains- level to gently undulating highly saline lower plains and drainage zones. The vegetation was described as: "Scattered to moderately close low shrublands, usually *Halosarcia* spp. (samphire) but also *Frankenia* spp. (frankenia)." (Pringle et al. p. 187)

Yilgangi Land System Landforms

One of the eight Landform units possibly occurring within the Yilgangi Land System was mapped:

Unit 1- Breakaways – narrow, stripped, lateritised surfaces above escarpments (generally < 10 m high), with stony scree slopes. The vegetation was described as: "Scattered eucalypt woodland in the south… [of the Technical Bulletin No 87-survey area] Scattered mixed shrublands… elsewhere." (Pringle et al. p. 289)

Vegetation Types

Marmion Land System Vegetation Types

Occurring within the **Sand sheet landform**, the Vegetation Type classification of **Sandplain spinifex hummock grassland (SASP)** described in Technical Bulletin No.87 covers a number of different sub-types; typically determined by the depth of the underlying sand, the dominance of Spinifex, and represented by their upper strata, including Mallees and Mulga.

Three of these sub-types of SASP were identified and mapped within the surveyed area:

- **Sandplain -gum stratum – SAGS**
- **Sand dune shrubland – SDSH**
- **Sandplain acacia shrublands - SACS**

One additional vegetation type was found within the Marmion Land System:

- **Mulga wanderrie grassy shrublands – MUWA**

Carnegie Land System Vegetation Types

The south-eastern corner of survey Area,1 encroaches on a salt lake, Lake Goongarrie.

One Vegetation Type was mapped within this land system: **Frankenia low shrublands – FRAN.** Although it is recognised that a similar vegetation type, Samphire low shrublands (SAMP) predominated in some sections of the lake edge it was not differentiated in the mapping at the scale of approximately 1:10 000.

Yilgangi Land System Vegetation Type

A small area of breakaways with stony foot slopes occurs on the north-western corner of Lake Goongarrie which is considered to be a landform described as occurring within the Yilgangi Land System. It appears to be an extension of the Yilgangi Land System that has been shown on the 1:250 000 map accompanying Technical Bulletin 87 as occurring approximately 2.5 kilometres to the east.

The Landform unit is described in Technical Bulletin 87 as:" Breakaways-narrow stripped, lateritised surfaces above escarpments (generally < 10 m high), with stony scree slopes."

Within this Landform unit, one Vegetation Type was identified and mapped:

- **Greenstone hill (non - halophytic) eucalypt woodlands- GNEW**

Find below the complete map of vegetation types with quadrats locations from the survey:

Map 4: Comet Vale Vegetation and Quadrat Locations.

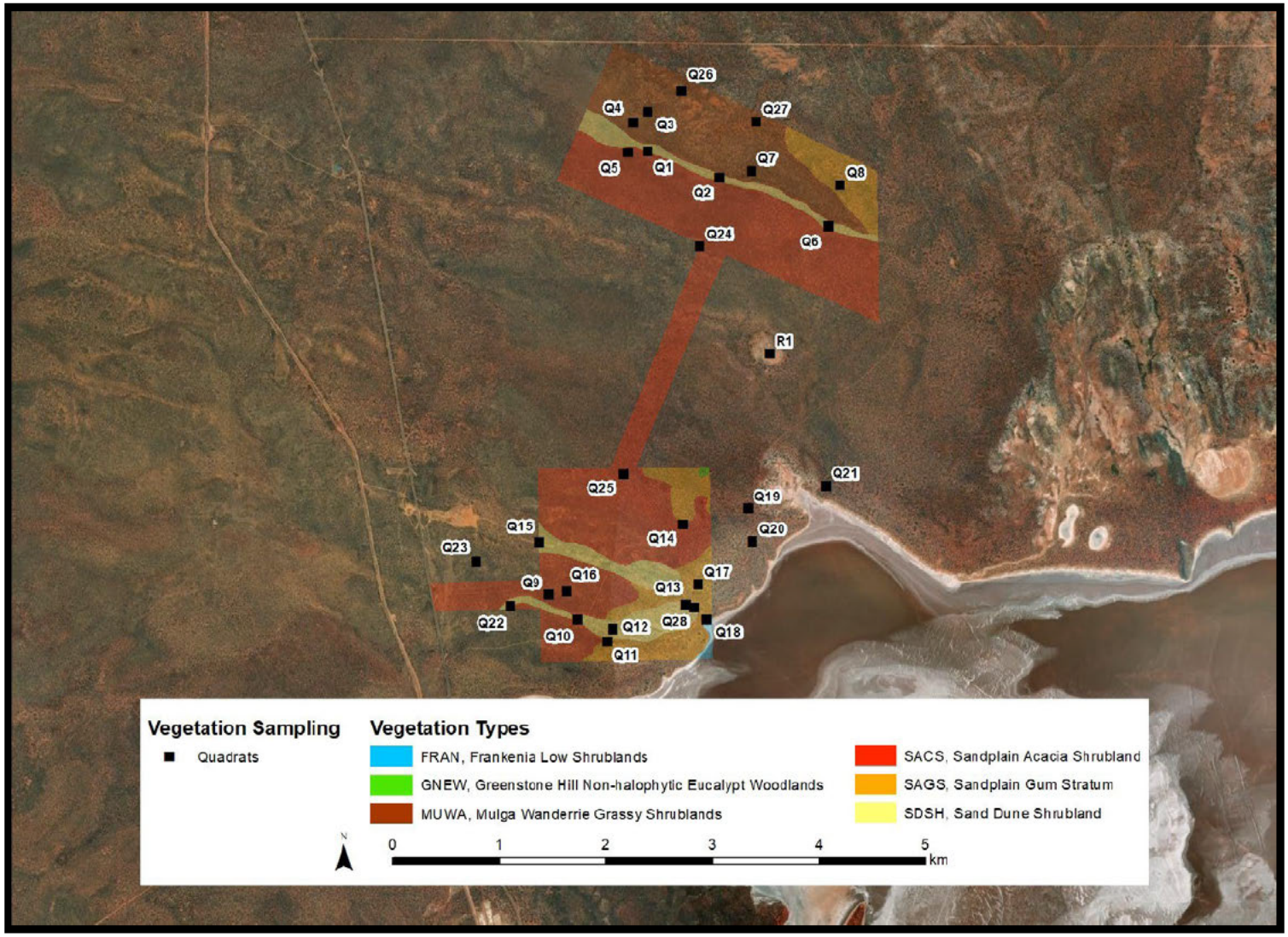


Table 3: Vegetation Type Proportions within the Survey Area

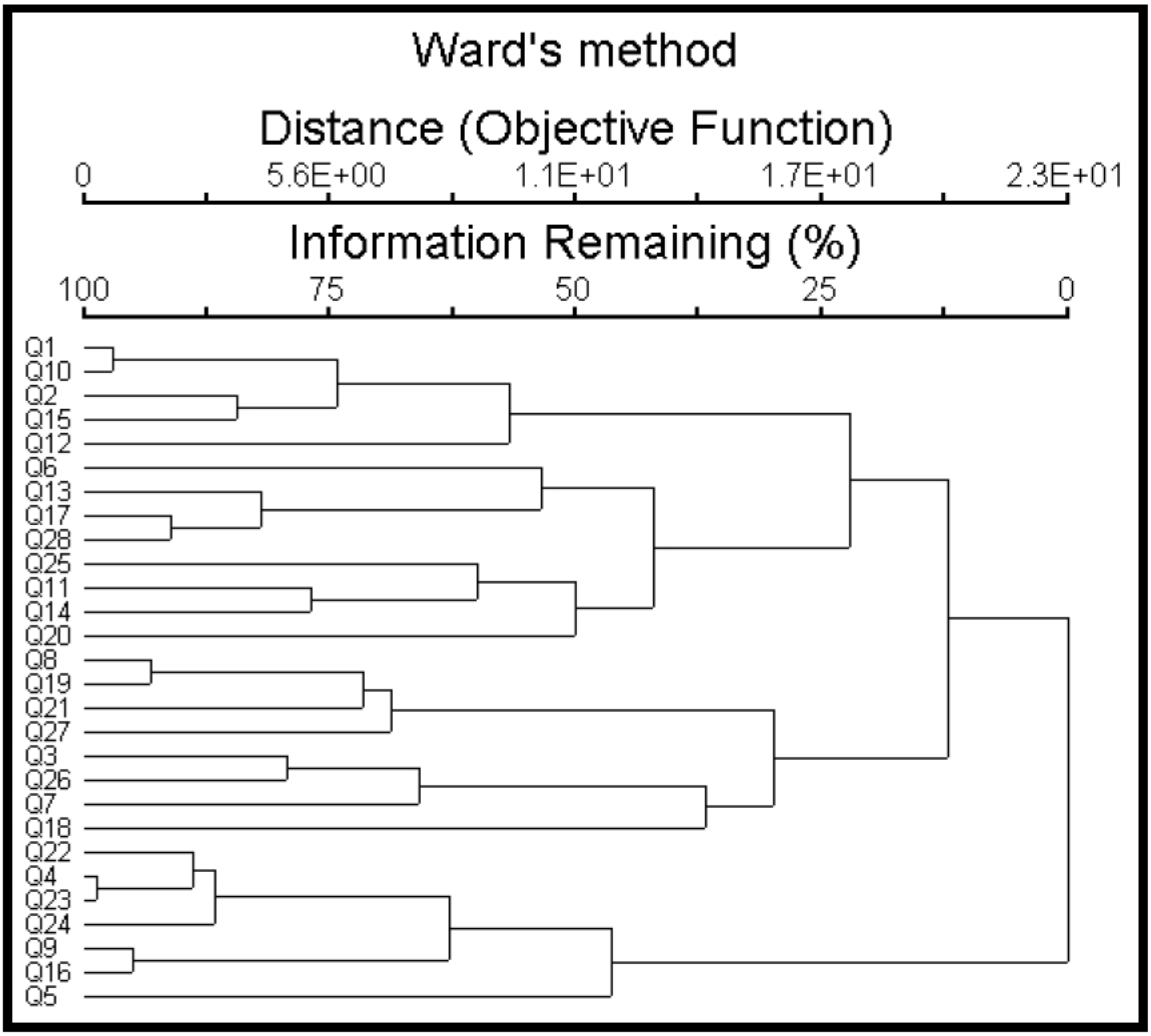
VEG TYPE	HECTARES
FRAN, Frankenia Low Shrublands	2.7
GNEW, Greenstone Hill Non-halophytic Eucalypt Woodlands	0.981
MUWA, Mulga Wanderrie Grassy Shrublands	150.184
SACS, Sandplain Acacia Shrubland	440.317
SAGS, Sandplain Gum Stratum	100.567
SDSH, Sand Dune Shrubland	78.532
Grand Total	**773.281**

4.3 Statistical analysis

A group cluster analysis was carried out on the data collected from the reconnaissance and detailed surveys, and a dendrogram was produced using Ward's method (Ward 1963). This is one of two methods recommended by McCune and Grace (2002),

Based on presence/absence of species, the dendrogram confirmed the grouping of 26 of the 28 quadrats into the vegetation types in which they had been previously mapped. The remaining two quadrats, 25 and 22, fell close to the mapped boundaries of the vegetation types to which they had been allocated.

Figure 2: **Ward's Method Dendrogram**



Quadrats 1,10, 2,15, 12, and 6 are in SDSH

Quadrats 13, 17,and 28 are in SAGS

Quadrat 25 is in SACS

Quadrats 11, 14, 20, 8 and 19 are in SAGS

Quadrat 21 is in GNEW

Quadrats 27, 3 ,26, and 7 are in MUWA

Quadrat 18 is in FRAN

Quadrat 22 is in SDSH

Quadrats 4, 23, 24, 9,16 and 5 are in SACS

A species-area curve was produced using the Sorensen/Bray-Curtis distance measure with β set to -0.25, as recommended by McCune and Grace (2002)

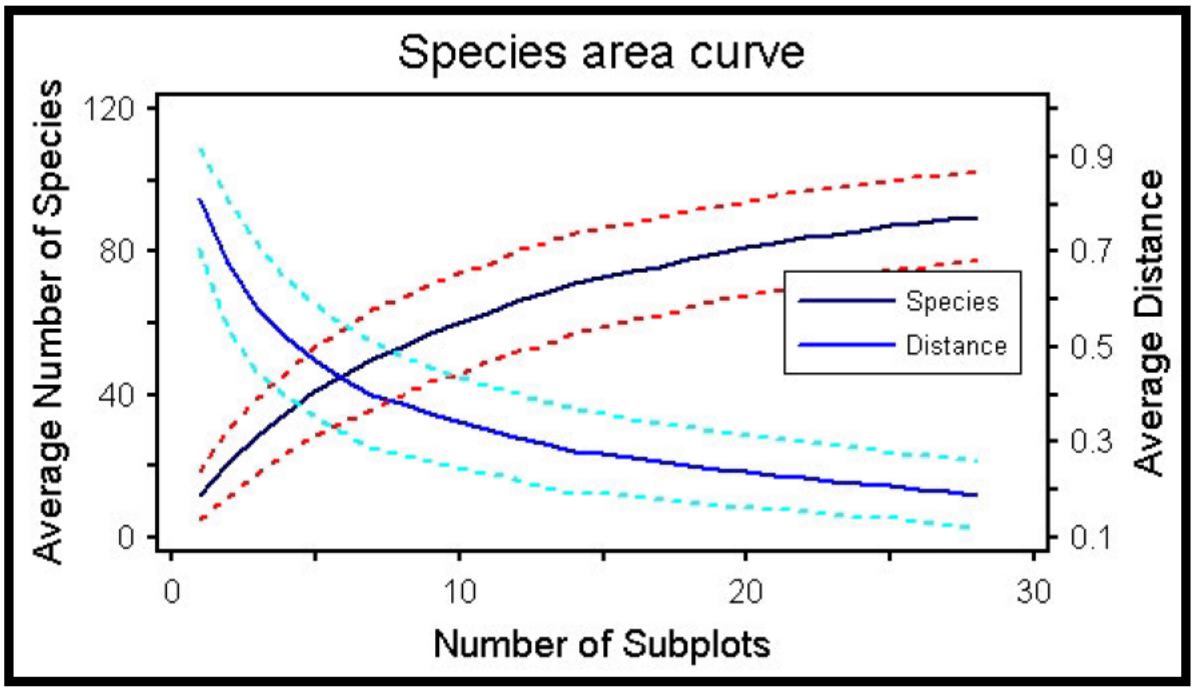
One hundred and four species were collected opportunistically in addition to the 111 species collected within the quadrats giving a total of 215.

First and second order jack-knife estimates, calculated from the quadrat records, of the total number of species occurring within the survey area, were 159.2 and 190.4 respectively.

Chao2 classic form and Chao2 bias corrected form estimates were 184.5 and 176.6 respectively.

These figures indicate that the 111 taxa recorded from the quadrat surveys represent between 58.3 and 69.7% of the total taxa on the site.

Figure 3: Species Area Graph



Priority Flora species

Nine Priority flora species were encountered within the area surveyed. *Persoonia leucopogon* (**P1**), *Apatelantha insignis* (**P2**), *Thryptomene eremaea* (**P2**), *Acacia eremophila* var. *variabilis* (**P3**), *Alyxia tetanifolia* (**P3**), *Homalocalyx grandiflorus* (**P3**), *Hysterobaeckea ochropetala* subsp. *cometes* (**P3**), *Eucalyptus jutsonii* subsp. *jutsonii* (**P4**), and *Grevillea secunda* (**P4**). Many of these were overlapping populations particularly in the south-eastern corner of the survey area.

The table below shows the total number of the various Priority species recorded within and around the survey area. Four species were found to extend well beyond the extent of the surveys: *Hysterobaeckea ochropetala* subsp. *cometes* (**P3**); *Eucalyptus jutsonii* subsp. *jutsonii* (**P4**); *Alyxia tetanifolia* (**P3**)and *Thryptomene eremaea* (**P2**).

Details of these species are shown below:

Table 4: Priority Species Ranking and Abundance

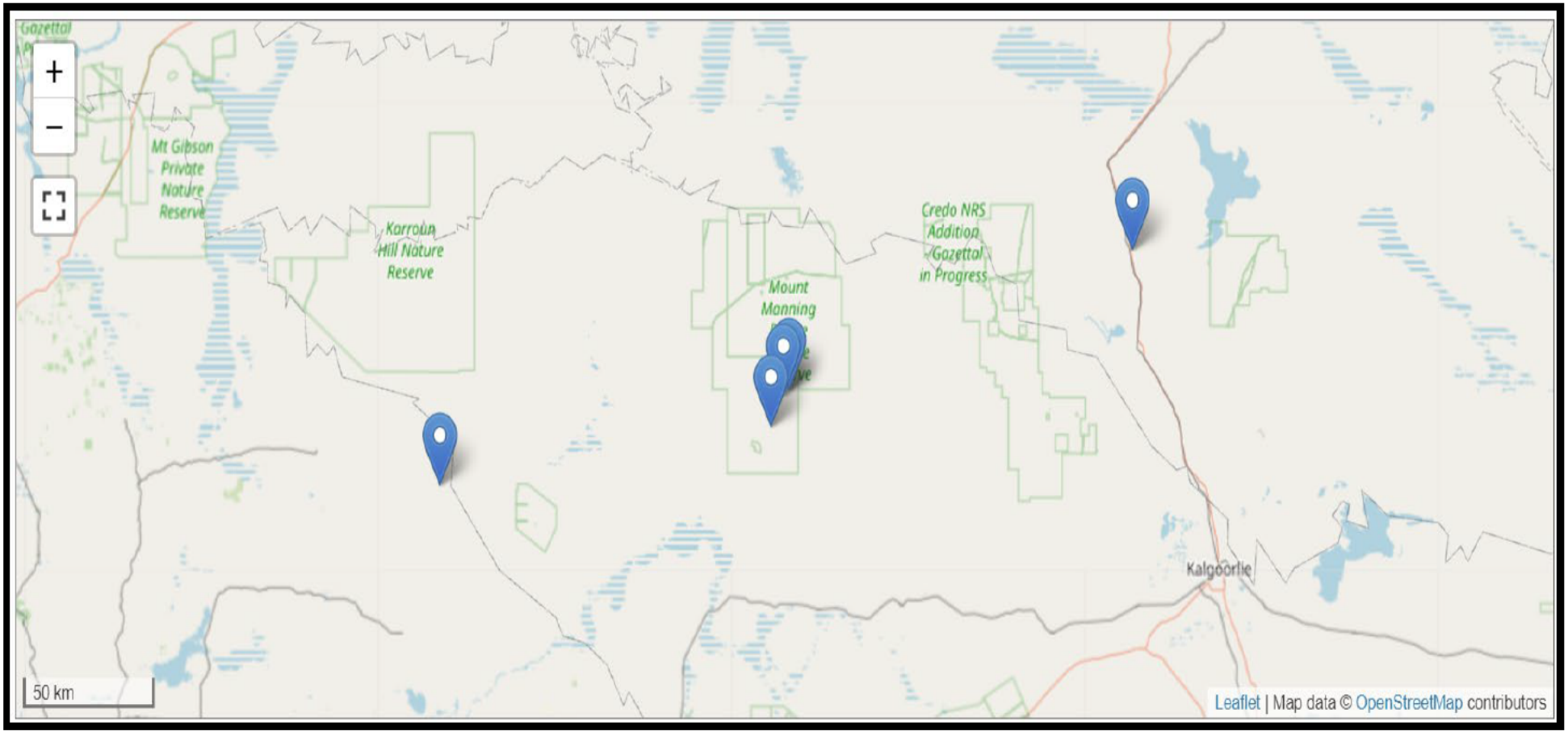
Priority ranking	**Abundance**
P1	**30**
Persoonia leucopogon	30
P2	**4047**
Apatelantha insignis	47
Thryptomene eremaea	4000
P3	**14834**
Acacia eremophila var. *variabilis*	326
Alyxia tetanifolia	359
Homalocalyx grandiflorus	7703
Hysterobaeckea ochropetala subsp. *cometes*	6446
P4	**1452**
Eucalyptus jutsonii subsp. *jutsonii*	1001
Grevillea secunda	451
Total	**20363**

Plate 1: *Persoonia leucopogon* (P1)

Persoonia leucopogon (**P1**) was the least abundant of the Priority plant species observed with a total of 30 recordings. Although individual sightings were made in Sand Dune Shrubland and Sandplain Gum Stratum, the majority, 90%, occurred in one population which was growing on both sides of the access track at the base of a dune in the south-eastern part of the survey area, in Sandplain Acacia Shrublands.

Persoonia leucopogon (**P1**) is described in Florabase as: "Erect or decumbent shrub, 0.3-0.6 m high. Fl. Yellow/green-yellow, Oct to Dec. Yellow sand or sandy clay."

Map 5: *Persoonia leucopogon* (P1) Regional Distribution.



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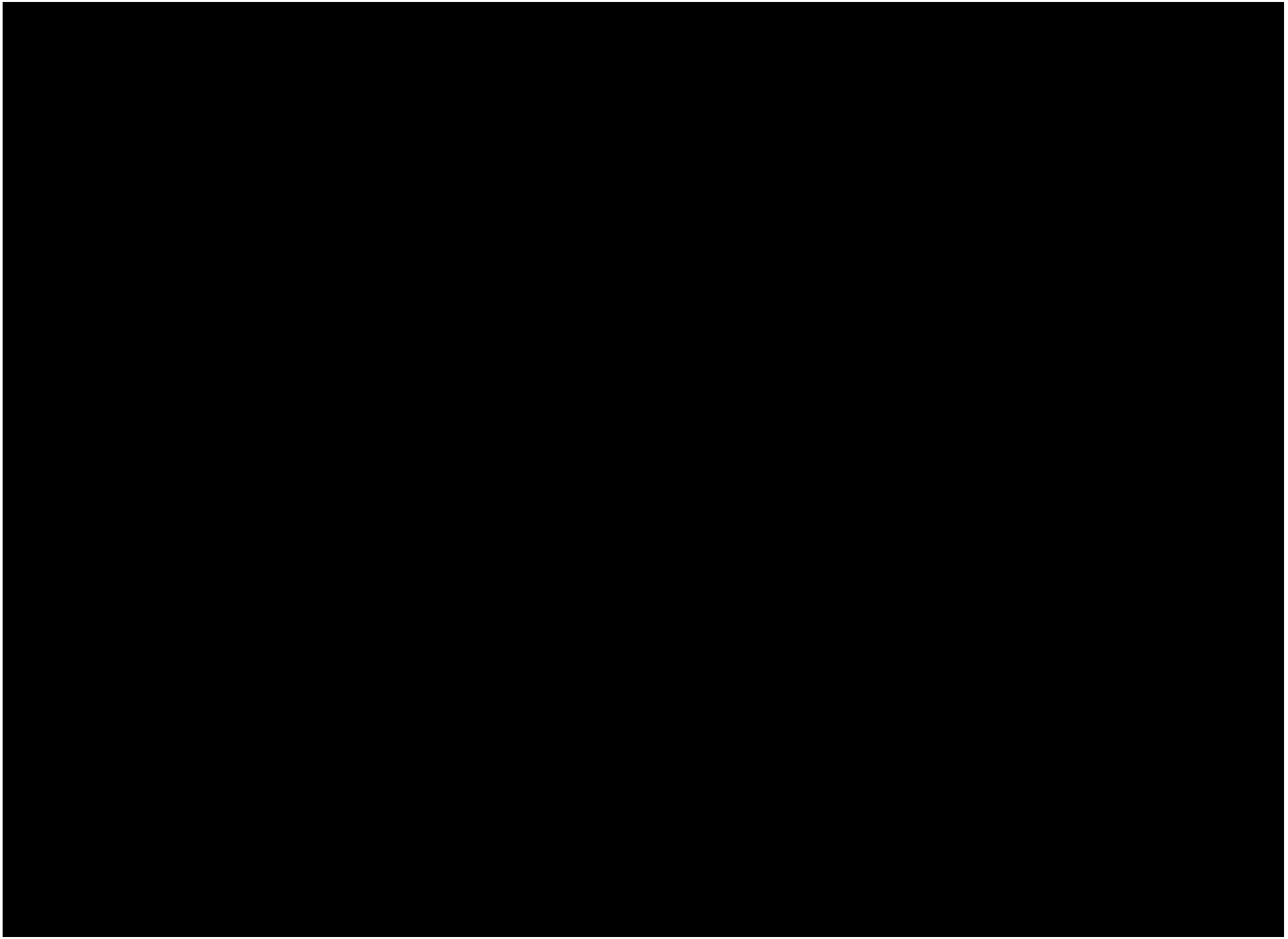
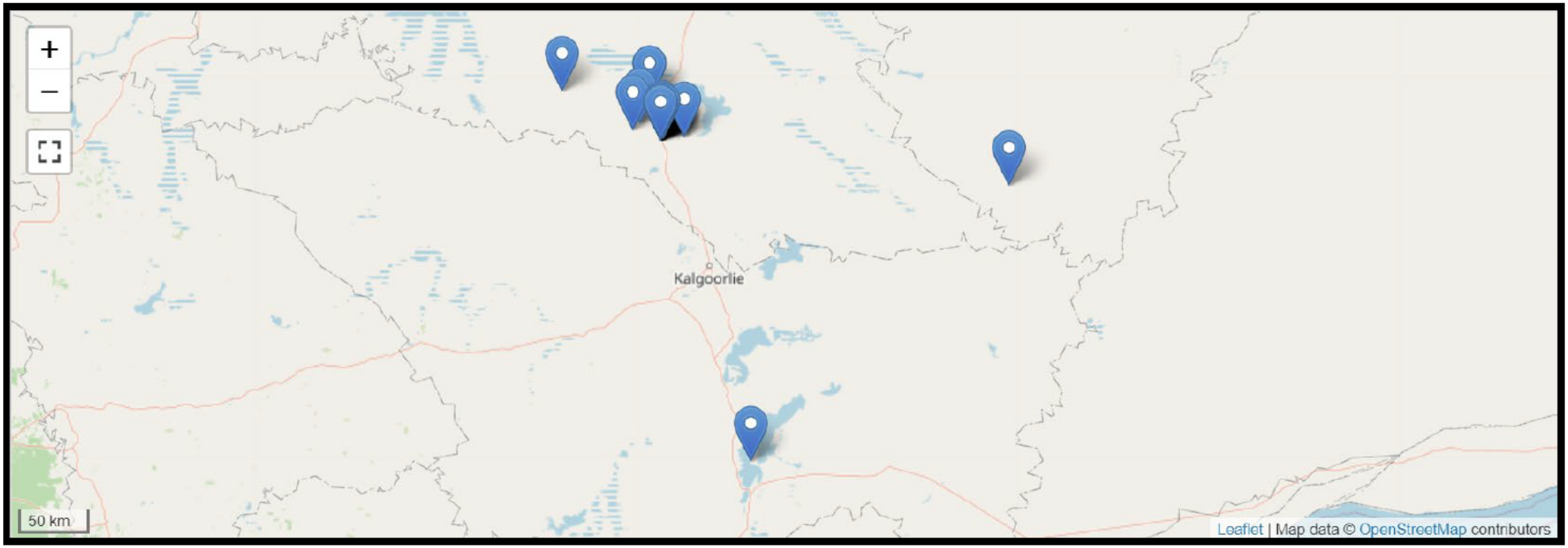


Plate 2: *Apatelantha insignis* (P2)

Apatelantha insignis (**P2**)(previously *Newcastelia insignis* (**P2**)) was found predominantly on dunes with some juveniles and seedlings emerging on lower sandy areas between the dunes and Lake Goongarrie. Some specimens of this short-lived, disturbance specialist, recorded in the 2017/18 Reconnaissance Survey, were no longer present in 2021.

Map 7: *Apatelantha insignis* (P2) Regional Distribution



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Map 8: *Apatelantha insignis* (P2) Survey area distribution

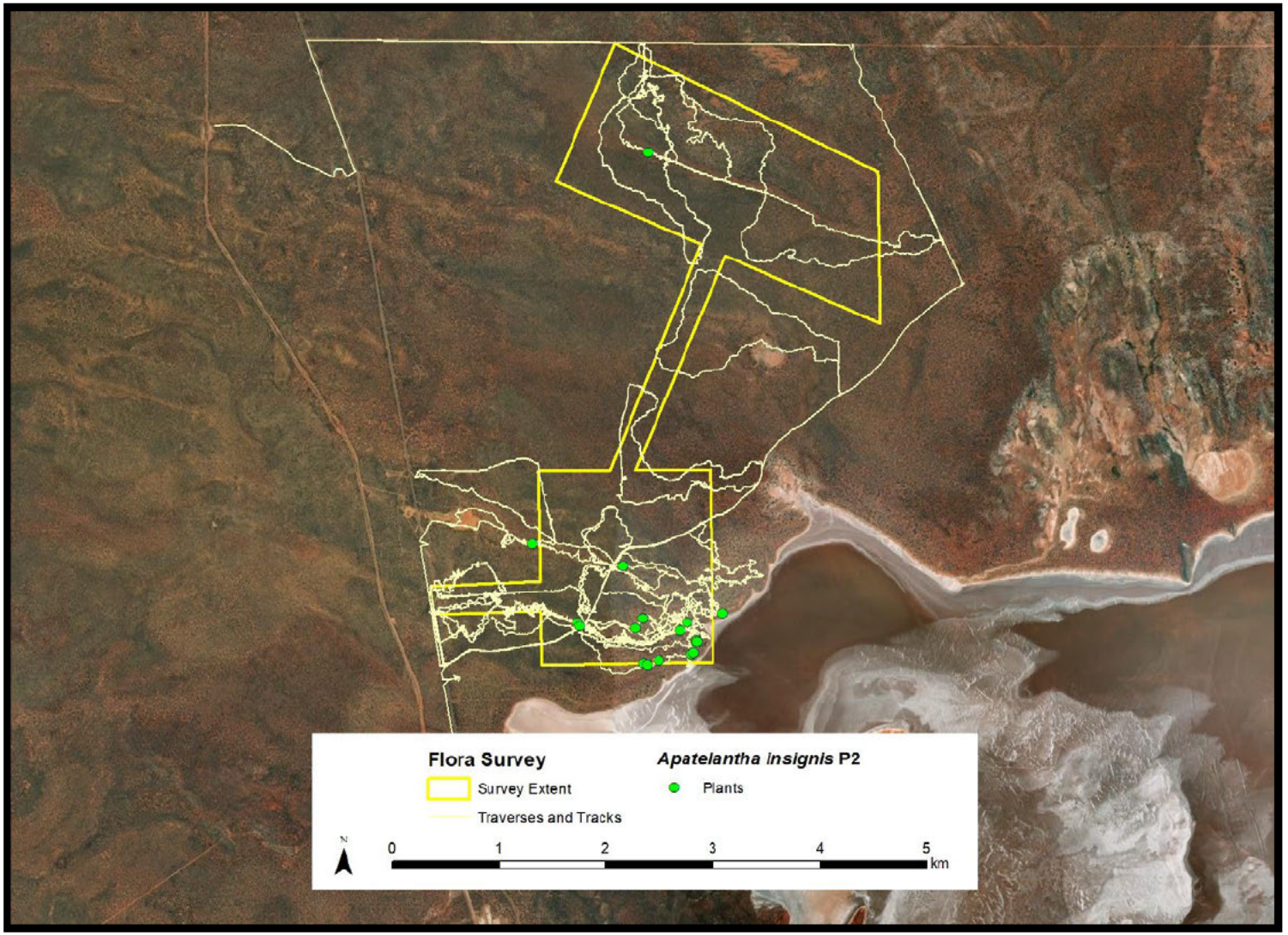

Plate 3: ***Thryptomene eremaea*** **(P2)**

Thryptomene eremaea (**P2**) was found to be growing in Mulga Wanderrie Grassy Shrublands on and around weathered granite platforms in the north of the survey area. The platforms and the *Thryptomene* that they hosted, extend beyond the northern boundary, where one large population estimated to cover approximately 17 hectares, is intersected by Tonkin Road. Estimates of the total number of stems within sub- populations in the survey area resulted in a range of 300-370 stems per hectare. Although discrete sub-populations were able to have stem counts conducted within them, each is within 500 m of another, and therefore considered to be one population with an estimated 4000 stems in total.

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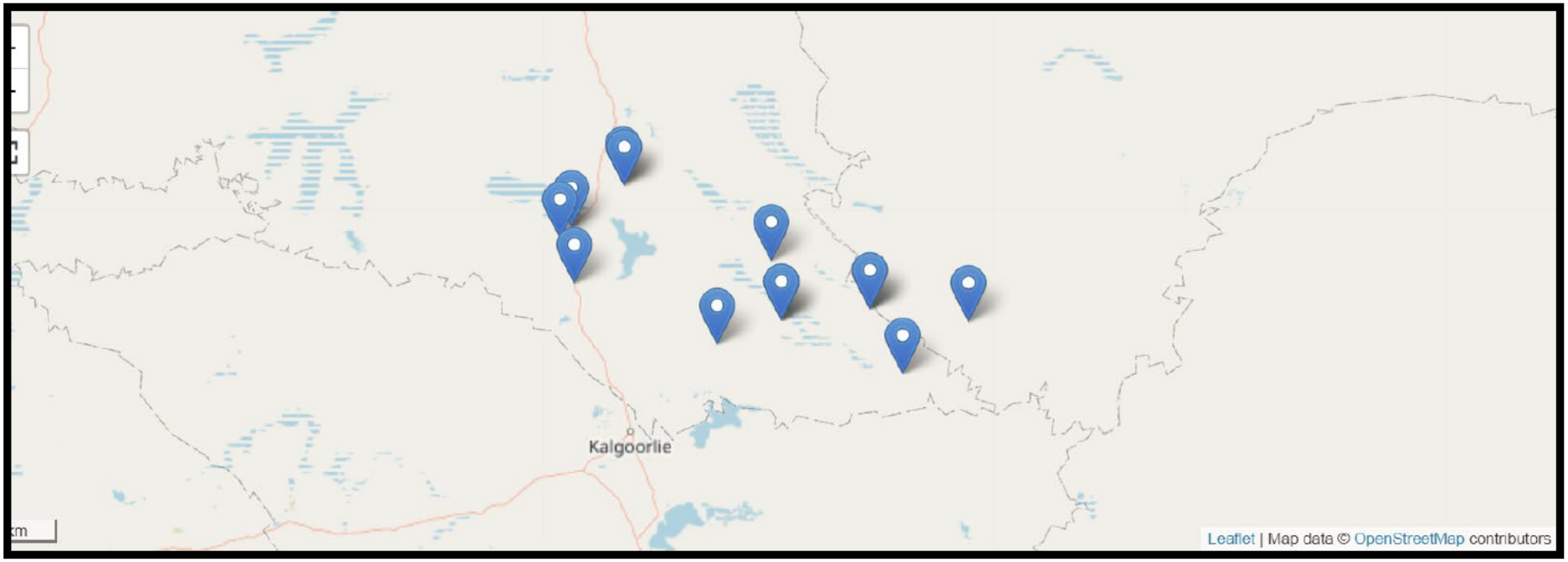
Map 9*: Thryptomene eremaea* (P2) Regional distribution



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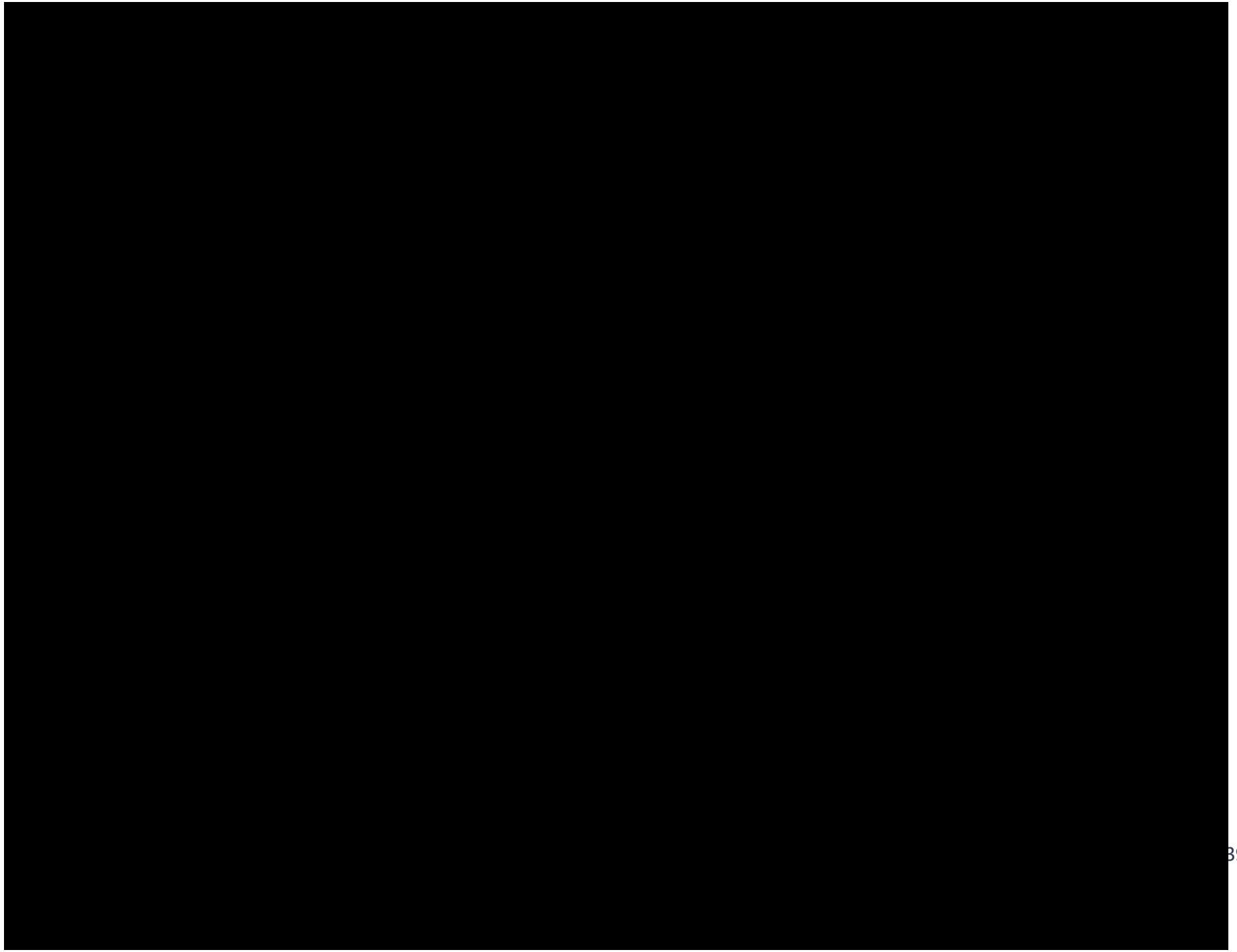
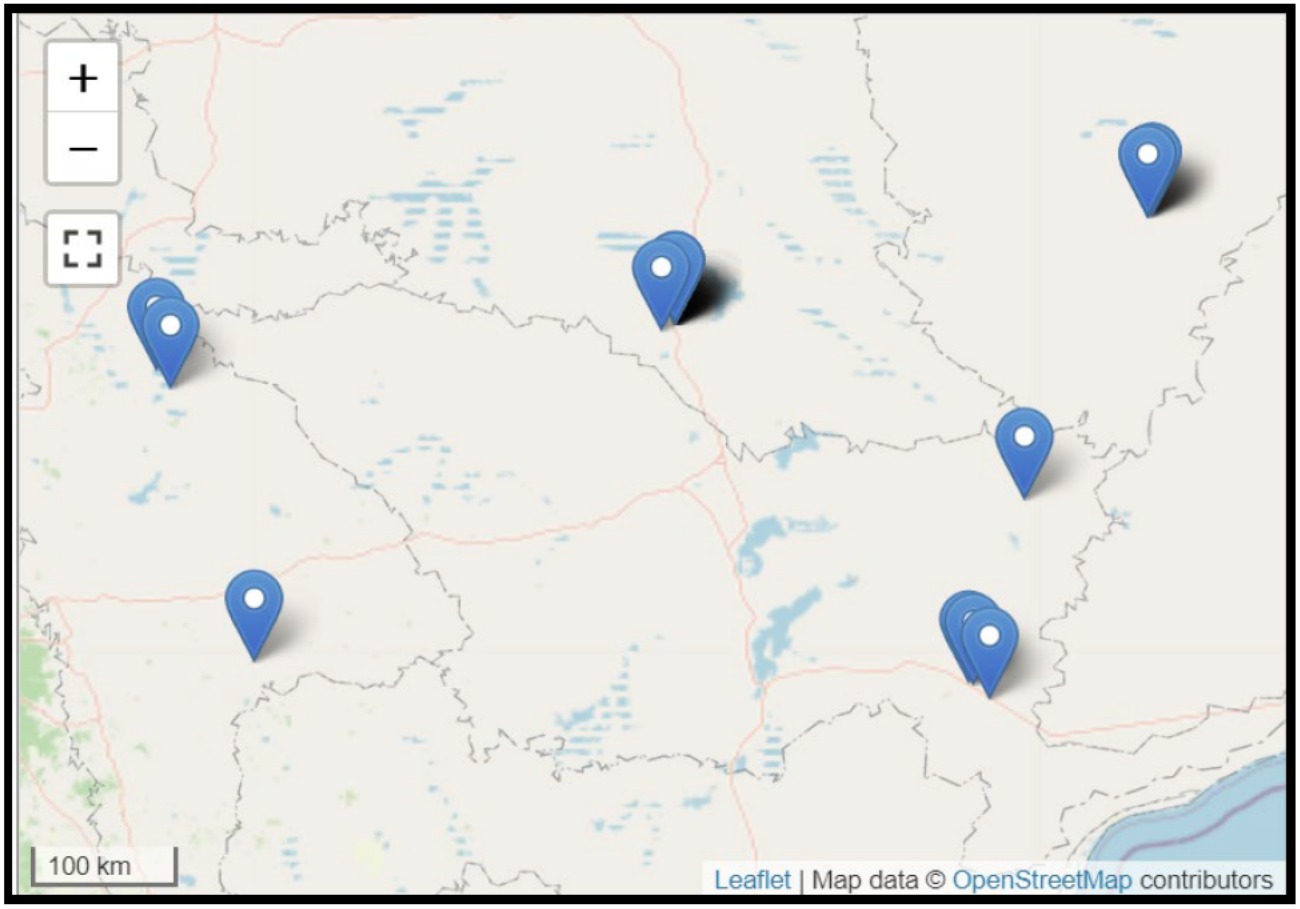


Plate 4: *Acacia eremophila* var. *variabilis* (P3)

Acacia eremophila var. *variabilis* (**P3**) was confined to the Sandplain Acacia Gum Stratum in the south-east of the survey area. It extended beyond the eastern boundary of the survey area between dunes and Lake Goongarrie.

Plate 5: *Acacia eremophila* var. *variabilis* (P3) pods

Map 11: *Acacia eremophila* var. *variabilis* (P3) Regional Distribution



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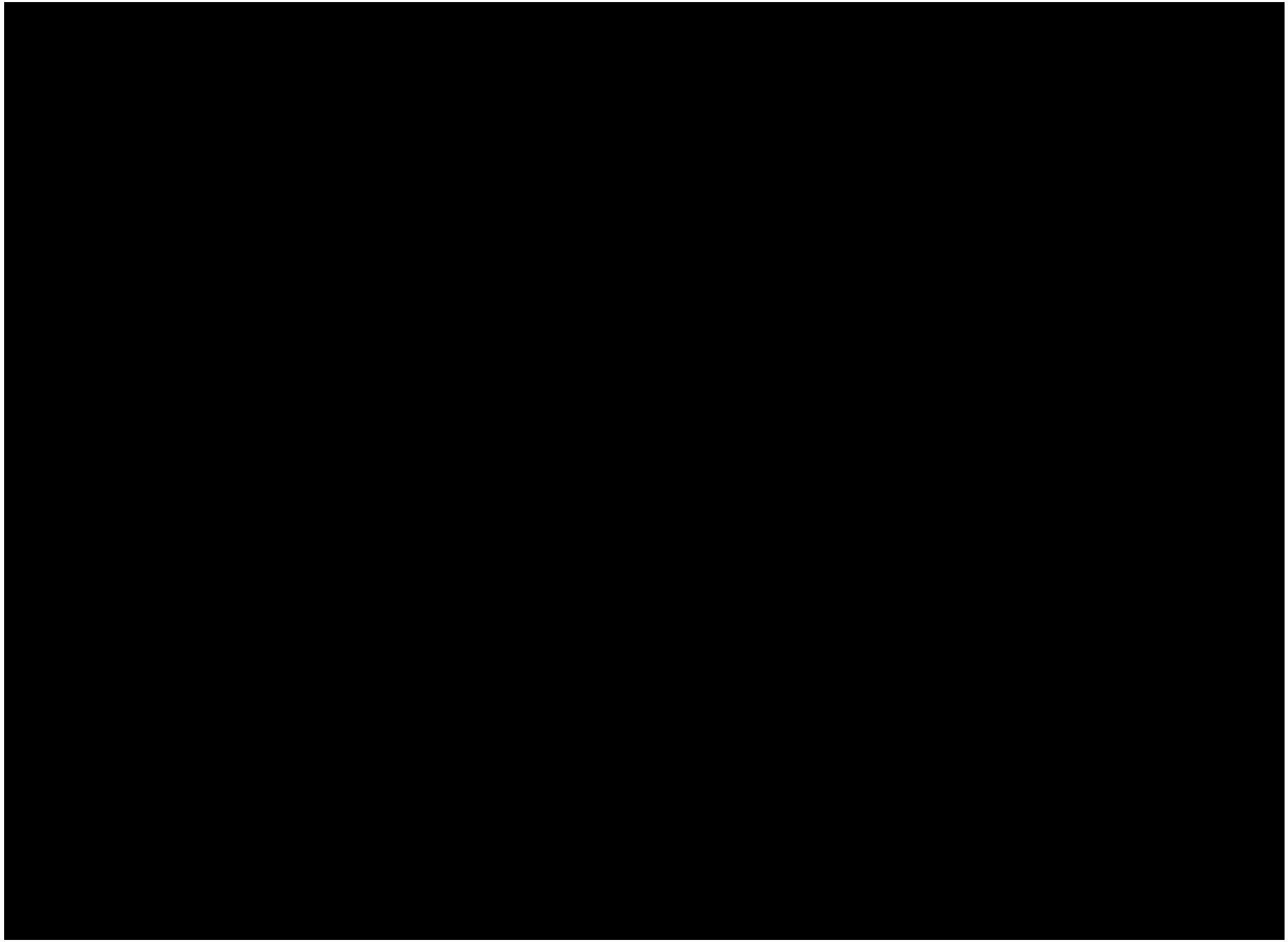


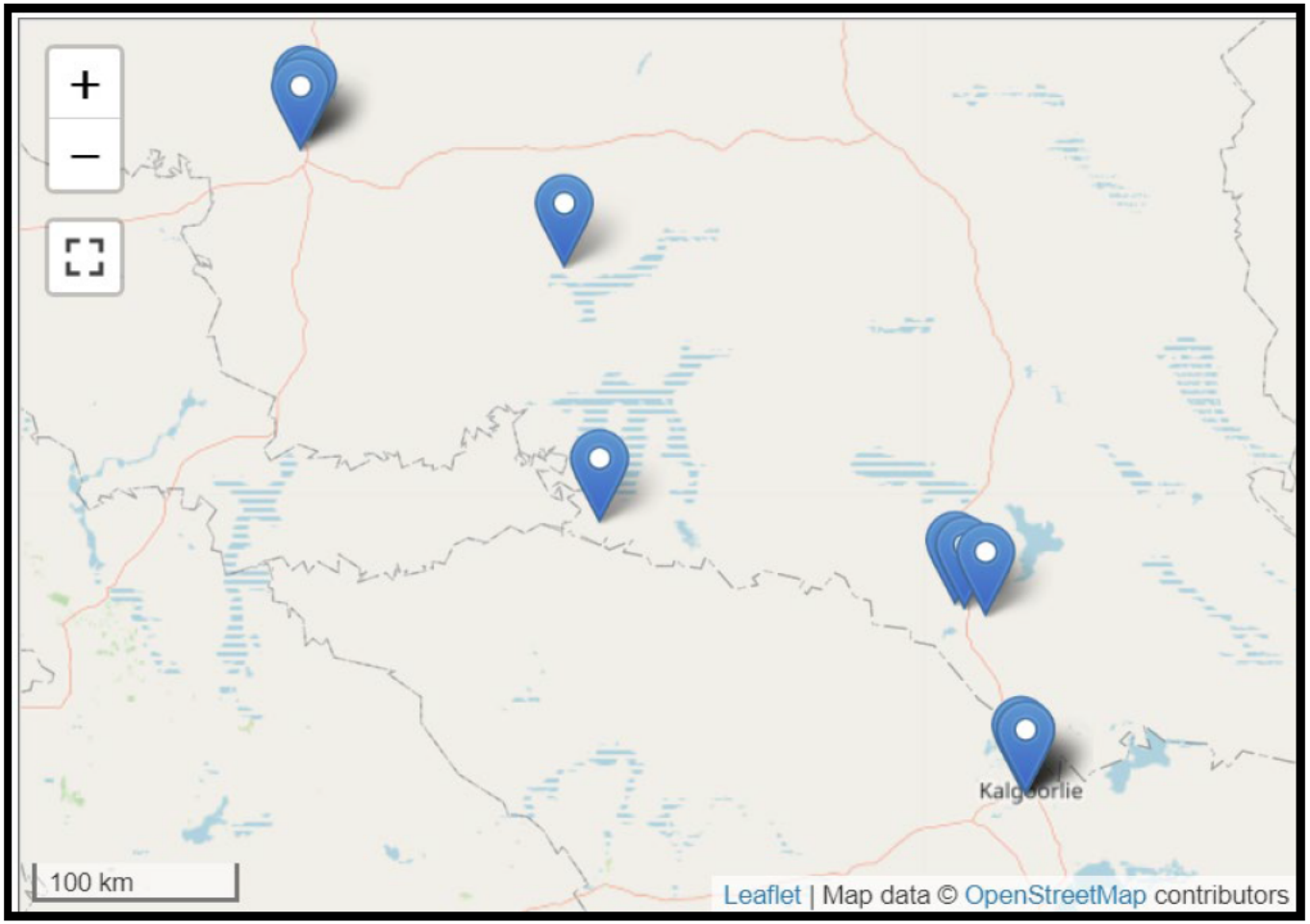
Plate 6: ***Alyxia tetanifolia*** **(P3)**

In Florabase *Alyxia tetanifolia* **(P3)** is described as: "Erect, rigid, pungent shrub, 1-2 m high, to 2.5 m wide. Fl. white-cream, May to Jun or Nov. Sandy clay, loam, concretionary gravel. Drainage lines, near lakes."

In this survey it was found on or at the base of dunes, usually as single plants growing under Eucalypts and often with *A. buxifolia* which may indicate dispersal of the seed contained within the small berries of these species by birds. It occurred predominantly within the Sandplain Gum Strata vegetation type in the south-east of the survey area.

Plate 7: ***Alyxia tetanifolia*** **(P3) flower**.

Map 13: *Alyxia tetanifolia* (P3) Regional Distribution



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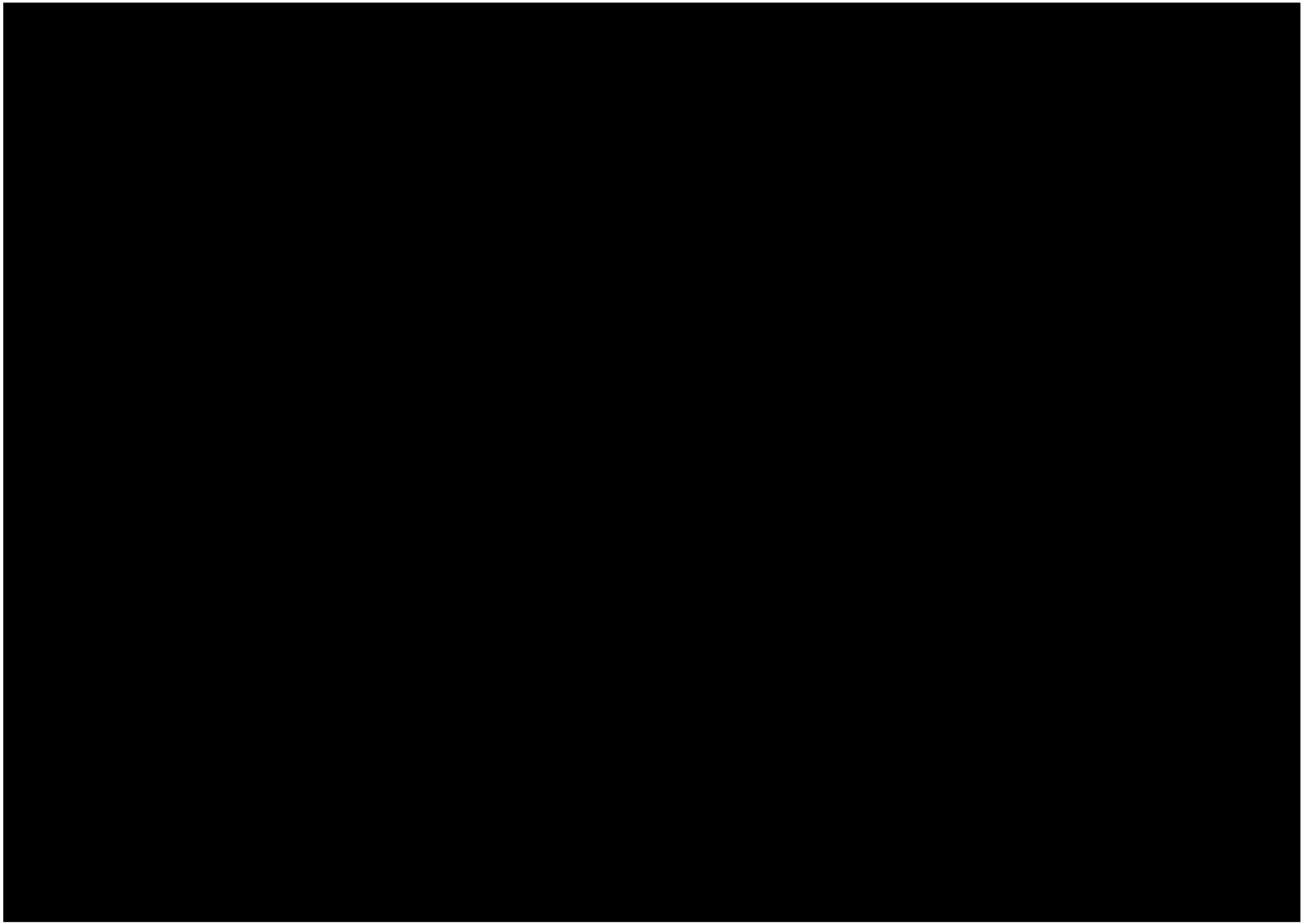
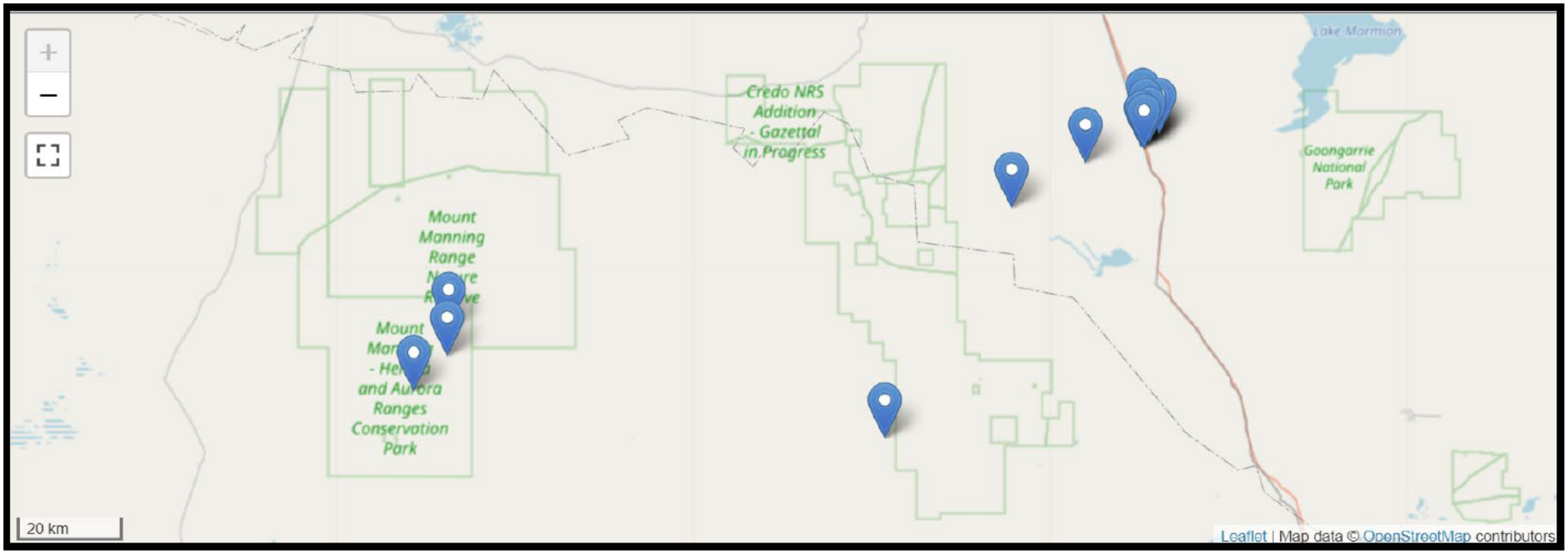


Plate 8: Homalocalyx grandiflorus (P3)

Homalocalyx grandiflorus (**P3**) was largely restricted to the Sand Dune Shrubland vegetation type, with some recordings in the adjacent Sandplain Acacia Shrubland and Sandplain Gum Stratum vegetation types. Florabase provides the description: Spreading shrub, 0.2-0.5(-2) m high. Fl. purple-red-pink, Oct to Dec. Yellow sand. Sandplains.

Plate 9: Homalocalyx grandiflorus (P3) flower

Map 15: *Homalocalyx grandiflorus* (P3) Regional Distribution



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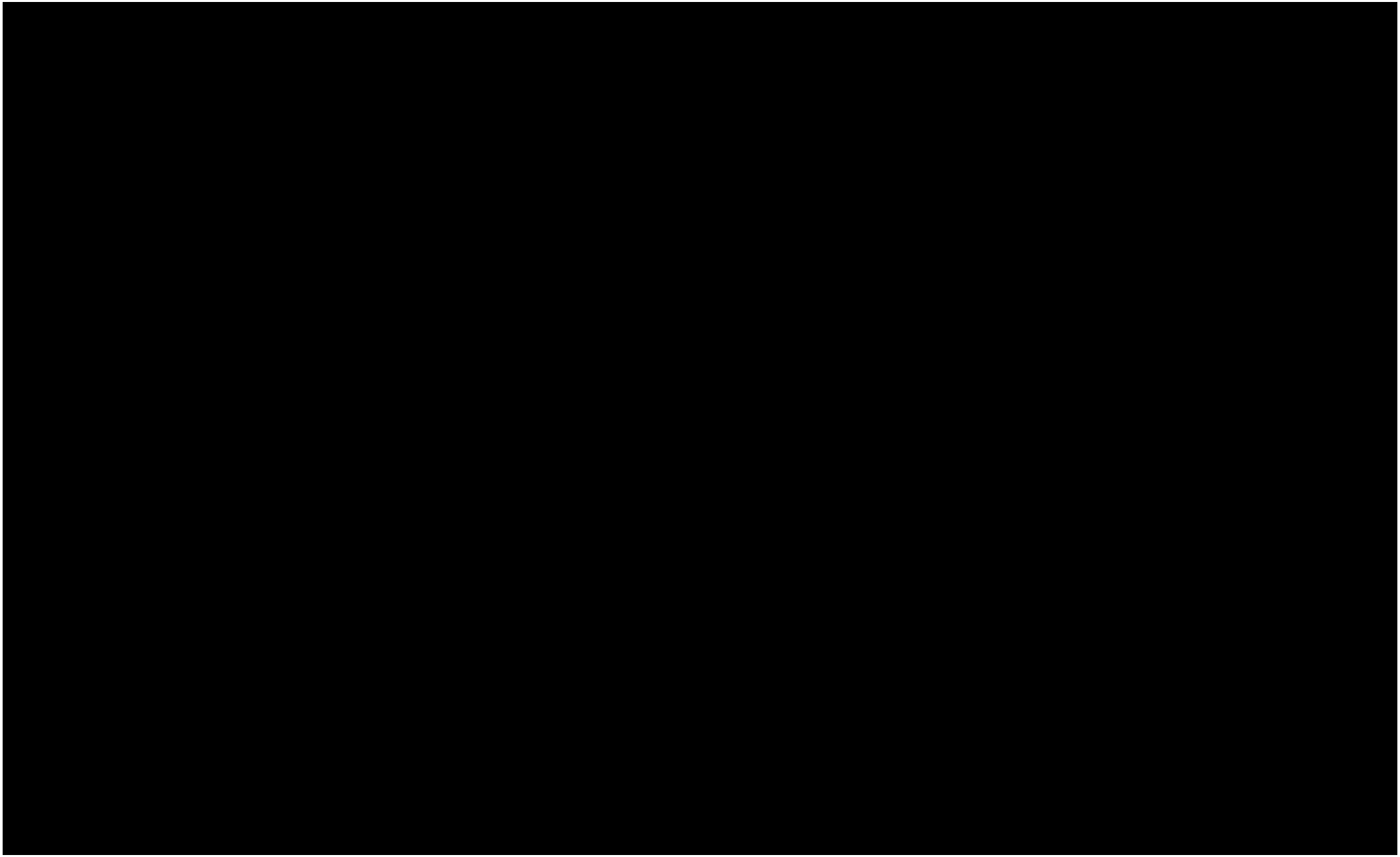


Plate 10: *Hysterobaeckea ochropetala* subsp. *cometes* (P3) growing in old borrow pit

Plate 11: *Hysterobaeckea ochropetala* subsp. *cometes* (P3) flower

Plate 12: *Hysterobaeckea ochropetala* subsp. *cometes* (P3) fruit

Hysterobaeckea ochropetala subsp. *cometes* (**P3**) was found to be growing extensively throughout the largest of the vegetation types mapped, Sandplain Acacia Shrubland, with relatively few recordings in Sand Dune Shrubland. It extended beyond the survey boundaries and was dominant in some previously disturbed areas such as borrow pits and old mineral exploration grid lines. Traverses conducted in order to estimate the total number of stems per Ha yielded different results, reflective of the effect of disturbance on this species. A single traverse over 150 m in a previously disturbed area indicated a density of 6067 stems per Ha, while the average of three traverses in undisturbed shrubland indicated 1169 stems per Ha.

Map 17: *Hysterobaeckea ochropetala* subsp. cometes (P3) Regional Distribution

Image used with the permission of the Western Australian Herbarium, Department of Biodiversity, Conservation and Attraction (https://florabase.dpaw.wa.gov.au/browse/profile/48649)Accessed on Thursday 14 April 2022.

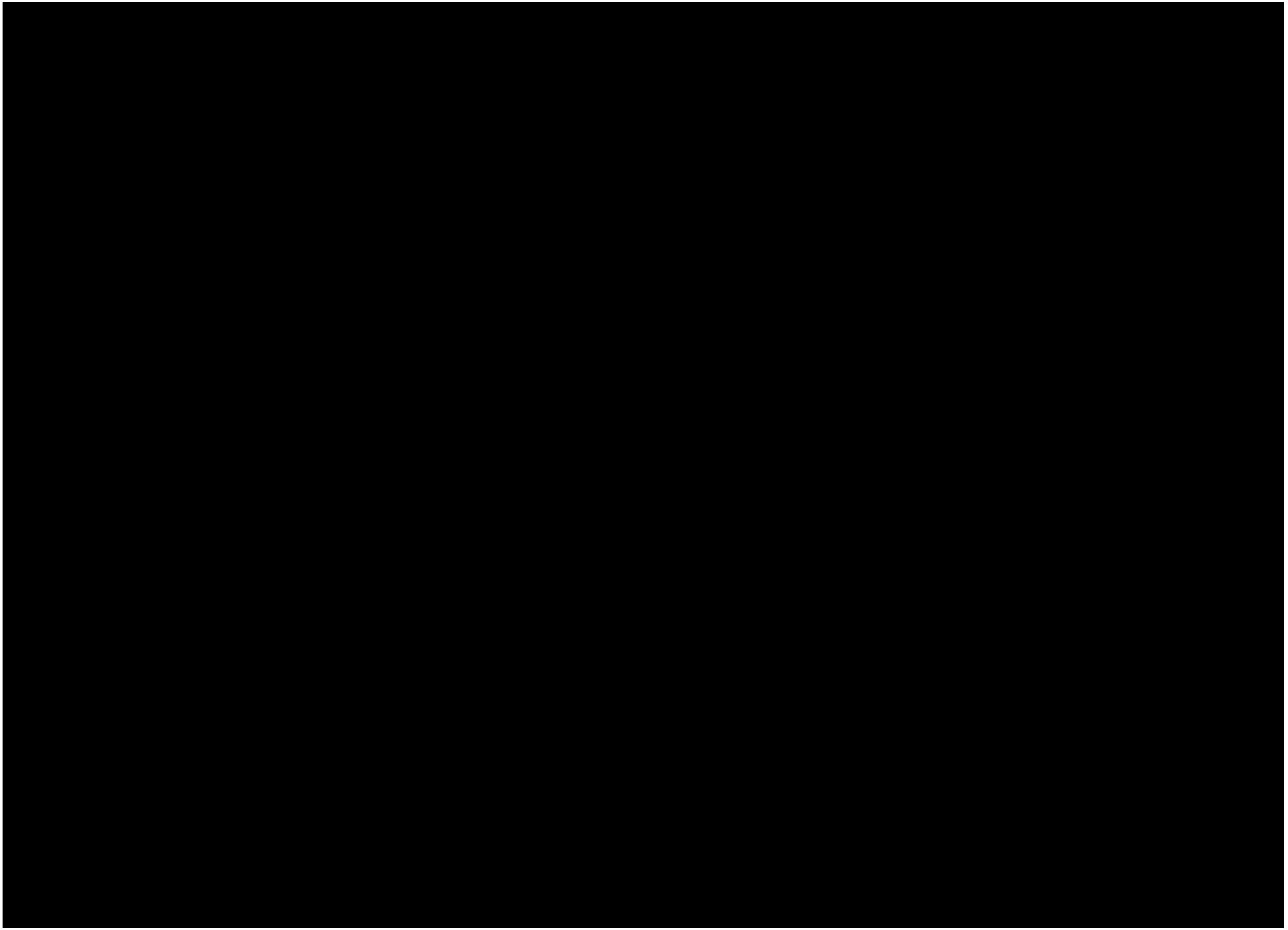


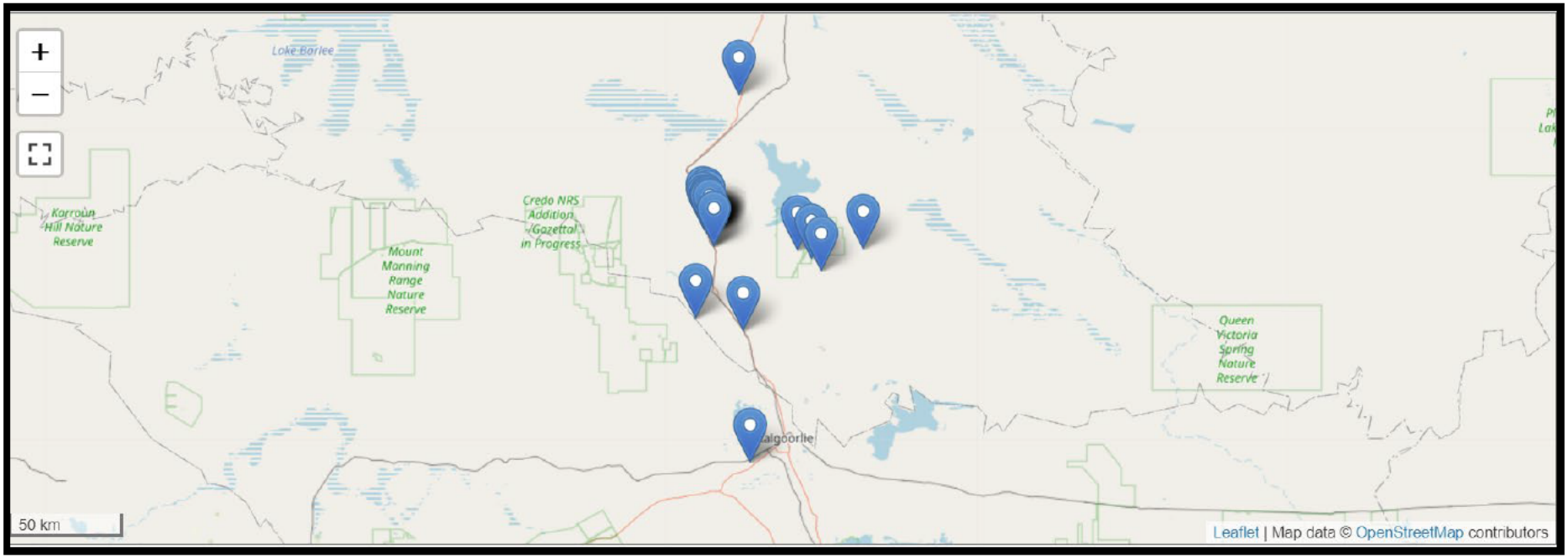
Plate 13: *Eucalyptus jutsonii* subsp. *jutsonii* (P4)

Plate 14: *Eucalyptus jutsonii* subsp. *jutsonii* (P4) flowers

Eucalyptus jutsonii subsp. *jutsonii* (**P4**) was only found in the southern part of the survey area where it occurred in the vegetation types Sand Dune Shrubland, Sandplain Gum Stratum and Sandplain Acacia Shrubland. Florabase describes this

species as: “(Mallee), 4-7 m high, bark rough over most stems, grey to light grey-brown. Red to pale orange deep sands. Undulating areas and on dunes.”

Map 19: *Eucalyptus jutsonii* subsp. *jutsonii* (P4) Regional Distribution



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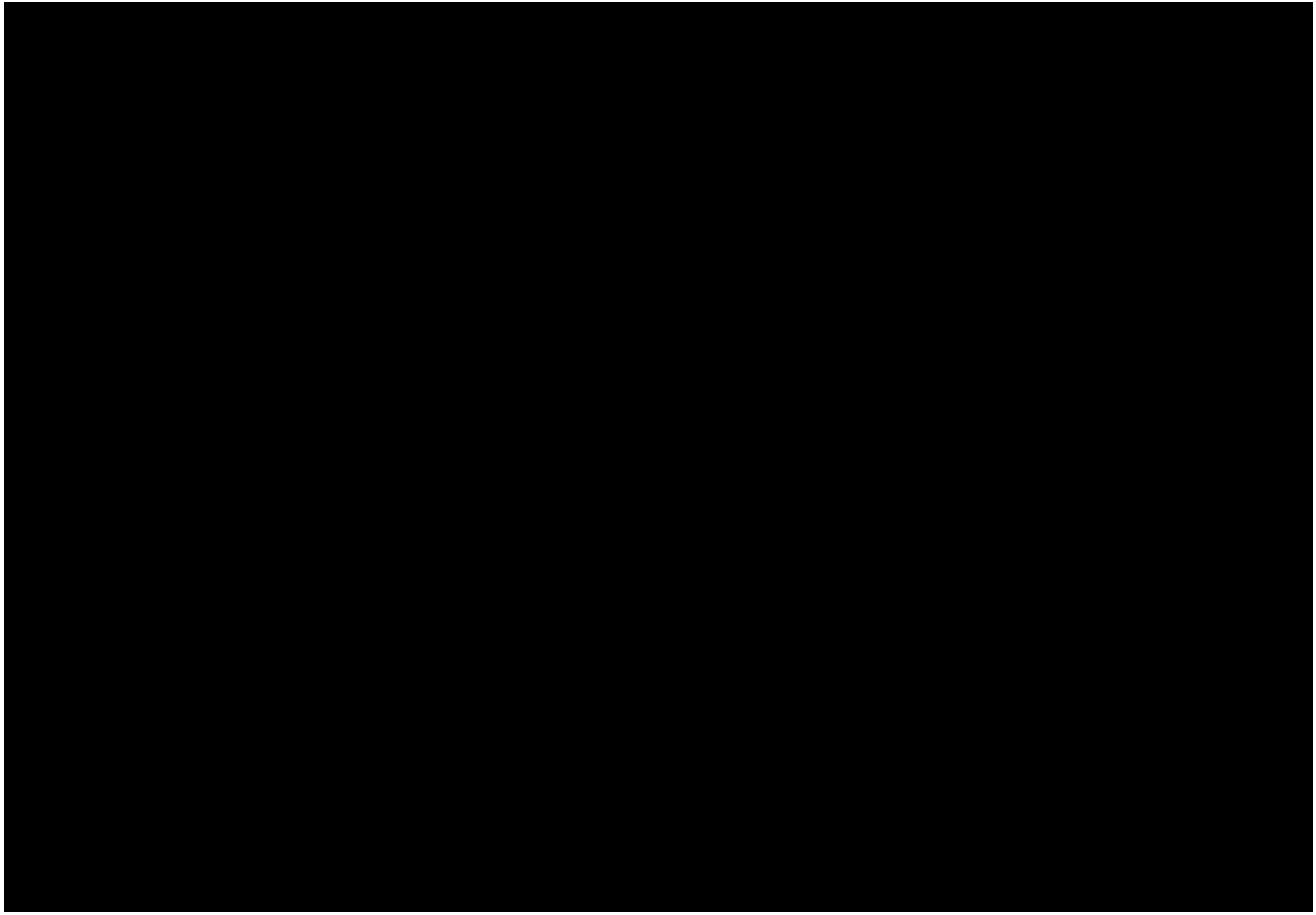
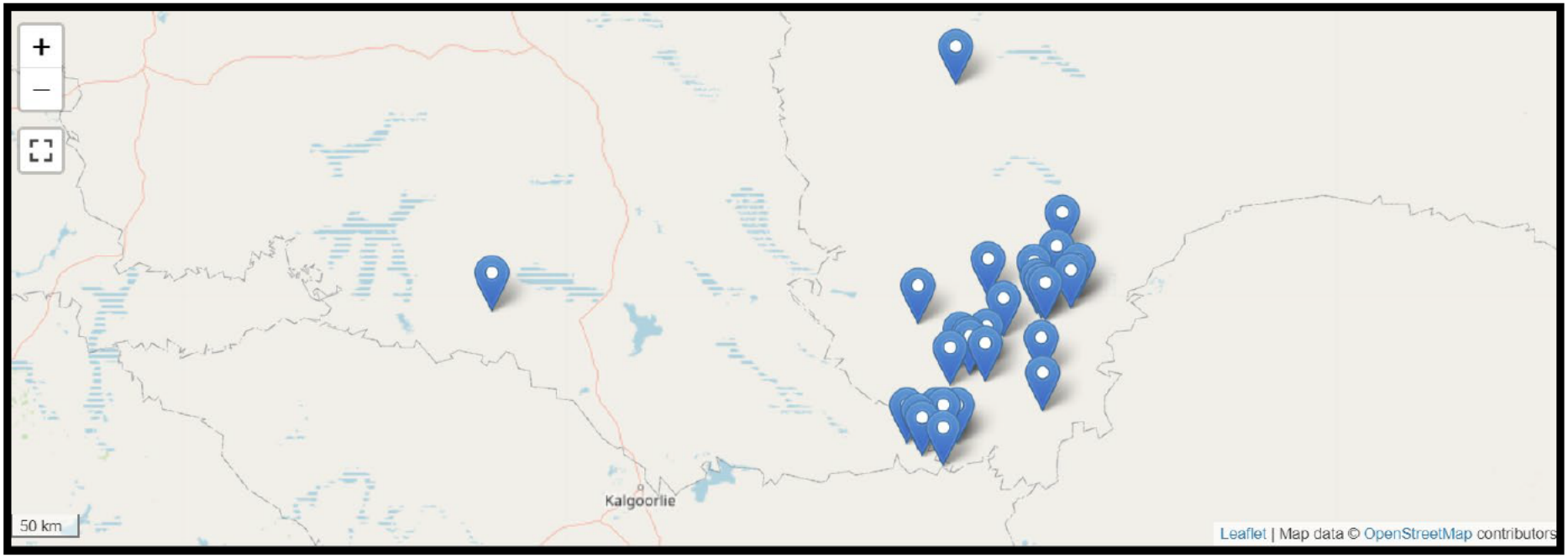


Plate 15: *Grevillea secunda* (P4)

Plate 16: *Grevillea secunda* (P4) flower.

Grevillea secunda (**P4**) was found in the vegetation types, Sand Dune Shrubland and Sandplain Gum Stratum, in the south-east of the survey area. It is described in Florabase as: "Low spreading shrub, 0.3-0.8 m high. Fl. red, Sep to Oct. Yellow or red sand. Sand dunes, sandplains."

Map 21: *Grevillea secunda* (P4) Regional Distribution



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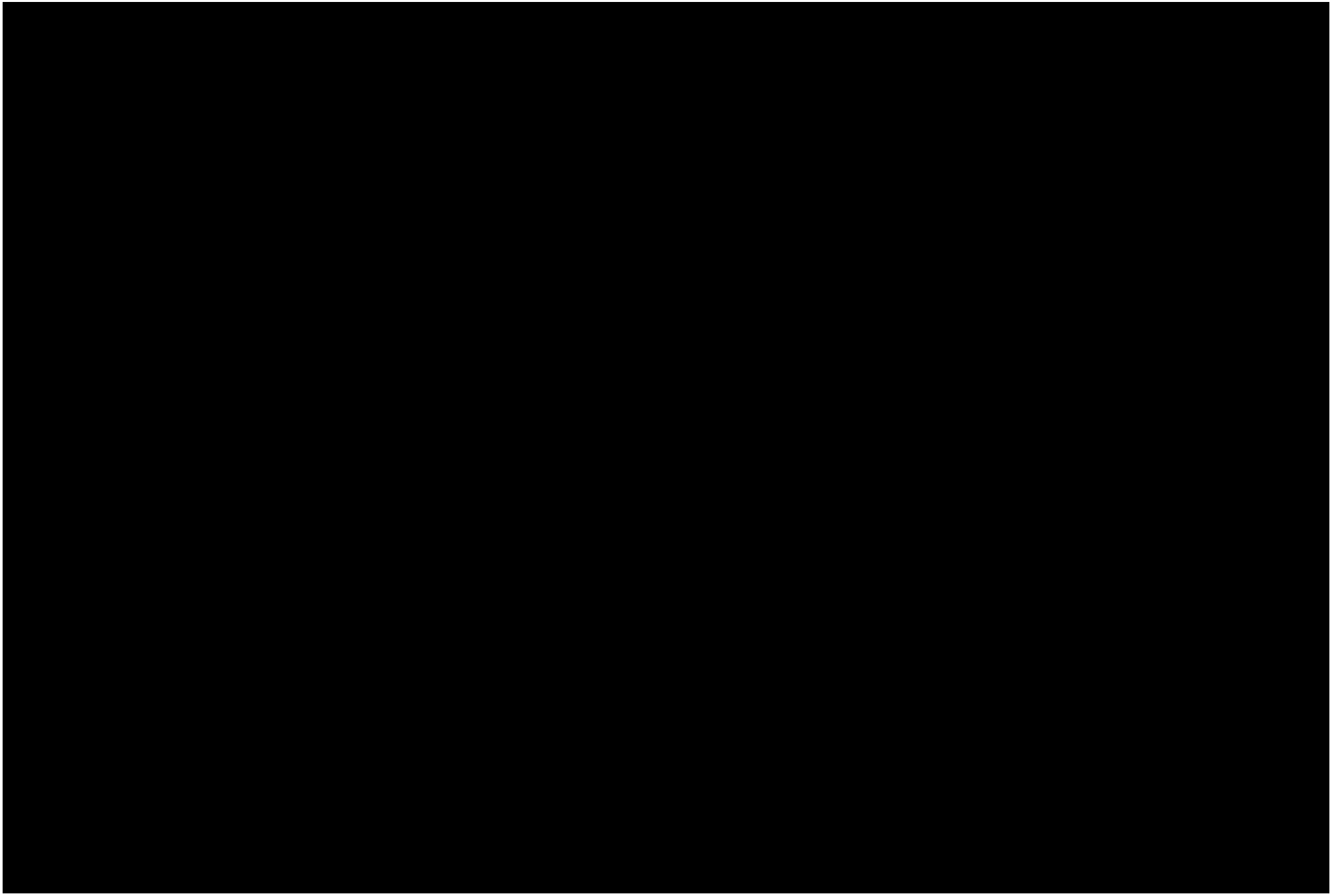


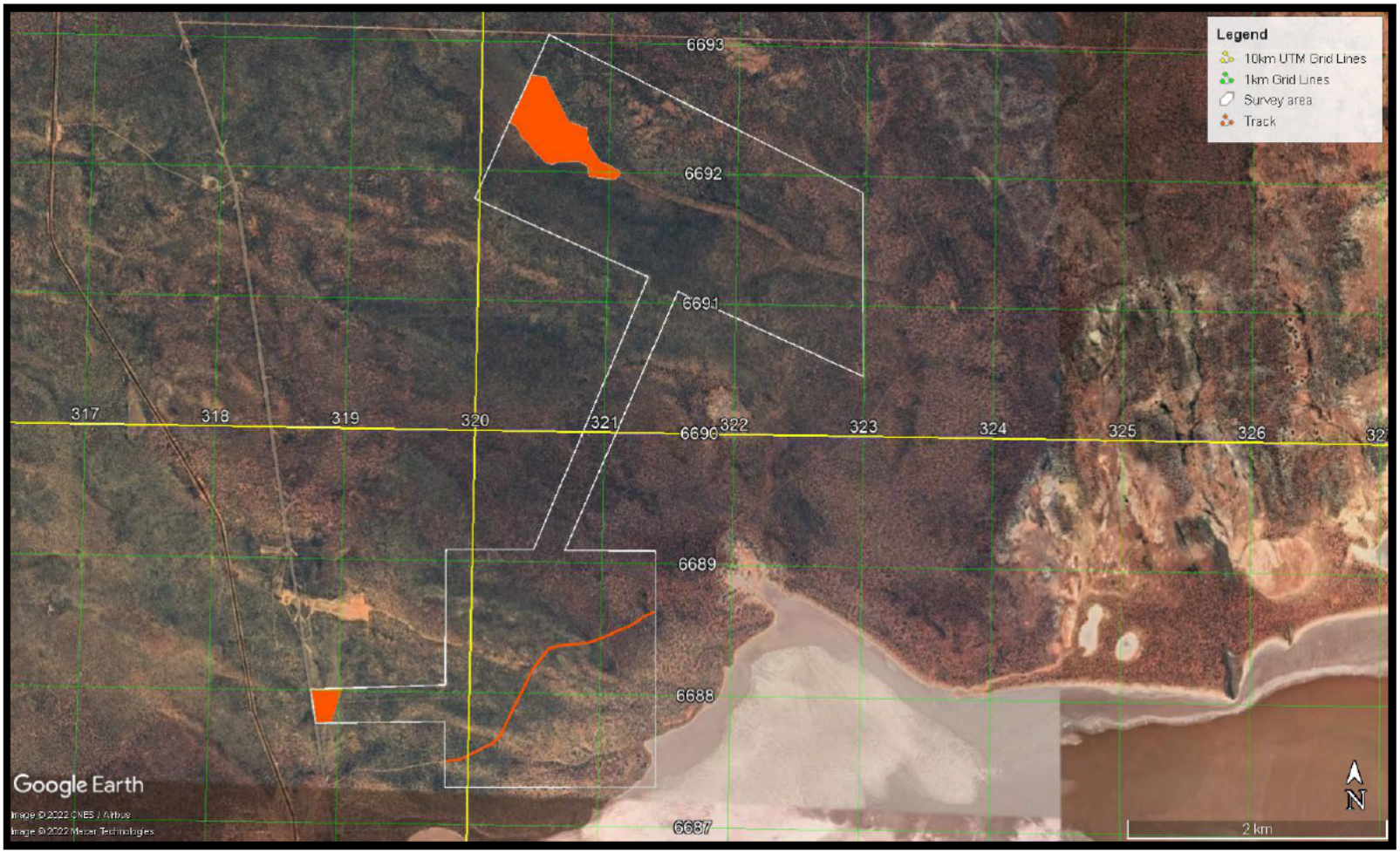
4.4 Condition of the Plant Communities

The vegetation in the area surveyed had been subjected to a variety of historical disturbances dating back to the discovery of gold in the area around 1894, (Wikipedia) and the subsequent requirement for mining timbers and condenser fuel. Sandalwood was also harvested from the area, and fence post cut to contain the sheep on the surrounding sheep stations. More recently, the mineral exploration boom of the late 1960's has left a number of old grid lines and drill sites throughout the area. Adjacent to the Goldfields Highway, which is within five kilometres of the furthest point of the survey area, some old borrow pits have been left to naturally revegetate. Sand has been mined from a now abandoned pit covering approximately 6.5 hectares which is located adjacent to the Goldfields Highway and within 500 m of this survey area

Near the north-western corner of the survey area, a bush fire, estimated to have occurred approximately 10 years ago, had burnt approximately 30 Ha of the survey area. The disturbance from the borrow pits covers approximately four hectares of the proposed southern haul road alignment. An additional 2.5 hectares has been classed as disturbed to cover the track passing through the southern part of the survey area, and only those grid lines which are still readily navigable on foot and discernable on Google Earth when viewed at a scale of approximately 1:13 000. Although these areas totalling 36.5 hectares or 4.7 % of the total survey area, have been disturbed, they are capable of regeneration and therefore not classified as Degraded.

Based on the vegetation condition scale adapted from Kieghery (1994) and Trudgen (1998), shown below, the condition of the vegetation in the area surveyed was classified as Good.

Map 23: Vegetation Condition



Highlighted portions indicate disturbed areas

Table 5: Vegetation Condition Scale for Eremaean and Northern Botanical Provinces (Keighery 1994, Trudgen 1988) taken from EPA (2016)

Excellent	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Very Good	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
Good	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Degraded	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
Completely Degraded	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

5. DISCUSSION

The WA Department of Agriculture's Technical Bulletin, No. 87 covers a survey area of 100 570 square kilometres. The Marmion Land System, within which this survey falls, occupies 4943 square kilometres or 4.9% of that area.
Six vegetation types were recorded and mapped within this Detailed Survey area of 774 hectares, which represents 0.16% of the land system.

Nine priority species were found growing in and around the survey area with the greatest concentration occurring where their populations overlapped in the southeast corner of the survey area. While some of these species are widespread regionally and abundant within

the survey area, one species, *Persoonia leucopogon* (**P1**) was restricted within the survey area to one small population of 27 stems in SACS (but within 50 metres of base of a dune) and three single stems, encountered elsewhere.

Given the nature of the proposed activity, i.e., shallow strip mining of sand, and associated haulage roads, any physical disturbance created would be confined to the Sand Dune Shrubland and Sandplain Acacia Shrubland vegetation types, with potential for indirect disturbance to the adjacent transition zones or vegetation types of Sandplain Gum Stratum and Mulga Wanderrie Grassland As referred to below, the high concentration of Priority species between the existing access track in the south of the survey area and Lake Goongarrie must be considered to be under threat if mining operations extended in to this area.

Although falling outside the Detailed Survey area, a feature observed on the Google Earth image of the area (51J 321965 m E; 6690160 m S) which appeared anomalous within the surrounding vegetation type of Sandplain Acacia Shrubland, was investigated and found to be a saline depression covering approximately five hectares.
A relevé was conducted and recorded several species which had not been seen elsewhere during the survey.

It was subsequently determined that the depression was fed from a drainage tract funnelling water into it from the north-west, which, in turn, was fed from a broad valley, and that one of the proposed haulage roads would intersect that drainage tract approximately 600m up-slope from the depression.

Given the potential of the proposed haul road to divert the drainage and have a detrimental effect on the environment in and around this depression, consideration should be given to its construction in order to minimise any unintended consequences.

Photographs of the saline depression and a list of the species recorded around it are shown below, with those species not observed elsewhere marked with an asterisk:

Plate 17: View of Saline Depression from NE

Plate 18: *Eremophila glabra* subsp. *tomentosa* Growing in Saline Depression

Plate 19: Vegetation Fringing Saline Depression

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List of species recorded in and around the saline depression located at 51J 321965 m E; 6690160 m S

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Table 6: Species list for Saline Depression

Family	***Genus***	***Species***
Myrtaceae	*Melaleuca*	*halmaturorum**
Frankeniaceae	*Frankenia*	*fecunda**
Chenopodiaceae	*Tecticornia*	*indica* subsp. *bidens*
Asteraceae	*Angianthus*	*tomentosus*
Chenopodiaceae	*Atriplex*	*bunburyana*
Scrophulariaceae	*Eremophila*	*glabra* subsp. *tomentose**
Asteraceae	*Senecio*	*pinnatifolius**
Asteraceae	*Senecio*	*lacustrinus**
Scrophulariaceae	*Eremophila*	*decipiens* subsp. *decipiens*
Chenopodiaceae	*Maireana*	*sedifolia*
Scrophulariaceae	*Eremophila*	*metallicorum*
Montiaceae	*Calandrinia*	*translucens**
Solanaceae	*Lyceum*	*austral**
Solanaceae	*Solanum*	*lasiophyllum*
Amaranthaceae	*Ptilotus*	*obovatus*
Chenopodiaceae	*Enchylaena*	*tomentosa*
Chenopodiaceae	*Maireana*	*georgei**
Pittosporaceae	*Pittosporum*	*angustifolium*
Proteaceae	*Grevillea*	*sarissa*
Fabaceae	*Senna*	*artemisioides* subsp. *filifolia*
Fabaceae	*Acacia*	*jennerae*

*Observed only at this location

6. CONCLUSIONS AND RECOMMENDATIONS

A total of 215 species (including sub-species and varieties) from 40 families and 106 genera have been recorded in the survey area. The most prevalent families recorded were *Fabaceae* and *Myrtaceae* (Appendix C).

- No plant species gazetted as Threatened or Declared Rare Flora pursuant to subsection (2) of section 23F of the *Biodiversity Conservation Act 2016* (W. A.) were recorded.
- No plant species listed as Threatened pursuant to Schedule 1 of the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth) (Department of Agriculture, Water, and the Environment) were recorded.
- No species listed as Declared by the Department of Agriculture and Food Western Australia under the *Biosecurity and Agricultural Management Act 2007* were recorded.
- No plant species listed as a Weed of National Significance (WoNS) under the *EPBC Act* were encountered in the survey area. Weeds of National Significance are considered by the States and Territories to pose a significant threat to biodiversity.
- Nine species identified as Priority species, listed by DBCA (2019) have been recorded.
- No TECs listed by the DBCA (2019) were recorded.
- No TECs listed by the Australian Government Department of Environment and Energy were identified.
- No PECs listed by the DBCA (2019) were recorded.

An Index of Biodiversity Surveys for Assessment (I.B.S.A.) data package has been prepared in accordance with the requirements of *the Environmental Protection Act of 1986.* and the priority flora report forms will be submitted.

The following recommendations are made to protect and enhance the conservation and botanical values in the Comet Vale Project area:

- Ground disturbance and clearing of vegetation should be limited to that which is essential for the development of the project.
- If this project is to proceed and disturbance to the Priority Flora identified is unavoidable, an application to impact Priority Flora should be submitted to the Regional DBCA office.

- Retain and stockpile cleared vegetation for use in the later rehabilitation of disturbed areas as per techniques previously employed at other MLG operated sites.

- Where possible, maintain existing drainage systems e.g., do not allow roads etc. to disrupt or divert historic flow patterns.

- Apply weed control measures.

7. PARTICIPANTS

Mr Phil Stanley Dip Cart, Dip Hort and Ms Paula Pavlovic BA, MA of Goldfields Landcare Services carried out the field work, plant identification, mapping, report and IBSA data preparation for this project. Flora Taking (Biological Assessment) Licence numbers: FB2000231 and FB62000232.

Statistical analysis was conducted by Dr Chris Hancock, BSc, PhD and GIS mapping by Mr Andrew Waters, BSc, GradCertGIS, AdvCertHort. of Woodgis.

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Appendix A: Species of Conservation Significance Database Search Result

Appendix A: Species of Conservation Significance recorded from DBCA data searches and DAWE Protected Matters Search. (See Key at bottom)

Taxon	Cons_Code	WAHERB	TPFL	NatureMap	EPBCA	Protected Matters
Acacia eremophila var. *variabilis*	3	X		X		
Alyxia tetanifolia	3	X	X	X		
*Apatelantha insignis (*prev. AKA *Newcastelia insignis)*	2	X	X	X		
Calandrinia quartzitica	1	X		X		
Chrysocephalum apiculatum subsp. *norsemanense*	3	X		X		
Elatine macrocalyx	3	X		X		
Eleocharis papillosa	3	X		X	V	
Eucalyptus educta	2	X		X		
Eucalyptus jutsonii subsp. *jutsonii*	4	X		X		Vulnerable
Eutaxia rubricarina	3	X		X		
Gastrolobium graniticum	T				T	Endangered
Grevillea erectiloba	4	X		X		
Grevillea subterlineata	3	X				
Homalocalyx grandiflorus	3	X	X	X		
Hysterobaeckea ochropetala subsp. *cometes*	3	X		X		
Malleostemon sp. Adelong (G.J. Keighery 11825)	2	X		X		
Myriophyllum lapidicola	T					Endangered
Notisia intonsa	3	X				
Persoonia leucopogon	1	X	X	X		
Philotheca coateana	3	X	X	X		
Ptilotus rigidus	1	X		X		

Taxon	Cons_Code	WAHERB	TPFL	NatureMap	EPBCA	Protected Matters
Ptilotus sp. Kalgoorlie (J. Jackson & B. Moyle 260)	1	X				
Rhodanthe uniflora	1	X		X		
Ricinocarpos brevis	T				E	Endangered
Sowerbaea multicaulis	4	X		X		
Tecticornia flabelliformis	1				V	Vulnerable
Thelimytra stellata	T				E	Endangered
Thryptomene eremaea	2	X		X		

KEY:

T: Threatened (DBCA)

P1, P2, P3, & P4: Priority rating (DBCA)

EPBC: Environment Protection and Biodiversity Conservation Act 1999

E: Endangered (EPBC)

CE: Critically Endangered

V: Vulnerable

WAHerb: WA Herbarium Database (DBCA)

NatureMap: NatureMap (DBCA)

TPFL: Threatened and Priority Flora Database (DBCA)

Appendix C: Species List by Vegetation Type

Appendix C: Species List by Vegetation Type

Family	Genus	Species	SDSH	SACS	SAGS	MUWA	GNEW	FRAN
Aizoaceae	*Gunniopsis*	*quadrifida*			x		x	x
Aizoaceae	*Gunniopsis*	*rodwayi*						x
Amaranthaceae	*Ptilotus*	*drummondii*			x			
Amaranthaceae	*Ptilotus*	*exultatus*			x			
Amaranthaceae	*Ptilotus*	*obovatus*			x	x		
Amaranthaceae	*Ptilotus*	*polystachyus*			x			
Amaranthaceae	*Surreya*	*diandra*						x
Apocynaceae	*Alyxia*	*buxifolia*	x	x	x	x	x	
Apocynaceae	*Alyxia*	*tetanifolia* **(P3)**	x		x		x	
Apocynaceae	*Leichhardtia*	*australis*	x		x			
Araliaceae	*Hydrocotyle*	*glochidiata*						x
Asparagaceae	*Thysanotus*	*manglesianus*		x		x		
Asteraceae	*Calocephalus*	*francisii*						x
Asteraceae	*Cratystylis*	*subspinescens*			x			
Asteraceae	*Olearia*	*lanuginosa*	x		x			
Asteraceae	*Olearia*	*meullerii*		x	x	x	x	
Asteraceae	*Olearia*	*ramosissima*	x					
Asteraceae	*Olearia*	*stuartii*			x			
Asteraceae	*Olearia*	*subspicata*	x	x	x			
Asteraceae	*Rhodanthe*	*floribunda*		x				
Asteraceae	*Waitzia*	*accuminata*				x		
Boraginaceae	*Halgania*	*cyanea* var. *Allambi Station*			x		x	

Appendix C: Species List by Vegetation Type (continued)

Family	*Genus*	*Species*	SDSH	SACS	SAGS	MUWA	GNEW	FRAN
Campanulaceae	*Lobelia*	*fissiflora*		x				
Casuarinaceae	*Allocasuarina*	*erioclamys*	x					
Casuarinaceae	*Allocasuarina*	*helmsii*		x			x	
Casuarinaceae	*Allocasuarina*	Sp.				x		
Casuarinaceae	*Allocasuarina*	*spinosissima*	x		x			
Casuarinaceae	*Casuarina*	*pauper*			x		x	
Chenopodiaceae	*Atriplex*	*bunburyana*			x			x
Chenopodiaceae	*Atriplex*	*nana*						x
Chenopodiaceae	*Dysphania*	*rhadinostachya* subsp. *rhadinostachya*				x		
Chenopodiaceae	*Enchylaena*	*tomentosa*			x			
Chenopodiaceae	*Maireana*	*amoena*			x			x
Chenopodiaceae	*Maireana*	*glomerifolia*			x			
Chenopodiaceae	*Maireana*	*sedifolia*						x
Chenopodiaceae	*Rhagodia*	*drummondii*					x	x
Chenopodiaceae	*Salsola*	*australis*			x			
Chenopodiaceae	*Sclerolaena*	*parviflora*			x			
Chenopodiaceae	*Tecticornia*	*indica* subsp. *bidens*						x
Chenopodiaceae	*Tecticornia*	*peltata*						x
Chenopodiaceae	*Tecticornia*	*pergranulata* subsp. *pergranulata*						x
Chenopodiaceae	*Tecticornia*	*pterygosperma* subsp. *pterygosperma*						x
Chenopodiaceae	*Tecticornia*	*undulata*						x
Cupressaceae	*Callitris*	*columellaris*	x	x	x			
Cupressaceae	*Callitris*	*preissii*				x		

Appendix C: Species List by Vegetation Type (continued)

Family	*Genus*	*Species*	SDSH	SACS	SAGS	MUWA	GNEW	FRAN
Cyperaceae	*Chrysitrix*	*distigmatosa*			x			x
Cyperaceae	*Schoenus*	*subaphyllus*	x		x			
Ericaceae	*Leucopogon*	sp Coolgardie (M. Hislop & F. Hort MH 3917)	x					
Euphorbiaceae	*Bertya*	*dimerostigma*	x	x	x			
Fabaceae	*Acacia*	*accuminata*				x		
Fabaceae	*Acacia*	*aneura*					x	
Fabaceae	*Acacia*	*burkittii*	x	x		x	x	
Fabaceae	*Acacia*	*caesaneura*		x	x	x	x	
Fabaceae	*Acacia*	*colletioides*	x		x	x	x	
Fabaceae	*Acacia*	*coolgardiensis* subsp. *coolgardiensis*	x		x	x		
Fabaceae	*Acacia*	*craspedocarpa*	x			x		
Fabaceae	*Acacia*	*effusifolia*	x	x	x	x	x	
Fabaceae	*Acacia*	*eremophila* var. *variabilis* **(P3)**			x			
Fabaceae	*Acacia*	*erinaceae*					x	
Fabaceae	*Acacia*	*fragilis*		x	x			
Fabaceae	*Acacia*	*hemiteles*		x	x	x	x	
Fabaceae	*Acacia*	*heteroneura* var. *jutsonii*		x				
Fabaceae	*Acacia*	*incurvaneura*	x	x	x	x		
Fabaceae	*Acacia*	*jennerae*		x	x			
Fabaceae	*Acacia*	*ligulata*	x		x		x	x
Fabaceae	*Acacia*	*longispinea*	x	x	x		x	
Fabaceae	*Acacia*	*murrayana*		x				
Fabaceae	*Acacia*	*oswaldii*					x	

Appendix C: Species List by Vegetation Type (continued)

Family	*Genus*	*Species*	SDSH	SACS	SAGS	MUWA	GNEW	FRAN
Fabaceae	*Acacia*	*oswaldii*					x	
Fabaceae	*Acacia*	*prainii*		x	x		x	
Fabaceae	*Acacia*	*quadrimarginea*	x					
Fabaceae	*Acacia*	*ramulosa* var. *ramulosa*	x	x	x	x	x	x
Fabaceae	*Acacia*	*sibina*	x	x				
Fabaceae	*Acacia*	*sibirica*				x		
Fabaceae	*Acacia*	*steedmanii* subsp. *steedmanii*			x			
Fabaceae	*Acacia*	*stowardii*				x	x	
Fabaceae	*Acacia*	*tetragonaphylla*	x		x	x	x	
Fabaceae	*Bossiaea*	*walkeri*			x		x	
Fabaceae	*Daviesia*	*grahamii*			x			
Fabaceae	*Jacksonia*	*arida*	x		x		x	x
Fabaceae	*Leptosema*	*aculeatum*	x		x			
Fabaceae	*Leptosema*	*chambersii*	x					
Fabaceae	*Mirbelia*	*rhagodioides*	x		x		x	
Fabaceae	*Senna*	*artemisioides* subsp. *filifolia*	x	x	x	x	x	
Fabaceae	*Templetonia*	*incrassata*					x	
Frankeniaceae	*Frankenia*	*sessilis*						x
Goodeniaceae	*Brunonia*	*australis*	x	x				
Goodeniaceae	*Coopernookia*	*strophiolata*	x					
Goodeniaceae	*Dampiera*	*ramosa*	x					
Goodeniaceae	*Goodenia*	*berardiana*				x		
Goodeniaceae	*Goodenia*	*daviesii*		x				
Goodeniaceae	*Goodenia*	*havilandii*				x	x	

Appendix C: Species List by Vegetation Type (continued)

Family	*Genus*	*Species*	SDSH	SACS	SAGS	MUWA	GNEW	FRAN
Goodeniaceae	*Goodenia*	*rosea*				x		
Goodeniaceae	*Leschenaultia*	*striata*	x					
Goodeniaceae	*Scaevola*	*spinescens*	x	x	x	x	x	
Gyrostemonaceae	*Gyrostemon*	*ramulosus*	x		x			
Haloragaceae	*Haloragis*	*odontocarpa*		x				
Hemerocallidaceae	*Dianella*	*revoluta*	x					
Lamiaceae	*Apatelantha*	*insignis* **(P2)**	x		x			
Lamiaceae	*Apatelantha*	*viscida*		x				
Lamiaceae	*Dampiera*	*lavandulaceae*			x			
Lamiaceae	*Hemigenia*	*brachyphylla*		x				
Lamiaceae	*Pityrodia*	*lepidota*	x					
Lamiaceae	*Pityrodia*	*loricata*		x				
Lamiaceae	*Prostanthera*	*althoferi* subsp. *althoferi*		x		x		
Lamiaceae	*Prostanthera*	*campbellii*	x	x	x	x		
Lamiaceae	*Prostanthera*	*grylloana*		x		x		
Lamiaceae	*Teucrium*	*teucriiflorum*			x			
Lamiaceae	*Westringia*	*cephalantha*	x	x	x		x	
Lamiaceae	*Westringia*	*rigida*	x	x	x	x	x	
Loranthaceae	*Amyema*	*benthamii*				x		
Loranthaceae	*Amyema*	*fitzgeraldii*	x		x			
Loranthaceae	*Amyema*	*gibberula* var. *gibberula*				x		
Loranthaceae	*Amyema*	*linophylla*				x		
Malvaceae	*Brachychiton*	*gregorii*	x			x	x	
Malvaceae	*Hannafordia*	*quadrivalvis* subsp. *quadrivalvis*			x			

Appendix C: Species List by Vegetation Type (continued)

Family	*Genus*	*Species*	SDSH	SACS	SAGS	MUWA	GNEW	FRAN
Malvaceae	*Seringia*	*velutina*	x					
Myrtaceae	*Aluta*	*aspera* subsp. *aspera*	x	x		x	x	
Myrtaceae	*Calytrix*	*birdii*	x		x			
Myrtaceae	*Calytrix*	*watsonii*	x		x			
Myrtaceae	*Enekbatus*	*cryptandroides*		x				
Myrtaceae	*Enekbatus*	*eremaeus*	x	x				
Myrtaceae	*Eucalyptus*	*ceratocorys*	x		x			
Myrtaceae	*Eucalyptus*	*clelandiorum*					x	
Myrtaceae	*Eucalyptus*	*concinna*			x	x	x	
Myrtaceae	*Eucalyptus*	aff. *concinna*				x		
Myrtaceae	*Eucalyptus*	*hypolaena*			x			
Myrtaceae	*Eucalyptus*	*jutsonii* subsp. *jutsonii* **(P4)**	x	x	x		x	
Myrtaceae	*Eucalyptus*	*leptopoda*	x	x	x	x	x	
Myrtaceae	*Eucalyptus*	*moderata*		x	x			
Myrtaceae	*Eucalyptus*	*oldfieldii*	x	x	x		x	
Myrtaceae	*Eucalyptus*	*oleosa* subsp. *oleosa*			x	x		
Myrtaceae	*Eucalyptus*	*rigidula*	x	x	x	x	x	
Myrtaceae	*Eucalyptus*	*transcontinentalis*	x		x		x	
Myrtaceae	*Euryomyrtus*	*maidenii*		x				
Myrtaceae	*Homalocalyx*	*grandiflorus* **(P3)**	x	x	x			
Myrtaceae	*Homalocalyx*	*thryptomenoides*	x	x		x		
Myrtaceae	*Hysterobaeckea*	*ochropetala* subsp. *cometes* **(P3)**	x	x				
Myrtaceae	*Leptospermum*	*erubescens*	x	x	x			

Appendix C: Species List by Vegetation Type (continued)

Family	*Genus*	*Species*	SDSH	SACS	SAGS	MUWA	GNEW	FRAN
Myrtaceae	*Leptospermum*	*fastigiatum*	x					
Myrtaceae	*Malleostemon*	*roseus*	x	x				
Myrtaceae	*Melaleuca*	*uncinata*	x	x	x		x	
Myrtaceae	*Micromyrtus*	*clavata*	x					
Myrtaceae	*Micromyrtus*	*flaviflora*		x	x	x		
Myrtaceae	*Micromyrtus*	*maidenii*		x				
Myrtaceae	*Micromyrtus*	*monotaxis*	x					
Myrtaceae	*Thryptomene*	*eremaea* **(P2)**				x		
Myrtaceae	*Thryptomene*	*urceolaris*	x	x	x		x	
Myrtaceae	*Verticordia*	*helmsii*	x		x	x		
Phyllanthaceae	*Poranthera*	*leiosperma*		x				
Pittosporaceae	*Bursaria*	*occidentalis*	x	x	x		x	
Pittosporaceae	*Marianthus*	*bicolor*	x		x			
Pittosporaceae	*Pittosporum*	*angustifolium*			x			
Poaceae	*Amphipogon*	*caricinus*		x	x			
Poaceae	*Austrostipa*	*elegantissima*			x	x		x
Poaceae	*Eragrostis*	*eriopoda*				x		
Poaceae	*Eragrostis*	*falcata*			x			x
Poaceae	*Eriopoda*	*dielsii*			x			
Poaceae	*Monachather*	*paradoxus*	x					
Poaceae	*Rytidosperma*	*caespitosum*	x	x	x	x		
Poaceae	*Triodia*	*basedowii*		x	x	x	x	x
Poaceae	*Triodia*	*schinzii*	x	x	x		x	

Appendix C: Species List by Vegetation Type (continued)

Family	*Genus*	*Species*	SDSH	SACS	SAGS	MUWA	GNEW	FRAN
Poaceae	*Triodia*	*schinzii*	x	x	x		x	
Proteaceae	*Banksia*	*elderiana*	x					
Proteaceae	*Grevillea*	*acacioides*	x	x				
Proteaceae	*Grevillea*	*berryana*		x	x	x		
Proteaceae	*Grevillea*	*didymobotrya* subsp. *didymobotrya*	x		x			
Proteaceae	*Grevillea*	*eremophila*	x		x			
Proteaceae	*Grevillea*	*extorris*	x	x				
Proteaceae	*Grevillea*	*juncifolia*	x	x	x			
Proteaceae	*Grevillea*	*oligomera*		x		x		
Proteaceae	*Grevillea*	*pterosperma*	x	x	x		x	
Proteaceae	*Grevillea*	*sarissa*	x		x		x	x
Proteaceae	*Grevillea*	*secunda* **(P4)**	x		x			
Proteaceae	*Grevillea*	*stenobotrya*	x					
Proteaceae	*Hakea*	*francisiana*	x	x	x		x	
Proteaceae	*Persoonia*	*coriaceae*			x			
Proteaceae	*Persoonia*	*leucopogon* **(P1)**	x	x	x			
Proteaceae	*Persoonia*	*saundersiana*	x		x			
Pteridaceae	*Cheilanthes*	*sieberi*				x		
Restionaceae	*Lepidobolus*	*deserti*	x					
Rhamnaceae	*Cryptandra*	*distigma*	x					
Rubiaceae	*Psydrax*	*suaveolens*			x	x		
Rutaceae	*Phebalium*	*canaliculatum*	x	x	x	x	x	
Rutaceae	*Phebalium*	*laevigatum*	x		x		x	

Appendix C: Species List by Vegetation Type (continued)

Family	*Genus*	*Species*	SDSH	SACS	SAGS	MUWA	GNEW	FRAN
Rutaceae	*Philotheca*	*brucei* subsp. *brucei*				x		
Rutaceae	*Philotheca*	*tomentella*	x			x		
Santalaceae	*Exocarpos*	*aphyllus*	x	x	x	x	x	x
Santalaceae	*Exocarpos*	*sparteus*			x			
Santalaceae	*Santalum*	*accuminatum*	x		x		x	
Santalaceae	*Santalum*	*spicatum*			x	x	x	
Sapindaceae	*Dodonaea*	*amblyophylla*	x		x			
Sapindaceae	*Dodonaea*	*lobulata*			x	x	x	
Sapindaceae	*Dodonaea*	*rigida*		x	x	x		
Sapindaceae	*Dodonaea*	*stenozyga*					x	
Sapindaceae	*Dodonaea*	*viscosa* subsp. *angustissima*	x		x		x	x
Scrophulariaceae	*Eremophila*	*alternifolia*					x	
Scrophulariaceae	*Eremophila*	*caperata*	x		x	x		
Scrophulariaceae	*Eremophila*	*clarkei*				x		
Scrophulariaceae	*Eremophila*	*decipiens* subsp. *decipiens*	x		x		x	x
Scrophulariaceae	*Eremophila*	*eriocalyx*		x				
Scrophulariaceae	*Eremophila*	*forrestii* subsp. *forrestii*		x	x	x	x	
Scrophulariaceae	*Eremophila*	*glabra* subsp. *albicans*		x				
Scrophulariaceae	*Eremophila*	*latrobei* subsp. *latrobei*			x	x		
Scrophulariaceae	*Eremophila*	*metallicorum*					x	
Scrophulariaceae	*Eremophila*	*miniata*					x	x
Scrophulariaceae	*Eremophila*	*oppositifolia*					x	
Scrophulariaceae	*Eremophila*	*platythamnos* subsp. *platythamnos*	x		x	x		

Appendix C: Species List by Vegetation Type (continued)

Family	*Genus*	*Species*	SDSH	SACS	SAGS	MUWA	GNEW	FRAN
Scrophulariaceae	*Eremophila*	*scoparia*			x		x	
Scrophulariaceae	*Eremophila*	sp. Mt Jackson (G.J. Keighery 4372)					x	
Solanaceae	*Anthotroche*	*pannosa*	x		x			
Solanaceae	*Duboisia*	*hopwoodii*	x					
Solanaceae	*Solanum*	*lasiophyllum*	x		x	x		
Solanaceae	*Solanum*	*orbiculatum*						x
Stylideaceae	*Stylidium*	*warriedarense*				x		
Thymelaeaceae	*Pimelea*	*microcephala* subsp. *microcephala*			x			
Zygophyllaceae	*Zygophyllum*	*aurantiacum*					x	x

Key:

SDSH: Sand dune shrublands.

SACS: Sandplain acacia shrublands

SAGS:. Sandplain gum stratum

MUWA: Mulga wanderrie grassy shrublands

GNEW: Greenstone hell eucalypt woodlands

FRAN: Frankenia low shrublands

Appendix D: Conservation Code Definitions

Appendix D1: Conservation Codes for Western Australian Flora and Fauna (Department of Biodiversity, Conservation and Attractions, 2016) Retrieved April 2022

Specially protected fauna and flora Code	Description
T	**Threatened species** Threatened species Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the Biodiversity Conservation Act 2016 (BC Act). Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for Threatened Fauna. Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the Wildlife Conservation (Rare Flora) Notice 2018 for Threatened Flora. The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.
CR	**Critically endangered species** Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for critically endangered flora.
EN	**Endangered species** Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.
VU	**Vulnerable species** Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.
EX	**Extinct species** Species where "there is no reasonable doubt that the last member of the species has died", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act). Published as presumed extinct under schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for extinct fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for extinct flora.
EW	**Extinct in the wild species** Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Appendix D2: Conservation Codes for Western Australian Flora and Fauna (Department of Biodiversity, Conservation and Attractions, 2016) Retrieved April 2022*continued*

Specially protected species	Description
MI	**Migratory species** Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. Published as migratory birds protected under an international agreement under schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.
CD	**Species of special conservation interest (conservation dependent fauna)** Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018..
OS	**Other specially protected species** Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.

Appendix D3: Conservation Codes for Western Australian Flora and Fauna (Department of Biodiversity, Conservation and Attractions, 2016) Retrieved April 2022*continued*

Priority Species Codes	Description
P1	**Priority 1: Poorly-known species** Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
P2	**Priority 2: Poorly-known species** Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
P3	**Priority 3: Poorly-known species** Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
P4	**Priority 4: Rare, Near Threatened and other species in need of monitoring** (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix D4: Definition of Threatened Flora Species (Environment Protection and Biodiversity *Conservation Act 1999* (Commonwealth)) Retrieved April 2022

Category Code	Category
Ex	**Extinct** Species which at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
ExW	**Extinct in the Wild** Species which is known only to survive in cultivation, in captivity or as a naturalized population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CE	**Critically Endangered** Species which at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
E	**Endangered** Species which is not critically endangered and it is facing a very high risk of extinction in the wild in the immediate or near future, as determined in accordance with the prescribed criteria.
V	**Vulnerable** Species which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent** Species which at a particular time if, at that time: a) the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximized; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

Appendix D5: Definitions and Criteria of Threatened Ecological Communities (Department of Environment and Conservation 2013) Retrieved April 2022

Category Code	Category
PD	**Presumed Totally Destroyed** An ecological community will be listed as Presumed Totally Destroyed if there are no recent records of the community being extant and either of the following applies: (i) Records within the last 50 years have not been confirmed despite thorough searches or known likely habitats or; (ii) All occurrences recorded within the last 50 years have since been destroyed
CE	**Critically Endangered** A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% **and either or both** of the following apply (i or ii): i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years); ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated B) Current distribution is limited, **and one or more** of the following apply (i, ii or iii): i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years); ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes; iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes C) The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years)
EN	**Endangered** An ecological community will be listed as **Endangered** when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future This will be determined on the basis of the best available information by it meeting **any one or more of** the following criteria (A, B, or C): A) The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement **and either or both** of the following apply (i or ii): i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years); ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated B) Current distribution is limited, **and one or more** of the following apply (i, ii or iii): i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years); ii) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes; iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years)
VU	**Vulnerable** An ecological community will be listed as **Vulnerable** when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future This will be determined on the basis of the best available information by it meeting **any one or more of** the following criteria (A, B or C): A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated B) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes

Appendix D6: Definitions and Criteria for Priority Ecological Communities (Department of Environment and Conservation 2013) Retrieved April 2022

Category Code	Category
P1	**Poorly-known ecological communities:** Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
P2	**Poorly-known ecological communities:** Communities that are known from few occurrences with a restricted distribution (generally ≤10 occurrences or a total area of ≤200ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3	**Poorly known ecological communities:** (i)Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) communities known from a few widespread occurrences, which are either large or with significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
P4	**Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.** 6. Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands. (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.
P5	**Conservation Dependent ecological communities** Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Appendix E: Vegetation Classification System

Appendix E: Vegetation Classification System (Modified Muir 1977)

Form/Height	**Canopy Cover**				
	Dense 70-100%	Mid-Dense 30-70%	Sparse 10-30%	Very Sparse 2-10%	Scattered <2%
Trees>30m Trees 15-30m Trees 5-15m Trees <5m	Dense Tall Forest Dense Forest Dense Low Forest A Dense Low Forest B	Tall Forest Forest Low Forest A Low Forest B	Tall Woodland Woodland Low Woodland A Low Woodland B	Open Tall Woodland Open woodland Open Low Woodland A Open Low Woodland B	Scattered Tall Trees Scattered Trees Scattered Low Trees A Scattered Low Trees B
Mallee tree form Mallee shrub form	Dense Tree Mallee Dense Shrub Mallee	Tree Mallee Shrub Mallee	Open Tree Mallee Open Shrub Mallee	Very Open Tree Mallee Very Open Shrub Mallee	Scattered Tree Mallees Scattered Shrub Mallees
Shrubs >2m Shrubs 1-2m Shrubs <1m	Dense Thicket Dense Heath Dense Low Heath	Thicket Heath Low Heath	Scrub Low Scrub Dwarf Scrub	Open Scrub Open Low Scrub Open Dwarf Scrub	Scattered Tall Shrubs Scattered Shrubs Scattered Low Shrubs
Mat plants, Bunch Grass, Hummock Grass, Sedges, Herbs	Dense Mat Plants/ Grass/Hummock Grass/Sedges/Herbs	Mat Plants/Grass/ Hummock Grass/ Sedges/Herbs	Open Mat Plants/ Grass/Hummock Grass/Sedges/Herbs	Very Open Mat Plants/ Grass/Hummock Grass/ Sedges/Herbs	Scattered Mat Plants/ Grasses/Hummock Grasses/Sedges/Herbs