HABITAT SOLUTIONS

# Monitoring and Biometric Condition Assessment Southern Highlands Regional Shooting Complex

Wattle Ridge Rd, Hilltop NSW 2575
July 2024

# Document Control

| Revision/Version No. | Date | Revised by |
|---|---|---|
| Revision A | 2 August 2024 | D Pisani & W Thurston |
| | | |
| | | |

# Authorised

| | | Signature | Date |
|---|---|---|---|
| Author | Daniel Pisani |  | 2 August 2024 |
| Approved | William Thurston |  | 2 August 2024 |

# Distribution

| Revision/Version No. | Date | Issued to |
|---|---|---|
| Revision A | 2 August 2024 | Southern Highlands Regional Shooting Complex |
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## Contents





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## Introduction

This report presents the findings of the first monitoring study undertaken by Habitat Solutions at the request of the NSW Office of Sport in regard to the ongoing development and use of the Southern Highlands Regional Shooting Complex (SHRSC) located on Wattle Ridge Road, Hill Top, NSW.

The monitoring involves the undertaking of six (6) flora plots and seven photo-point locations within the SHRSC (Figure 1). For reference, the coordinates of these locations are provided in Tables 1 and 2.

Table 1. Vegetation plot coordinates

| Plot No. | Grid Reference (GDA 94) | | General location and description |
|---|---|---|---|
| | Easting | Northing | |
| 1 | 265573 | 6199190 | Southern end of the 800m range. |
| 2 | 265546 | 6199096 | 230m south-west of the 800m range. |
| 3 | 265119 | 6197472 | Fire trail on the western side of a powerline easement, 1.8 km south of the 800m range. |
| 4 | 264843 | 6200465 | West of the 50m range |
| 5 | 265435 | 6200643 | On the southern side of Wattle Ridge Road. |
| 6 | 265680 | 6199995 | The gully between 500m and 800m ranges. |

Table 2. Photo-point coordinates

| Photo-points | Grid Reference (GDA 94) | | General location and description |
|---|---|---|---|
| | Easting | Northing | |
| 1 | 265635 | 6199258 | South end of 800m range. |
| 2 | 265503 | 6199183 | Intact woodland. |
| 3 | 265263 | 6197520 | Powerline easement crossing, 1.8km south of the 800m range. |
| 4 | 265635 | 6199258 | South end of 800m range |
| 5 | 264932 | 6200416 | Northern boundary of the 50m range |
| 6 | 265000 | 6200218 | South-east of the 50m range. |
| 7 | 265196 | 6200362 | Drainage below sediment dam west of the 500m range |



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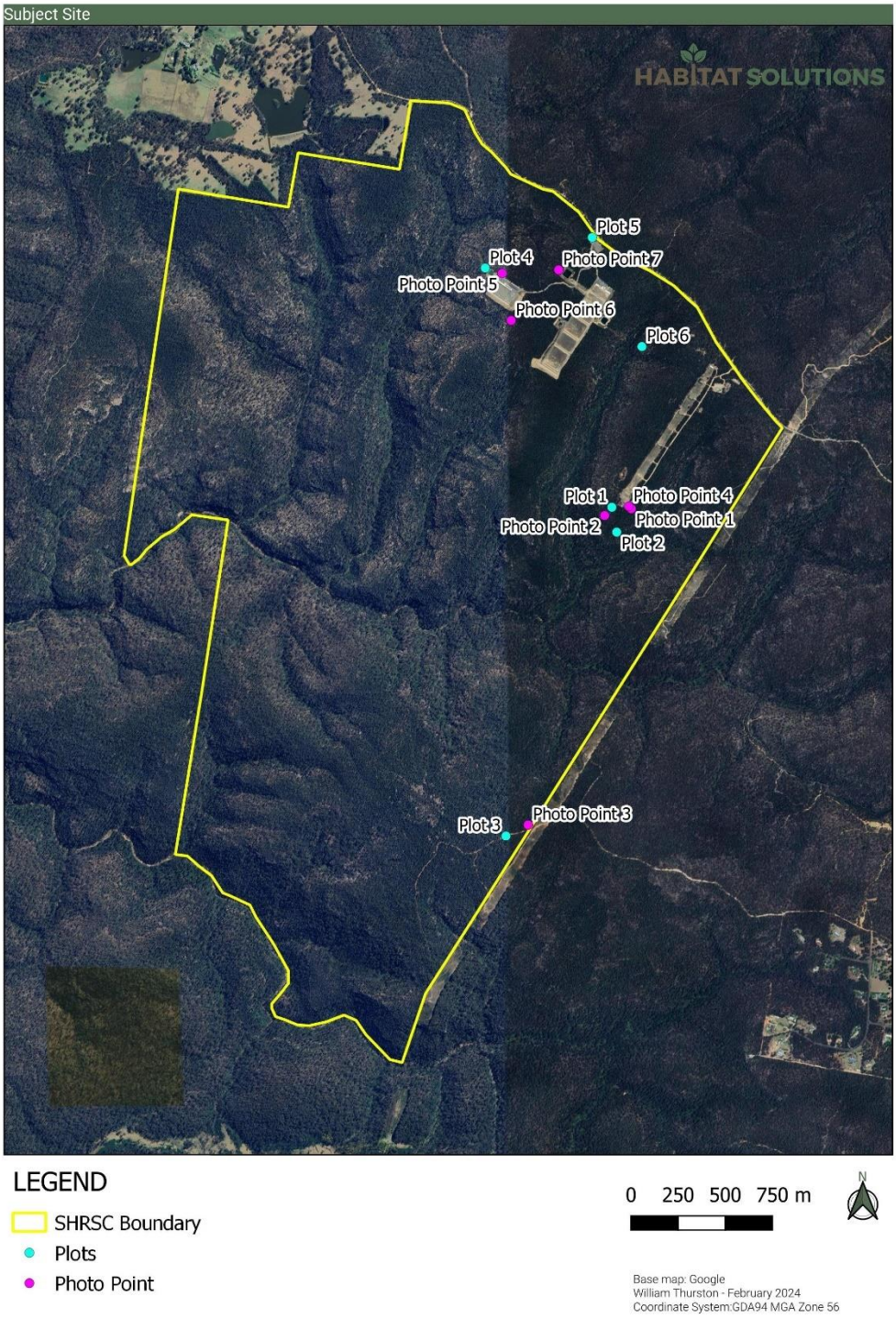
Figure 1. Map of SHRSC boundary and monitoring locations.



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# Results

## 2.01 Vegetation Plots

The six vegetation survey plots established by Epacris are generally located close to the boundary of the development zones, one being near the powerline easement. Plots are 20 m by 20 m in size and were marked on all four corners with 40 cm steel star pickets which are topped by yellow plastic caps. It is noted that a number of the star pickets established during the initial monitoring session were not relocated during the current study even though extensive searches were undertaken. The density of the post-fire understory regeneration has had an adverse impact on site visibility, reducing the ability to relocate several of these. The use of pink flagging tape was implemented to re-establish the corner locations.

At each quadrat, floristic information was collected including vegetation structure covering height range, cover and dominant species for each plant stratum, full floristics and an estimate of cover/abundance using a modified Braun-Blanquet scale (1-7) (Table 3).

Table 3: Cover Abundance Scale (Modified Braun Blanquet)

| | |
|---|---|
| 1 | cover less than 5% of site and 3 or less individuals |
| 2 | <5% - more than 3 sparsely scattered |
| 3 | <5% - common consistent throughout plot |
| 4a | <5% very abundant (many individuals throughout plot) |
| 4b | cover of 5-25% of site |
| 5 | cover of 25-50% of site |
| 6 | cover of 50-75% of site |
| 7 | cover of 75-100% of site |

The photos attached in the results section were taken looking in from the north-western corner of the plot. The 4 cardinal photos (taken looking north, east, south and west from the north-western corner-post) have been provided in Appendix 1.
Each plot contains a flora species list identified during inspection. All species were collated and provided in Appendix 2.



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## 2.02 Plot 1

Table 4: Plot 1 Floristic Site Survey Form

| Plot 1 Floristic Site Survey Form | | | |
|---|---|---|---|
| **Date:** 17th April 2024 | | | |
| **Recorder:** W. Thurston & D. Pisani | | | |
| **Location:** Southern end of the 800 m rifle range, Hill Top Conservation Area, NSW | | | |
| **Plot Size:** 20 m x 20 m | | | |
| **Easting:** 265573 | **Northing:** 6199190 | **Position in quadrat:** north-west corner | |
| **Zone No.:** 56 | | | |
| **Altitude:** 616 m asl | | **Slope:** 1° | |
| **Mitchell Landscape:** Nattai Plateau | | **CMA:** Hawkesbury-Nepean | |
| **Geology:** Nattai Tablelands erosional | | | |
| **Vegetation Structure:** (Walker & Hopkins 1983) | | | |
| **Stratum** | **Height (m)** | **% cover** | **Dominant species** |
| **Upper** | 12 | 5 | *Eucalyptus sieberi, E. piperita, Corymbia gummifera* |
| **Mid-upper** | 6 | 10 | *Corymbia gummifera* |
| **Shrub** | 2.5 | 80 | *Acacia linifolia, Acacia myrtifolia, Acacia suaveolens, Acacia terminalis, Hakea dactyloides, Hakea sericea,* Regenerating *Eucalyptus* spp. |
| **Ground** | 0.5 | 50 | *Caustis flexuosa, Lomandra cylindrica, Patersonia sericea, Poranthera ericifolia, Platysace ericoides, Xanthosia pilosa* |
| **Total Number of native species recorded:** 38 | | | |
| **Total Number of weed species:** 0 | | | |
| **Vegetation formation and class** Sydney Hinterland Dry Sclerophyll Forests | | | |
| **(Keith 2004):** Dry Sclerophyll Forests | | | |
| **Vegetation on-ground description:** Open Forest - *Eucalyptus sieberi — Corymbia gummifera* | | | |
| **PCT:** 1086. Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin. | | | |



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| Feature | Y/N | Comment |
|---|---|---|
| Hollow-bearing trees | Y | Small (11-20 cm) hollows are present in overhanging branches. |
| Rock outcrop | Y | Minor occurrences. |
| Mistletoe | N | |
| Water body | N | |
| Threatened species | N | |
| Weeds | N | |
| Pest fauna | N | |
| Tree dieback | N | |
| Fire history | Y | Bushfire in December 2019 still affecting vegetation structure and composition. Epicormic growth in remaining canopy trees is evident throughout. Dense shrub stratum regrowth dominates vegetation cover. |
| Erosion | N | |
| Other | Y | Vegetation has grown extremely thick throughout the historic sediment runoff. |



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Table 5: Plot 1 Floristic Species List

| Plot 1: Floristic | | |
|---|---|---|
| No. | Species | Cover Abundance |
| 1 | *Acacia linifolia* | 4b |
| 2 | *Acacia myrtifolia* | 4b |
| 3 | *Acacia suaveolens* | 4b |
| 4 | *Acacia terminalis* | 4b |
| 5 | *Acacia ulicifolia* | 4b |
| 6 | *Banksia marginata* | 3 |
| 7 | *Banksia spinulosa* | 3 |
| 8 | *Bossiaea obcordata* | 1 |
| 9 | *Caustis flexuosa* | 3 |
| 10 | *Corymbia gummifera* | 4a |
| 11 | *Dillwynia floribunda* | 1 |
| 12 | *Dillwynia retorta* | 1 |
| 13 | *Dodonaea triquetra* | 1 |
| 14 | *Entolasia stricta* | 2 |
| 15 | *Eragrostis brownii* | 1 |
| 16 | *Eucalyptus piperita* | 4a |
| 17 | *Hakea dactyloides* | 4a |
| 18 | *Hakea sericea* | 4a |
| 19 | *Hardenbergia violacea* | 2 |
| 20 | *Isolepis inundata* | 1 |
| 21 | *Isopogon anemonifolius* | 1 |
| 22 | *Lambertia formosa* | 2 |
| 23 | *Leptospermum parvifolium* | 1 |
| 24 | *Leptospermum trinervium* | 2 |
| 25 | *Lomandra cylindrica* | 2 |
| 26 | *Lomandra obliqua* | 2 |
| 27 | *Lomatia silaifolia* | 2 |
| 28 | *Microlaena stipoides* var. *stipoides* | 1 |
| 29 | *Patersonia sericea* | 3 |
| 30 | *Persoonia levis* | 1 |
| 31 | *Persoonia pinifolia* | 1 |
| 32 | *Petrophile pulchella* | 2 |
| 33 | *Pimelea linifolia* subsp. *linifolia* | 3 |
| 34 | *Platysace ericoides* | 2 |
| 35 | *Poranthera corymbosa* | 2 |
| 36 | *Poranthera ericifolia* | 3 |
| 37 | *Xanthosia pilosa* | 3 |
| 38 | *Xanthosia tridentata* | 1 |



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Figure 2. Vegetation within Plot 1.

## 2.03 Plot 2

Table 6: Plot 2 Floristic Site Survey Form

| Plot 2: Floristic Site Survey Form | | | |
|---|---|---|---|
| **Date:** 17th April 2024 | | | |
| **Recorder:** W. Thurston & D. Pisani | | | |
| **Location:** 230 m south-west of the 800 m rifle range, Hill Top Conservation Area, NSW | | | |
| **Plot Size:** 20 m x 20 m | | | |
| **Easting:** 265540 **Northing:** 6199076 **Position in quadrat:** north-west corner | | | |
| **Zone No.:** 56 | | | |
| **Altitude:** 602 m asl **Slope:** 2° | | | |
| **Mitchell Landscape:** Nattai Plateau **CMA:** Hawkesbury-Nepean | | | |
| **Geology:** Nattai Tablelands erosional | | | |
| **Vegetation Structure:** (Walker & Hopkins 1983) | | | |
| Stratum | Height (m) | % cover | Dominant species |
| Upper | 15 | 15 | *Corymbia gummifera, Eucalyptus piperita, Eucalyptus sieberi.* |
| Mid-upper | 8-10 | 20 | *Corymbia gummifera* |
| Shrub | 2.5 | 80 | *Acacia linifolia, Acacia longifolia* subsp. l*ongifolia, Acacia terminalis, Banksia spinulosa, Grevillea sphacelata, Persoonia levis.* |
| Ground | 0.5 | 60 | *Hardenbergia violacea, Gonocarpus teucrioides, Poranthera ericifolia, Lomandra obliqua.* |
| **Total Number of native species recorded:** 32 | | | |
| **Total Number of weed species:** 0 | | | |
| **Vegetation formation and class** Sydney Hinterland Dry Sclerophyll Forests | | | |
| **(Keith 2004):** Dry Sclerophyll Forests | | | |
| **Vegetation on-ground description:** Open Forest - *Eucalyptus sieberi — Corymbia gummifera* | | | |
| **PCT:** 1086. Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin. | | | |

| Feature | Y/N | Comment |
|---|---|---|
| Hollow-bearing trees | Y | Small (11-20 cm) and Medium (21-30 cm) sized hollows are present. |
| Rock outcrop | N | |
| Mistletoe | N | |
| Water body | N | |
| Threatened species | N | |
| Weeds | N | |
| Pest fauna | N | |
| Tree dieback | N | |
| Fire history | Y | Bushfire in December 2019 still affecting vegetation structure and composition. Epicormic growth in remaining canopy trees is evident throughout. Dense shrub stratum regrowth dominates vegetation cover. |
| Erosion | N | |
| Other | N | |



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Table 7: Plot 2 Floristic Species List

| | Plot 2: Floristic Composition | |
|---|---|---|
| No. | Species | Cover Abundance |
| 1 | *Acacia linifolia* | 3 |
| 2 | *Acacia longifolia* subsp. *longifolia* | 3 |
| 3 | *Acacia terminalis* | 4b |
| 4 | *Acacia ulicifolia* | 2 |
| 5 | *Amperea xiphoclada* var. *xiphoclada* | 2 |
| 6 | *Banksia spinulosa* | 2 |
| 7 | *Bauera rubioides* | 1 |
| 8 | *Billardiera scandens* | 1 |
| 9 | *Boronia ledifolia* | 2 |
| 10 | *Bossiaea obcordata* | 2 |
| 11 | *Caustis flexuosa* | 2 |
| 12 | *Corymbia gummifera* | 4b |
| 13 | *Dillwynia retorta* | 1 |
| 14 | *Eriostemon australasius* | 2 |
| 15 | *Eucalyptus piperita* | 3 |
| 16 | *Eucalyptus sieberi* | 3 |
| 17 | *Gonocarpus teucrioides* | 3 |
| 18 | *Grevillea sphacelata* | 3 |
| 19 | *Hardenbergia violacea* | 4a |
| 20 | *Hovea linearis* | 1 |
| 21 | *Isopogon anemonifolius* | 2 |
| 22 | *Lomandra filiformis* | 2 |
| 23 | *Lomandra multiflora* subsp. *multiflora* | 1 |
| 24 | *Lomandra obliqua* | 3 |
| 25 | *Lomatia silaifolia* | 3 |
| 26 | *Olax stricta* | 2 |
| 27 | *Persoonia levis* | 3 |
| 28 | *Pteridium esculentum* | 1 |
| 29 | *Smilax glyciphylla* | 2 |
| 30 | *Xanthosia pilosa* | 2 |
| 31 | *Xylomelum pyriforme* | 1 |
| 32 | *Zieria granulata* | 1 |



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Figure 3. Vegetation within Plot 2.

## 2.04 Plot 3

Table 8: Plot 3 Floristic Site Survey Form

| Plot 3: Floristic Site Survey Form | | | |
|---|---|---|---|
| **Date:** 30th July 2024 | | | |
| **Recorder:** W. Thurston & D. Pisani | | | |
| **Location:** 50 m along the fire trail west of the powerline easement, 1.8 km south of the 800 m range, Hill Top Conservation Area, NSW | | | |
| **Plot Size:** 20 m x 20 m | | | |
| **Easting:** 265119 **Northing:** 6197472 **Position in quadrat:** north-west corner | | | |
| **Zone No.:** 56 | | | |
| **Altitude:** 639 m asl **Slope:** 2° | | | |
| **Mitchell Landscape:** Nattai Plateau **CMA:** Hawkesbury-Nepean | | | |
| **Geology:** Nattai Tablelands erosional | | | |
| **Vegetation Structure:** (Walker & Hopkins 1983) | | | |
| Stratum | Height (m) | % cover | Dominant species |
| Upper | 15-20 | 20 | *Eucalyptus eugenioides, Eucalyptus sclerophylla, Corymbia gummifera.* |
| Mid-upper | 4 | 15 | *Eucalyptus sclerophylla, Corymbia gummifera.* |
| Shrub | 0.5-1.5 | 50 | *Acacia myrtifolia, Grevillea sphacelata, Grevillea sphacelata, Lomatia silaifolia.* |
| Ground | 0.5 | 15 | *Lomandra multiflora* subsp. *multiflora, Gonocarpus teucrioides, Caustis flexuosa.* |
| **Total Number of native species recorded:** 28 | | | |
| **Total Number of weed species:** 0 | | | |
| **Vegetation formation and class** Sydney Hinterland Dry Sclerophyll Forests | | | |
| **(Keith 2004):** Dry Sclerophyll Forests | | | |
| **Vegetation on-ground description:** Open Forest - *Eucalyptus sieberi — Corymbia gummifera* | | | |
| **PCT:** 1086. Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin. | | | |

| Feature | Y/N | Comment |
|---|---|---|
| Hollow-bearing trees | N | |
| Rock outcrop | Y | Minimal occurrences. |
| Mistletoe | N | |
| Water body | N | |
| Threatened species | N | |
| Weeds | N | |
| Pest fauna | N | |
| Tree dieback | N | |
| Fire history | Y | Bushfire in December 2019 still affecting vegetation structure and composition. Epicormic growth in remaining canopy trees is evident throughout. Dense shrub stratum regrowth dominates vegetation cover. |
| Erosion | N | |
| Other | Y | Gate has been re-established at vehicle entrance to site subject. |



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Table 9: Plot 3 Floristic Species List

| | Plot 3: Floristic Composition | |
|---|---|---|
| No. | Species | Cover Abundance |
| 1 | *Acacia linifolia* | 3 |
| 2 | *Acacia longifolia* subsp. *longifolia* | 1 |
| 3 | *Acacia myrtifolia* | 5 |
| 4 | *Acianthus fornicatus* | 2 |
| 5 | *Banksia spinulosa* | 2 |
| 6 | *Bossiaea obcordata* | 2 |
| 7 | *Cassytha glabella* | 1 |
| 8 | *Caustis flexuosa* | 2 |
| 9 | *Corymbia gummifera* | 4a |
| 10 | *Daviesia ulicifolia* | 1 |
| 11 | *Entolasia stricta* | 2 |
| 12 | *Eucalyptus eugenioides* | 2 |
| 13 | *Eucalyptus sclerophylla* | 2 |
| 14 | *Gompholobium glabratum* | 2 |
| 15 | *Gonocarpus teucrioides* | 4a |
| 16 | *Goodenia hederacea* subsp. *hederacea* | 2 |
| 17 | *Grevillea sphacelata* | 3 |
| 18 | *Hardenbergia violacea* | 2 |
| 19 | *Lepidosperma laterale* | 2 |
| 20 | *Lomandra filiformis* | 1 |
| 21 | *Lomandra multiflora* subsp. *multiflora* | 3 |
| 22 | *Lomandra obliqua* | 2 |
| 23 | *Lomatia silaifolia* | 3 |
| 24 | *Persoonia levis* | 1 |
| 25 | *Petrophile pulchella* | 2 |
| 26 | *Pimelea linifolia* subsp. *linifolia* | 3 |
| 27 | *Platysace ericoides* | 2 |
| 28 | *Poranthera ericifolia* | 2 |



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Figure 4. Vegetation within plot 3.

## 2.05 Plot 4

Table 10: Plot 4 Floristic Site Survey Form

| Plot 4: Floristic Site Survey Form | | | |
|---|---|---|---|
| **Date:** 17th April 2024 | | | |
| **Recorder:** W. Thurston & D. Pisani | | | |
| **Location:** West of the 50 m range, Hill Top Conservation Area, NSW | | | |
| **Plot Size:** 20 m x 20 m | | | |
| **Easting:** 264843 **Northing:** 6200465 **Position in quadrat:** north-west corner | | | |
| **Zone No.:** 56 | | | |
| **Altitude:** 602 m asl **Slope:** 15° | | | |
| **Mitchell Landscape:** Nattai Plateau **CMA:** Hawkesbury-Nepean | | | |
| **Geology:** Nattai Tablelands erosional | | | |
| **Vegetation Structure:** (Walker & Hopkins 1983) | | | |
| Stratum | Height (m) | % cover | Dominant species |
| Upper | 15-20 | 20 | *Corymbia gummifera, Eucalyptus piperita.* |
| Mid-upper | 2-5 | 10 | *Corymbia gummifera* and *Eucalyptus* spp. |
| Shrub | 2-3 | 60 | *Acacia myrtifolia, Acacia terminalis, Banksia spinulosa, Hakea dactyloides, Persoonia levis.* |
| Ground | 0.5 | 15 | *Gonocarpus teucrioides, Hardenbergia violacea, Lepidosperma laterale.* |
| **Total Number of native species recorded:** 27 | | | |
| **Total Number of weed species:** 0 | | | |
| **Vegetation formation and class** Sydney Hinterland Dry Sclerophyll Forests | | | |
| **(Keith 2004):** Dry Sclerophyll Forests | | | |
| **Vegetation on-ground description:** Open Forest - *Eucalyptus sieberi — Corymbia gummifera* | | | |
| **PCT:** 1086. Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin. | | | |

| Feature | Y/N | Comment |
|---|---|---|
| Hollow-bearing trees | Y | Small (11-20 cm) hollows are present but in poor condition. |
| Rock outcrop | Y | Large areas of rocky outcrops with steep ledges and drop offs. |
| Mistletoe | N | |
| Water body | N | |
| Threatened species | N | |
| Weeds | N | |
| Pest fauna | N | |
| Tree dieback | N | |
| Fire history | Y | Bushfire in December 2019 still affecting vegetation structure and composition. Epicormic growth in remaining canopy trees is evident throughout. Dense shrub stratum regrowth dominates vegetation cover. |
| Erosion | N | |
| Other | N | |



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Table 11: Plot 4 Floristic Species List

| | Plot 4: Floristic Composition | |
|---|---|---|
| No. | Species | Cover Abundance |
| 1 | *Acacia linifolia* | 3 |
| 2 | *Acacia myrtifolia* | 4a |
| 3 | *Acacia suaveolens* | 2 |
| 4 | *Acacia terminalis* | 4b |
| 5 | *Acacia ulicifolia* | 2 |
| 6 | *Actinotus helianthi* | 2 |
| 7 | *Banksia serrata* | 2 |
| 8 | *Banksia spinulosa* | 3 |
| 9 | *Bossiaea obcordata* | 2 |
| 10 | *Corymbia gummifera* | 4a |
| 11 | *Dillwynia parvifolia* | 1 |
| 12 | *Dillwynia ramosissima* | 1 |
| 13 | *Dodonaea triquetra* | 1 |
| 14 | *Entolasia stricta* | 2 |
| 15 | *Eriostemon australasius* | 2 |
| 16 | *Eucalyptus agglomerate* | 2 |
| 17 | *Eucalyptus piperita* | 4b |
| 18 | *Gonocarpus teucrioides* | 4a |
| 19 | *Grevillea sphacelata* | 1 |
| 20 | *Hakea dactyloides* | 3 |
| 21 | *Hardenbergia violacea* | 3 |
| 22 | *Isopogon anemonifolius* | 3 |
| 23 | *Lepidosperma laterale* | 4b |
| 24 | *Leptospermum polygalifolium* | 1 |
| 25 | *Lomandra obliqua* | 2 |
| 26 | *Persoonia levis* | 3 |
| 27 | *Petrophile pulchella* | 3 |



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Figure 5. Vegetation within Plot 4.

## 2.06 Plot 5

Table 12: Plot 5 Floristic Site Survey Form

| Plot 5: Floristic Site Survey Form | | | |
|---|---|---|---|
| **Date:** 17th April 2024 | | | |
| **Recorder:** W. Thurston & D. Pisani | | | |
| **Location:** Southern side of Wattle Ridge Road, 20m north-west of the entry to the 50m range, Hill Top Conservation Area, NSW | | | |
| **Plot Size:** 20 m x 20 m | | | |
| **Easting:** 264843 **Northing:** 6200465 **Position in quadrat:** north-west corner | | | |
| **Zone No.:** 56 | | | |
| **Altitude:** 602 m asl **Slope:** 15° | | | |
| **Mitchell Landscape:** Nattai Plateau **CMA:** Hawkesbury-Nepean | | | |
| **Geology:** Nattai Tablelands erosional | | | |
| **Vegetation Structure:** (Walker & Hopkins 1983) | | | |
| Stratum | Height (m) | % cover | Dominant species |
| Upper | 20 | 20 | *Corymbia gummifera, Eucalyptus sieberi.* |
| Mid-upper | 5 | 40 | *Corymbia gummifera* and *Eucalyptus* spp. |
| Shrub | 2 | 80 | *Acacia myrtifolia, Acacia terminalis, Daviesia ulicifolia, Lomatia silaifolia, Pultenaea scabra.* |
| Ground | 0.5 | 50 | *Entolasia stricta, Goodenia hederacea* subsp. *hederacea, Hardenbergia violacea.* |
| **Total Number of native species recorded:** 31 | | | |
| **Total Number of weed species:** 3 | | | |
| **Vegetation formation and class** Sydney Hinterland Dry Sclerophyll Forests | | | |
| **(Keith 2004):** Dry Sclerophyll Forests | | | |
| **Vegetation on-ground description:** Open Forest - *Eucalyptus sieberi — Corymbia gummifera* | | | |
| **PCT:** 1086. Red Bloodwood - Sydney Peppermint - Blue-leaved Stringybark heathy forest of the southern Blue Mountains, Sydney Basin. | | | |

| Feature | Y/N | Comment |
|---|---|---|
| Hollow-bearing trees | N | |
| Rock outcrop | N | |
| Mistletoe | N | |
| Water body | N | |
| Threatened species | N | |
| Weeds | Y | *Cirsium vulgare, Conyza bonariensis, Senecio madagascariensis* |
| Pest fauna | N | |
| Tree dieback | N | |
| Fire history | Y | Bushfire in December 2019 still affecting vegetation structure and composition. Epicormic growth in remaining canopy trees is evident throughout. Dense shrub stratum regrowth dominates vegetation cover. |
| Erosion | N | |
| Other | N | |



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Table 13: Plot 5 Floristic Species List

| | Plot 5: Floristic Composition | |
|---|---|---|
| No. | Species | Cover Abundance |
| 1 | *Acacia linifolia* | 3 |
| 2 | *Acacia myrtifolia* | 4b |
| 3 | *Acacia terminalis* | 4a |
| 4 | *Acacia ulicifolia* | 2 |
| 5 | *Austrostipa pubescens* | 2 |
| 6 | *Billardiera scandens* | 2 |
| 7 | *Bossiaea obcordata* | 3 |
| 8 | *Bothriochloa macra* | 1 |
| 9 | **Cirsium vulgare* | 1 |
| 10 | **Conyza bonariensis* | 1 |
| 11 | *Corymbia gummifera* | 4b |
| 12 | *Cynodon dactylon* | 1 |
| 13 | *Daviesia ulicifolia* | 3 |
| 14 | *Entolasia stricta* | 4b |
| 15 | *Eucalyptus agglomerata* | 3 |
| 16 | *Eucalyptus sieberi* | 4b |
| 17 | *Gompholobium grandiflorum* | 1 |
| 18 | *Goodenia hederacea* subsp. *hederacea* | 3 |
| 19 | *Grevillea sphacelate* | 1 |
| 20 | *Hakea dactyloides* | 2 |
| 21 | *Hardenbergia violacea* | 4b |
| 22 | *Hovea linearis* | 1 |
| 23 | *Leptospermum polygalifolium* | 1 |
| 24 | *Lindsaea microphylla* | 1 |
| 25 | *Lissanthe strigosa* | 3 |
| 26 | *Lomandra filiformis* | 3 |
| 27 | *Lomandra obliqua* | 2 |
| 28 | *Lomatia silaifolia* | 4b |
| 29 | *Patersonia glabrata* | 2 |
| 30 | *Pimelea linifolia* subsp. *linifolia* | 3 |
| 31 | *Poa affinis* | 1 |
| 32 | *Pomax umbellata* | 3 |
| 33 | *Pultenaea scabra* | 3 |
| 34 | **Senecio madagascariensis* | 1 |



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Figure 6. Vegetation within Plot 5.

## 2.07 Plot 6

Table 14: Plot 6 Floristic Site Survey Form

| Plot 6: Floristic Site Survey Form | | | |
|---|---|---|---|
| **Date:** 30th July 2024 | | | |
| **Recorder:** W. Thurston & D. Pisani | | | |
| **Location:** The gully between the 800 m and 500 m firing ranges, Hill Top Conservation Area, NSW | | | |
| **Plot Size:** 20 m x 20 m | | | |
| **Easting:** 265365 **Northing:** 6200056 **Position in quadrat:** north-west corner | | | |
| **Zone No.:** 56 | | | |
| **Altitude: 595** m asl **Slope:** 10° | | | |
| **Mitchell Landscape:** Nattai Plateau **CMA:** Hawkesbury-Nepean | | | |
| **Geology:** Nattai Tablelands erosional | | | |
| **Vegetation Structure:** (Walker & Hopkins 1983) | | | |
| Stratum | Height (m) | % cover | Dominant species |
| Upper | 20 | 5 | *Corymbia gummifera, Eucalyptus agglomerata, Eucalyptus piperita.* |
| Mid-upper | 5 | 10 | *Corymbia gummifera, Eucalyptus agglomerata, Eucalyptus piperita.* |
| Shrub | 1.5 | 50 | *Acacia longifolia* subsp. *Longifolia, Acacia terminalis, Dodonaea triquetra, Grevillea sphacelata.* |
| Ground | 0.5 | 15 | *Gonocarpus teucrioides, Lomandra longifolia, Pimelea linifolia* subsp. *Linifolia.* |
| **Total Number of native species recorded:** 38 | | | |
| **Total Number of weed species:** 0 | | | |
| **Vegetation formation and class** Sydney Hinterland Dry Sclerophyll Forests | | | |
| **(Keith 2004):** Dry Sclerophyll Forests | | | |
| **Vegetation on-ground description:** Open Forest - *Eucalyptus sieberi — Corymbia gummifera* | | | |
| **PCT:** 1181. Smooth-barked Apple - Red Bloodwood - Sydney Peppermint heathy open forest on slopes of dry sandstone gullies of western and southern Sydney, Sydney Basin Bioregion. | | | |

| Feature | Y/N | Comment |
|---|---|---|
| Hollow-bearing trees | Y | Large stag tree with small and medium hollows present. |
| Rock outcrop | Y | Large rock outcrops present along slope. |
| Mistletoe | N | |
| Water body | N | |
| Threatened species | N | |
| Weeds | N | |
| Pest fauna | N | |
| Tree dieback | N | |
| Fire history | Y | Bushfire in December 2019 still affecting vegetation structure and composition. Epicormic growth in remaining canopy trees is evident throughout. Dense shrub stratum regrowth dominates vegetation cover. |
| Erosion | N | |
| Other | N | |



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Table 15: Plot 6 Floristic Species List

| | Plot 6: Floristic Composition | |
|---|---|---|
| No. | Species | Cover Abundance |
| 1 | *Acacia linifolia* | 2 |
| 2 | *Acacia longifolia* subsp. *longifolia* | 3 |
| 3 | *Acacia terminalis* | 4b |
| 4 | *Acacia ulicifolia* | 2 |
| 5 | *Banksia spinulosa* | 2 |
| 6 | *Billardiera scandens* | 1 |
| 7 | *Boronia ledifolia* | 2 |
| 8 | *Bossiaea obcordata* | 2 |
| 9 | *Corymbia gummifera* | 2 |
| 10 | *Dampiera purpurea* | 2 |
| 11 | *Dianella caerulea* | 2 |
| 12 | *Dodonaea triquetra* | 3 |
| 13 | *Entolasia stricta* | 2 |
| 14 | *Eucalyptus agglomerata* | 2 |
| 15 | *Eucalyptus piperita* | 3 |
| 16 | *Eucalyptus punctata* | 2 |
| 17 | *Gonocarpus teucrioides* | 3 |
| 18 | *Grevillea arenaria* subsp. *arenaria* | 2 |
| 19 | *Grevillea sphacelata* | 3 |
| 20 | *Hakea dactyloides* | 1 |
| 21 | *Hardenbergia violacea* | 2 |
| 22 | *Lepidosperma laterale* | 2 |
| 23 | *Lindsaea microphylla* | 1 |
| 24 | *Lomandra filiformis* | 2 |
| 25 | *Lomandra longifolia* | 2 |
| 26 | *Lomandra obliqua* | 2 |
| 27 | *Lomatia silaifolia* | 3 |
| 28 | *Persoonia levis* | 1 |
| 29 | *Persoonia pinifolia* | 1 |
| 30 | *Petrophile pulchella* | 2 |
| 31 | *Pimelea linifolia* subsp. *linifolia* | 2 |
| 32 | *Platysace ericoides* | 2 |
| 33 | *Pomax umbellata* | 1 |
| 34 | *Poranthera ericifolia* | 2 |
| 35 | *Pteridium esculentum* | 2 |
| 36 | *Smilax glyciphylla* | 2 |
| 37 | *Telopea speciosissima* | 2 |
| 38 | *Xanthosia tridentata* | 1 |

Figure 7. Vegetation within Plot 6.

## Photo Monitoring Points

### 3.01 Photo Point 1

Figure 8. Photo Point 1 looking South-west over the conservation area (17/4/24).

### 3.02 Photo Point 2

Figure 9. Photo Point 2 looking South-east along rock ledge towards plot 2 (17/4/24).

## 3.03 Photo Point 3

Figure 10. Photo Point 3 looking North-east with the conservation area evident to the west of the powerline easement (30/7/24).

## 3.04 Photo Point 4

Figure 14. Photo point 4 looking west over the disturbed area at the southern end of the 800m rifle range (17/4/24).



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## 3.05 Photo Point 5

Figure 15. Photo Point 5 looking along northern boundary of the 50m rifle range (17/4/24).

## 3.06 Photo Point 6

Figure 16. Photo point 6 looking over the drainage pit and vegetation at the South-eastern corner of the 50m rifle range (17/4/24).



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## 3.07 Photo Point 7

Figure 17. Photo point 7 looking North-west into vegetation below basin runoff (17/4/24).



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## Weeds

A Priority Weed is a weed that can have serious economic or environmental impacts with their priority status being determined by the State and Regional Weed Committees, Department of Primary Industry and other advisory or Regulatory Bodies.

All weeds in NSW fall under Section 22 of the Biosecurity Act 2015 General Biosecurity Duty but only weeds that are contained in The Greater Sydney Strategic Weed Management Plan are considered Priority Weeds for this site. Under the National Weeds Strategy, 32 introduced plants have been identified as Weeds of National Significance (WONS). These weeds are regarded as the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts.
During the time of monitoring the vegetation plots and photo points there were minimal weeds observed within these areas. The weeds included *Cirsium vulgare, Conyza bonariensis, Cynodon dactylon* and *Senecio madagascariensis* and were in low concentration primarily found adjacent to the urban-bushland interface in areas of potential sediment runoff. The majority of the conservation area was observed to be of significantly high native resilience.
*Senecio madagascariensis* was the only weed observed as threating as a Weed of National Significance (WONS).

The table below provides further detail in relation to Biosecurity Categories & Management Actions.
**Table 16: Categories of management under the Greater Sydney Regional Strategic Weed Management Plan 2023-2027 under the NSW Biosecurity Act 2015 are as follows:**

| Category | Management Action |
|---|---|
| Prevention (Prevent) | To prevent the weed species arriving and establishing in the Region. |
| Eradication (Eliminate) | To permanently remove the species and its propagules from the Region, OR to destroy infestations to reduce the extent of the weed in the region with the aim of local eradication. |
| Containment (Minimise) | To prevent the ongoing spread of the species in all or part of the Region. |
| Asset Protection (Manage) | To prevent the spread of weeds to key sites/ assets of high economic, environmental and social value, or to reduce their impact on these sites if spread. |
| GBD (General Biosecurity Duty) | All plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable." |
| RRM (Regional Recommended Measure) | Specific details for each species included in table. |
| PoD (Prohibition on Dealings) | Must not be imported into the State or sold. |
| B Zone (Biosecurity Zone) | Specific details for each species included in table. |
| PM (Prohibited Matter) | A person who deals with prohibited matter or a carrier of prohibited matter is guilty of an offence. A person who becomes aware of or suspects the presence of prohibited matter must immediately notify the Department of Primary Industries. |



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## Pest Animals

There was no evidence observed of pest animal species including rabbits, pigs, foxes or deer.

## Summary of Findings

The results of the current monitoring data a total of eighty-eight (88) flora species were identified. Of which, eighty-five (85) were native with only three (3) exotic species present within the plots.

The entire site has a significantly high native resilience throughout with only minor weed incursions along the urban-bushland interface surrounding structures such as sediment basins, drainage lines, roadsides or carparks where runoff is likely to occur.

The vegetation structure and composition has been highly modified due to the catastrophic bush fires in 2019 and is likely to continue for several years. Some canopy species are still recovering from the fire and dieback is evident where they have failed to regrow.

The shrub stratum and understory has responded extremely well with the highest vegetation density. In particular several Acacia species have regenerated post-fire.

A summary of data and management issues and actions is provided in tables 17 and 18 below.



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Table 17: Summary of findings and management issues within plots.

| Plot | PCT | Native Species Richness | TEC or Threatened Species | Management Issues/Actions |
|---|---|---|---|---|
| 1 | 1086 | 38 | No | None. |
| 2 | 1086 | 22 | No | None. |
| 3 | 1086 | 28 | No | A new gate has been erected on the Powerline Firetrail, however evidence of vehicles bypassing through vegetation beyond gate was observed.<br>Gate at start of site was intact with no evidence of diversion. |
| 4 | 1086 | 27 | No | No weeds were observed within the plot, however evidence of discharge from the adjacent sediment basin may provide opportunity for establishment of new weed incursions. This area should be monitored and treated in accordance with the current weed management plan. |
| 5 | 1086 | 31 | No | Minor weeds were observed within the plot. This area should be treated in accordance with the current weed management plan. Monitoring and treatment of adjacent roadside buffers to prevent the establishment of any new weed incursions. |
| 6 | 1181 | 38 | No | None. |



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Table 18: Summary of findings and management issues at photo points.

| Photo Point | Management Issues/Actions |
|---|---|
| 1 | None. |
| 2 | None. |
| 3 | None. |
| 4 | None. |
| 5 | None. |
| 6 | None. |
| 7 | Minor weeds were observed surrounding photo point. Evidence of discharge from the adjacent sediment basin may provide opportunity for establishment of new weed incursions. This area should be monitored and treated in accordance with the current weed management plan. |

## Recommendations

Continue ongoing monitoring and maintenance of any new weed incursions in accordance with the current Weed Management Plan.

Install new plot and photo point markers with pickets to re-establish designated locations after being damaged from bush fire.



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## Appendix A – Photographic record of SHRSC

Plot 1

Plate 1. Looking North

Plate 2. Looking East

Plate 3. Looking South

Plate 4. Looking West

Plot 2

Plate 1. Looking North

Plate 2. Looking East

Plate 3. Looking South

Plate 4. Looking West

Plot 3

Plate 1. Looking North

Plate 2. Looking East

Plate 3. Looking South

Plate 4. Looking West

Plot 4

Plate 1. Looking North

Plate 2. Looking East

Plate 3. Looking South

Plate 4. Looking West

Plot 5

Plate 1. Looking North

Plate 2. Looking East

Plate 3. Looking South

Plate 4. Looking West

Plot 6

Plate 1. Looking North

Plate 2. Looking East

Plate 3. Looking South

Plate 4. Looking West

## Appendix B – Cumulative flora species list at each plot

| Scientific Name | Common Name | Plot 1 | Plot 2 | Plot 3 | Plot 4 | Plot 5 | Plot 6 |
|---|---|---|---|---|---|---|---|
| *Acacia linifolia* | White Wattle | x | x | x | x | x | x |
| *Acacia longifolia subsp. longifolia* | Sydney Golden Wattle | | x | x | | | x |
| *Acacia myrtifolia* | Myrtle Wattle | x | | x | x | x | |
| *Acacia suaveolens* | Sweet wattle | x | | | x | | |
| *Acacia terminalis* | Sunshine Wattle | x | x | | x | x | x |
| *Acacia ulicifolia* | Prickly Moses | x | x | | x | x | x |
| *Acianthus fornicatus* | Bristly Mosquito Orchid | | | x | | | |
| *Actinotus helianthi* | Flannel Flower | | | | x | | |
| *Amperea xiphoclada var. xiphoclada* | Broom Spurge | | x | | | | |
| *Austrostipa pubescens* | Spear Grass | | | | | x | |
| *Banksia marginata* | Silver Banksia | x | | | | | |
| *Banksia serrata* | Saw Banksia | | | | x | | |
| *Banksia spinulosa* | Hairpin Banksia | x | x | x | x | | x |
| *Bauera rubioides* | River Rose | | x | | | | |
| *Billardiera scandens* | Apple Berry | | x | | | x | x |
| *Boronia ledifolia* | Sydney boronia | | x | | | | x |
| *Bossiaea obcordata* | Spiny Bossiaea | x | x | x | x | x | x |
| *Bothriochloa macra* | Red-leg grass | | | | | x | |
| *Cassytha glabella* | Slender devil's twine | | | x | | | |
| *Caustis flexuosa* | Curly Wig | x | x | x | | | |
| **Cirsium vulgare* | Spear thistle | | | | | x | |
| **Conyza bonariensis* | Fleabane | | | | | x | |
| *Corymbia gummifera* | Red Bloodwood | x | x | x | x | x | x |
| **Cynodon dactylon* | Couch Grass | | | | | x | |
| *Dampiera purpurea* | Purple Dampiera | | | | | | x |
| *Daviesia ulicifolia* | Gorse Bitter-pea | | | x | | x | |
| *Dianella caerulea* | Blue Flax Lily | | | | | | x |
| *Dillwynia floribunda* | Showy Parrot-pea | x | | | | | |
| *Dillwynia parvifolia* | Small Parrot-pea | | | | x | | |
| *Dillwynia ramosissima* | Bushy Parrot-pea | | | | x | | |
| *Dillwynia retorta* | Twisted Parrot Pea | x | x | | | | |
| *Dodonaea triquetra* | Common Hop Bush | x | | | x | | x |
| *Entolasia stricta* | Wiry Panic Grass | x | | x | x | x | x |
| *Eragrostis brownii* | Browns Lovegrass | x | | | | | |
| *Eriostemon australasius* | Pink Wax Flower | | x | | x | | |
| *Eucalyptus agglomerata* | Blue-leaved Stringybark | | | | x | x | x |
| *Eucalyptus eugenioides* | Thin-leaved Stringybark | | | x | | | |
| *Eucalyptus piperita* | Sydney Peppermint | x | x | | x | | x |

| Scientific Name | Common Name | Plot 1 | Plot 2 | Plot 3 | Plot 4 | Plot 5 | Plot 6 |
|---|---|---|---|---|---|---|---|
| *Eucalyptus punctata* | Grey Gum | | | | | | x |
| *Eucalyptus sclerophylla* | Scribbly Gum | | | x | | | |
| *Eucalyptus sieberi* | Silvertop Ash | | x | | | x | |
| *Gompholobium glabratum* | Dainty Wedge-pea | | | x | | | |
| *Gompholobium grandiflorum* | Large Wedge-pea | | | | | x | |
| *Gonocarpus teucrioides* | Forest Raspwort | | x | x | x | | x |
| *Goodenia hederacea* subsp. *hederacea* | Forest Goodenia | | | x | | x | |
| *Grevillea arenaria* subsp. *arenaria* | Sand Grevillea | | | | | | x |
| *Grevillea sphacelata* | Grey Spider Flower | | x | x | x | x | x |
| *Hakea dactyloides* | Finger Hakea | x | | | x | x | x |
| *Hakea sericea* | Bushy Needlewood | x | | | | | |
| *Hardenbergia violacea* | Native Sarsaparilla | x | x | x | x | x | x |
| *Hovea linearis* | Common Hovea | | x | | | x | |
| *Isolepis inundata* | Swamp Club-Rush | x | | | | | |
| *Isopogon anemonifolius* | Broad-leaved Drumsticks | x | x | | x | | |
| *Lambertia formosa* | Mountain Devil | x | | | | | |
| *Lepidosperma laterale* | Variable Swordsedge | | | x | x | | x |
| *Leptospermum parvifolium* | Lemon-scented Tea-tree | x | | | | | |
| *Leptospermum polygalifolium* | Yellow Tea Tree | | | | x | x | |
| *Leptospermum trinervium* | Flaky-barked Tea-tree | x | | | | | |
| *Lindsaea microphylla* | Lacy Wedge Fern | | | | | x | x |
| *Lissanthe strigosa* | Peach Heath | | | | | x | |
| *Lomandra cylindrica* | Needle Mat-rush | x | | | | | |
| *Lomandra filiformis* | Wattle Mat-rush | | x | x | | x | x |
| *Lomandra longifolia* | Spiny-head Mat-rush | | | | | | x |
| *Lomandra multiflora* subsp. *multiflora* | Many-flowered Mat-rush | | x | x | | | |
| *Lomandra obliqua* | Fish Bones | x | x | x | x | x | x |
| *Lomatia silaifolia* | Crinkle Bush | x | x | x | | x | x |
| *Microlaena stipoides* var. *stipoides* | Weeping Grass | x | | | | | |
| *Olax stricta* | Olax | | x | | | | |
| *Patersonia glabrata* | Leafy Purple Flag Iris | | | | | x | |
| *Patersonia sericea* | Silky Purple Flag Iris | x | | | | | |
| *Persoonia levis* | Broad-Leaved Geebung | x | x | x | x | | x |
| *Persoonia pinifolia* | Pine-leaf Geebung | x | | | | | x |



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| Scientific Name | Common Name | Plot 1 | Plot 2 | Plot 3 | Plot 4 | Plot 5 | Plot 6 |
|---|---|---|---|---|---|---|---|
| *Petrophile pulchella* | Conesticks | *x* | | *x* | *x* | | *x* |
| *Pimelea linifolia* subsp. *linifolia* | Slender Rice-flower | *x* | | *x* | | *x* | *x* |
| *Platysace ericoides* | Heath Platysace | *x* | | *x* | | | *x* |
| *Poa affinis* | Tussock Grass | | | | | *x* | |
| *Pomax umbellata* | Pomax | | | | | x | x |
| *Poranthera corymbosa* | Clustered Poranthera | x | | | | | |
| *Poranthera ericifolia* | A Poranthera | x | | x | | | x |
| *Pteridium esculentum* | Austral Bracken | | x | | | | x |
| *Pultenaea scabra* | Rough Bush-pea | | | | | x | |
| **Senecio madagascariensis* | Fireweed | | | | | x | |
| *Smilax glyciphylla* | Sweet Sarsaparilla | | x | | | | x |
| *Telopea speciosissima* | Waratah | | | | | | x |
| *Xanthosia pilosa* | Woolly Xanthosia | x | x | | | | |
| *Xanthosia tridentata* | Rock Xanthosia | x | | | | | x |
| *Xylomelum pyriforme* | Woody Pear | | x | | | | |
| *Zieria granulata* | Hilly Zieria | | x | | | | |



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