

Black Hill Reserve
Environmental Management Plan
(Part 1 – Background Report)
(Part 2 – Actions and Implementation)



Main Entrance



Prepared for Macedon Ranges Shire Council

Adopted by Council: 24 May 2017

Black Hill Reserve
Environmental Management Plan– Parts 1 and 2
Adopted by Council 24th May 2017

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PART ONE
BLACK HILL RESERVE
ENVIRONMENTAL
MANAGEMENT PLAN:
BACKGROUND
ECOLOGICAL
INFORMATION

1. VISION AND OBJECTIVES

1.1 Vision

Black Hill Reserve is highly valued by the local community for its ecological, cultural and passive recreation values which benefit the community's health and wellbeing.

The reserve's remnant bushland and revegetation areas provide a refuge in the landscape for native flora and wildlife, including various endangered and threatened species.

Through careful management and conservation, the reserve will continue to provide an opportunity for all members of the community to understand, appreciate and engage with local flora and fauna as well as the area's cultural heritage.

Into the future, Black Hill Reserve will continue to fulfil an important ecological, educational, passive recreation and nature tourism role, enriching the lives of the local community and visitors.

1.2 Management Objectives

The management objectives at Black Hill Reserve are:

- 1) To protect and enhance the reserve's ecological and habitat values, including its role as an important wildlife refuge within the broader landscape.
- 2) To protect and increase indigenous vegetation across the reserve.
- 3) To contain the non-indigenous regeneration of planted species to areas of lower quality.
- 4) To manage and mitigate against threats to the reserve's environmental values, including invasive species, erosion and inappropriate visitor activities.
- 5) To facilitate and enhance passive recreation and nature tourism opportunities without compromising the reserve's ecological values.
- 6) To increase Council's and the community's knowledge of the site's ecological and cultural heritage values.

2. INTRODUCTION

Practical Ecology Pty Ltd was commissioned by the Macedon Ranges Shire Council in December 2014 to prepare an Environmental Management Plan (EMP) for Black Hill Reserve, Kyneton. On 7th January 2015, approximately 80% of the reserve was burnt in a bushfire that commenced as a result of a lightning strike.

The bushfire meant that the preparation of the EMP was delayed for eight months, with the fieldwork commencing in September 2015. As the reserve was not visited prior to the January 2015 bushfire, this EMP is based on others knowledge of the pre-bushfire reserve.

Black Hill Reserve is a granite outcrop, with a varied history of agricultural usage, and timber and gravel extraction which resulted in the loss of large areas of natural vegetation, a growth of weed species and large areas of erosion. Most of this degradation has been halted through the hard work and dedication of the Friends of Black Hill, who commenced in 1979 with a program of protecting the reserve. Prior to the Friends of Black Hill, Kyneton Shire had undertaken plantings in the mid-1960s.

Black Hill today contains remnant vegetation, large areas of planted native vegetation, and more recently indigenous revegetation, resulting in a mixed bushland reserve that is composed of mostly non-indigenous flora. This range of vegetation provides a more extensive range of fauna habitats than would normally exist in remnant granitic hills woodland.

Today, Black Hill is a bushwalking destination that is well utilised by locals and day visitors. It has a network of three well established walking tracks that allow walkers to visit the highlights of the reserve which include walking the Ridge Track amongst the granite outcrops to two lookout points, the Circuit Track around the base of the granite outcrops, and walking through the most recently revegetated area (Revegetated Area Track).

As a reserve that commenced restoration in the 1960s, Black Hill is an interesting case study of the history of bushland restoration in Australia. The early emphasis was on halting erosion and further degradation; therefore planting was based on any native trees and shrubs that would grow in the barren conditions, resulting in a plethora of flora species that would never naturally occur in a granitic landscape. In the last 15 or so years, the emphasis has switched towards planting local indigenous species.

This is the first Management Plan that has been prepared for the reserve. The main focus of the EMP is on identifying its ecological values, understanding its history and the impacts that has had, documenting the restorative work undertaken and providing recommendations to enhance the ecological values of the reserve.

To prepare the EMP, the project has involved reviewing previous literature associated with Black Hill and the surrounding area; undertaking fieldwork to determine the ecological values of Black Hill and to establish baseline ecological monitoring data; and undertaking stakeholder consultations including with representatives from the various relevant Council Departments and the Friends of Black Hill.

2.1 EMP Objectives

The objectives of the Black Hill Environmental Management Plan (as outlined in the Project Brief; November 2014) are:

- To identify the environmental values of the reserve
- To establish a prioritised program of management actions aimed at conserving and enhancing the site's environmental values while managing environmental risks and maintaining the reserve's leisure and recreation functions
- To establish a monitoring and evaluation program for the site's environmental assets and management.

This EMP is primarily focused upon the ecological (indigenous flora, fauna and vegetation communities) values of Black Hill reserve. It is not concerned with other environmental concerns such as water usage, climate and resources, except where these concerns are related to, or impact upon, the management of ecological values within the reserve.

2.2 Regional Context

Black Hill Reserve is located approximately nine kilometres north of Kyneton, on the northern side of the Calder Highway.

Black Hill Reserve is surrounded by mostly cleared farmland, with some areas of bushland to the east of the reserve and to the south (Kyneton Bushland Resort). The reserve is connected to surrounding bushland patches by roadside vegetation and remnant vegetation on private land.

The closest larger areas of bushland are the Cobaw Ranges to the east, Mount Macedon/the Great Dividing Range and Wombat State Forest to the south and south-west, and the State Forest to the west between Malmsbury and Castlemaine.

Black Hill is a small granite outcrop that rises from the surrounding volcanic plains surrounding Kyneton. Aerial photography (Google Earth) depicts that Black Hill is one of the few patches of remnant vegetation that remains in these plains, which makes it an important habitat 'stepping stone' within the region.

Refer to Map 1 for the location of Black Hill in the regional landscape.

2.3 Reserve Description

Black Hill Reserve is approximately 100 hectares in area and comprises several allotments. The northern allotments are owned by Council, whilst the southern allotments are Crown land. Parks Victoria is responsible for management of the Crown land, however in reality; the active management of the entire reserve is undertaken by both the Friends of Black Hill and the Macedon Ranges Shire Council.

The vast majority of the reserve is vegetated, with three main walking tracks, one of which (the Circuit Track) is also a vehicle/management track. There are numerous dams which have either been constructed or are a result of the previous quarrying activities. The granite outcrops are located along the ridge and upper slopes of Black Hill, with granite gravel occurring on the lower slopes as a result of the erosion of the outcrops over thousands of years.

Historical aerial images (Pricor 1987) depict that most of the north-west and north-east area of the reserve was unvegetated in the 1980's. Today, very little of the reserve has not been revegetated, although the bushfire has resulted in the loss of some of the vegetation. The exact extent of vegetation loss will not be possible to determine for at least another 5 years (until 2021), as plants are still regenerating with the seasons and adequate rainfall.

Due to the history of gravel and timber extraction, the Black Hill of 30 years ago, according to the literature and the Friends Group, was a barren landscape with islands of large remnant eucalypts surrounded by gravel extraction pits. It was a moonscape with little vegetation. Due to the bushfire, pockets of this landscape are again visible; although it is likely the moonscape will disappear with the regeneration of trees and shrubs that has commenced across the burnt areas of the reserve.

To restore the landscape, firstly the Kyneton Shire Council, and then the Friends Group undertook an extensive program of revegetation that reflects the trends in Australian landscaping and bushland restoration since the 1960's. Revegetation commenced with the use of any Australian and Victorian native plants that could survive in the conditions of the reserve. It gradually swapped to the use of indigenous species in the last 15 or so years as the emphasis of revegetation has moved towards restoring landscapes with locally sourced indigenous species that are suited to local climate and soils.

Ground storey Vegetation

Of interest is the ground storey vegetation, which has not been the focus of any restoration works. There are still areas of the reserve that contain remnant indigenous ground storey plants. Whilst surveying across the reserve, it was apparent that the majority of the reserve was quarried for granite gravel, as evidenced by the numerous shallow pits and the 'tree islands' that are still visible across the landscape. It is of interest why some areas of the reserve have a higher coverage of indigenous species than others. Along the ridge and around the granite outcrops, it is obvious that quarrying could not occur too close to the boulders.

However it is unclear why there are some areas with a high cover of indigenous ground storey species on the lower slopes, which would have been easier to access for quarrying. One possibility is that on the lower slopes, the granite gravel was not as deep as on the slopes of Black Hill, or that the granite gravel 'mixed' with the surrounding basalt soils so it was not as good a quality, so these areas were not as intensively quarried, therefore the existing ground storey vegetation was not as badly disturbed.

Reserve Entrances, Facilities and Adjacent Road Reserves

There are two entrances to the reserve, one at the intersection of Black Hill School and Ennis Roads on the western side of the reserve and another off Blackhill Road (Parsell Road) in the south-east corner of the reserve.

The western entrance is the main entrance with a car park, picnic facilities and a shelter. There are no facilities at the south-east entrance. The walking tracks are well signed posted around the reserve, with the perimeters of many areas of the walking tracks defined by fallen branches that have been dragged into place.

The reserve is mostly surrounded by private land utilised for grazing or wineries, to the north, east, west and south. There are also two unused road reserves adjoining the reserve. The one to the north is licensed to the adjoining land owner. The one to the east (extension of Parsell Road) is unlicensed.

Refer to Map 2 for a map depicting the Site Description of Black Hill.

2.4 Geology

Black Hill is geologically significant as a granite outcrop (biotite granite) rising approximately 100 metres above the surrounding basalt plains and 600 metres above sea level. Black Hill forms the northern end of the ridge that runs southward towards Bald Hill.

Black Hill is an outcrop of granite, a plutonic rock. The outcrop formed through a large mass of molten magma, which cooled very slowly deep below the earth's surface, allowing the formation of the minerals that together create granite, primarily quartz, mica, and feldspar. This large mass has then been forced up to the earth's surface, and over millions of years been subjected to the effects of erosion due to rain, wind, and temperature changes, creating the granite outcrops of Black Hill that are visible today (Black Hill Reserve website).

The soil on most of the lower slopes of Black Hill is granite gravel, a material produced by the erosion of granite, and it is of high quality for road base construction. From the 1920's to the 1970's, Black Hill was mined for road making material.

The largest granite monolith in the reserve (The Monolith) occurs in the north-east of the reserve, adjacent to the Base Track. The Monolith is one of the geological features of the reserve, along with Cave Rocks and the Eastern and Northern Lookouts, all of which are large granite boulders.

Interestingly after the January 2015 bushfire, granite is flaking off some of the boulders in sheets. It was observed that this has mostly occurred where large trees were growing close to the boulders. The heat from these trees, many of which would have burnt/smouldered for days, has probably caused prolonged heat exposure to some sections of granite, which has resulted in sections of the boulders flaking off. These flaked boulders now provide habitat for wildlife.



Granite flaking off the boulders

2.5 Land Tenure and Management

Land Tenure

Black Hill consists of both Crown allotments and freehold land. Lots 10A and 10B are freehold land which is owned by Macedon Ranges Shire Council, whilst Lots 10D, 10E, 10F and 10G are Crown allotments, managed by Parks Victoria. The locations of the Lots are depicted in Figure 1 below (source: Macedon Ranges Planning Scheme on-line).



Figure 1. Land Tenure at Black Hill Reserve

Management

Management of the freehold allotments (owned by the Macedon Ranges Shire Council) in the northern section of the reserve is the responsibility of the Macedon Ranges Shire Council.

Management of the Crown allotments in the southern portion of the reserve is the responsibility of Parks Victoria. In reality, the entire reserve is managed by the Macedon Ranges Shire Council. To formalise this arrangement and ensure coordinated management across the reserve, it is recommended that Council apply to become Committee of Management for the Crown land component of the site.

Currently Black Hill Reserve is managed by the Strategic Planning and Environment Department of the Macedon Ranges Shire Council. There are no on-site rangers. Some day-to-day operational management in terms of track and fence maintenance is undertaken by members of the Friends Group.

Regular weed control is undertaken by the Macedon Ranges Shire Council, along with some rabbit control work.

Protective Covenants

Black Hill Reserve is currently not subject to any covenants or restrictions. Many of Council's other Bushland Reserve Environmental Management Plans recommend exploring opportunities to protect the conservation status of the reserves using mechanisms such as a Section 69 Conservation Covenant or a Trust for Nature Covenant.

While this Environmental Management Plan, if adopted by Council, will confirm Council's commitment to protecting and enhancing the site's environmental values, further protection via a covenant could create opportunities to access funding for conservation works at the site. It is noted that investigating and applying conservation covenants can be a costly and time consuming process.

Recommendation

Rec 1. Macedon Ranges Shire Council should apply to become Committee of Management for the Crown Land section of the reserve.

Rec 2. Investigate whether the site is suitable for a conservation covenant such as a Trust for Nature Covenant.

2.6 Legislative and Policy Context

2.6.1 Planning Zones

Information outlining the zoning and overlays across the Reserve and along the adjacent roadsides is available in the Macedon Ranges Shire Council Planning Scheme.

The zones and overlays which cover Black Hill form part of the Macedon Ranges Planning Scheme and aim to ensure that any proposed works within the reserve and in the surrounding landscape have due regard to the environmental, landscape and vegetation features of the Reserve and surrounding landscape. In most cases, a planning permit is required for buildings, works and/or tree removal/limb lopping undertaken within the reserve.

The freehold allotments are zoned Farming Zone and the Crown land is zoned Public Conservation and Resource Zone.

The purpose of Farming Zone is:

- *To provide for the use of land for agriculture.*
- *To encourage the retention of productive agricultural land.*
- *To ensure that non-agricultural uses, including dwellings, do not adversely affect the use of land for agriculture.*
- *To encourage the retention of employment and population to support rural communities.*
- *To encourage use and development of land based on comprehensive and sustainable land management practices and infrastructure provision.*

Under this zone no planning permit is required for agricultural, timber production or the construction of one dwelling on a lot. A permit is required for all other uses and development (buildings and works). Several uses and developments are prohibited, mostly concerning higher usage residential activities such as childcare centres.

The purpose of the PCRZ (which covers the remainder of the reserve) is:

- *To protect and conserve the natural environment and natural processes for their historic, scientific, landscape, habitat or cultural values.*
- *To provide facilities which assist in public education and interpretation of the natural environment with minimal degradation of the natural environment or natural processes*
- *To provide for appropriate resource based uses.*

Given that the reserve primarily functions as a passive recreation reserve, containing valuable native vegetation assets, consideration should be given to rezoning the Farm Zone sections of the reserve to a Public Conservation and Resource Zone (PCRZ), as it would be more consistent with the reserve's function and use.

Recommendation

Rec 3. Consider rezoning the Farming Zone sections of the reserve to Public Conservation and Recreation (PCRZ)

2.6.2 Overlays

Three overlays cover all or part of the reserve:

- Environmental Significance Overlay– Schedule 4 (ESO4)
- Significant Landscape Overlay– Schedule 1 (SLO1)
- Bushfire Management Overlay (BMO)

The environmental objective to be achieved with ESO4 is:

- *To ensure the protection and maintenance of water quality and water yield within the Eppalock Water Supply Catchment Area as listed under Section 5 of the Catchment, and Land Protection Act 1994.*

Under ESO4, a permit is required for the removal of native and non-native vegetation (with some exceptions). No permit is required for buildings and works other than buildings and works associated with intensive animal husbandry or accommodation not connected to reticulated sewerage.

The landscape character objective to be achieved with SLO1 is:

- *To preserve and enhance significant landscape features.*
- *To promote the siting and design of buildings and works including the choice of building materials, that are responsive to the landscape character of the site.*

The purpose of the Bushfire Management Overlay is:

- *To ensure that the development of land prioritises the protection of human life and strengthens community resilience to bushfire.*
- *To identify areas where the bushfire hazard warrants bushfire protection measures to be implemented.*
- *To ensure development is only permitted where the risk to life and property from bushfire can be reduced to an acceptable level.*

Under the Bushfire Management Overlay a planning permit is required to construct a building or construct or carry out works associated with a range of specified uses, including leisure and recreation uses, an education centre and a place of assembly. All facilities requiring a permit must be constructed to the relevant bushfire attack level.

An outline of the land tenure, zoning and overlays associated with the Reserve is provided in Table 1.

Table 1. Land Tenure and Management at Black Hill Reserve

Area	Land tenure	Legal status	Zoning and Overlays
Black Hill Reserve			
Lot 10A	Freehold	Private land	<ul style="list-style-type: none"> • Farm Zone (FZ) • Environmental Significance Overlay– Schedule 4 (ESO4) • Significant Landscape Overlay– Schedule 1 (SLO1) • Wildfire Management Overlay (WMO)– partial coverage of lot
Lot 10B	Freehold	Private land	<ul style="list-style-type: none"> • Farm Zone (FZ) • Environmental Significance Overlay– Schedule 4 (ESO4) • Significant Landscape Overlay– Schedule 1 (SLO1) • Wildfire Management Overlay (WMO)– partial coverage of lot
Lot 10D	Crown Land	Crown Land (Reserves) Act 1978 (Section 4)	<ul style="list-style-type: none"> • Public Conservation and Resource Zone (PCRZ) • Environmental Significance Overlay– Schedule 4 (ESO4) • Significant Landscape Overlay– Schedule 1 (SLO1) • Wildfire Management Overlay (WMO)
Lot 10E	Crown Land	Crown Land (Reserves) Act 1978 (Section 4)	<ul style="list-style-type: none"> • Farm Zone (FZ) • Environmental Significance Overlay– Schedule 4 (ESO4) • Significant Landscape Overlay– Schedule 1 (SLO1) • Wildfire Management Overlay (WMO)
Lot 10F	Crown Land	Crown Land (Reserves) Act 1978 (Section 4)	<ul style="list-style-type: none"> • Public Conservation and Resource Zone (PCRZ) • Environmental Significance Overlay– Schedule 4 (ESO4) • Significant Landscape Overlay– Schedule 1 (SLO1) • Wildfire Management Overlay (WMO)
Lot 10G	Crown Land	Crown Land (Reserves) Act 1978 (Section 4)	<ul style="list-style-type: none"> • Public Conservation and Resource Zone (PCRZ) • Environmental Significance Overlay– Schedule 4 (ESO4) • Significant Landscape Overlay– Schedule 1 (SLO1) • Wildfire Management Overlay (WMO)
Adjacent Roadsides			
Blackhill School Road	Crown Land (Government Road)	Crown Land (Reserves) Act 1978 (Section 4)	<ul style="list-style-type: none"> • Farm Zone (FZ) • Environmental Significance Overlay– Schedule 4 (ESO4) • Vegetation Protection Overlay–Schedule 2 (VPO2) • Significant Landscape Overlay– Schedule 1 (SLO1) • Vegetation Protection Overlay– Schedule 6 (VPO6) • Wildfire Management Overlay (WMO)– covers northern portion of road adjacent to reserve
Blackhill Road (formed road reserve)	Crown Land (Government Road)	Crown Land (Reserves) Act 1978 (Section 4)	<ul style="list-style-type: none"> • Farm Zone (FZ) • Environmental Significance Overlay– Schedule 4 (ESO4) • Vegetation Protection Overlay–Schedule 2 (VPO2) • Significant Landscape Overlay– Schedule 1 (SLO1) • Wildfire Management Overlay (WMO)
Unused road reserve adjacent to Lot10A (northern perimeter of reserve)	Crown Land (Government Road)	Crown Land (Reserves) Act 1978 (Section 4)	<ul style="list-style-type: none"> • Farm Zone (FZ) • Environmental Significance Overlay– Schedule 4 (ESO4) • Significant Landscape Overlay– Schedule 1 (SLO1) • Wildfire Management Overlay (WMO)– partial coverage
Unused road reserve (continuation of	Crown Land (Government Road)	Crown Land (Reserves) Act 1978 (Section 4)	<ul style="list-style-type: none"> • Farm Zone (FZ) • Environmental Significance Overlay– Schedule 4 (ESO4)

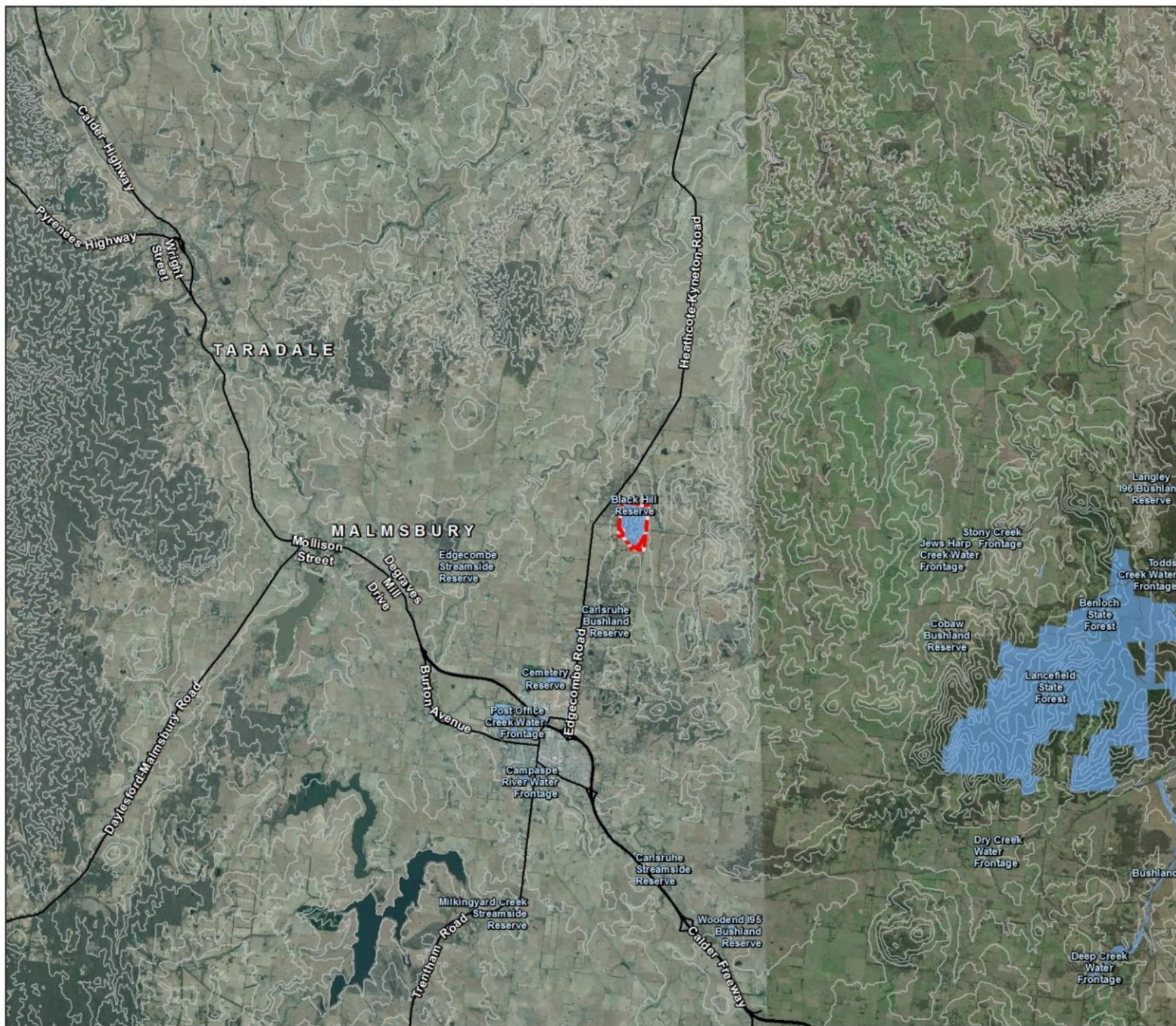
Area	Land tenure	Legal status	Zoning and Overlays
Blackhill Road beyond entrance to reserve)			<ul style="list-style-type: none"> • Vegetation Protection Overlay–Schedule 2 (VPO2)– adjacent to Lot 10F only • Significant Landscape Overlay– Schedule 1 (SLO1) • Wildfire Management Overlay (WMO)– coverage of almost entire length, apart from northern end

2.7 Bushfire Recovery Works

With regards to management after the 2015 bushfire, recovery work commenced as soon as it was safe to do so. Works included clearing fallen and dangerous trees, repairing walking tracks and signage, discouragement of erosion with repaired and improved drainage channels, the replacement of 70+ nesting boxes, plus other infrastructure work such as fencing and replacing walking track steps.

The Friends Of Black Hill were assisted in these works by inmates from both the Loddon Prison at Castlemaine, and the Youth Training Centre at Malmsbury, with management and planning expertise provided by a number of departments in the Macedon Ranges Shire Council, along with ongoing advice and assistance from the CFA both at a local level and from Headquarters, and from local Landcare groups (Friends of Black Hill website).

Map 1. Landscape Context
Black Hill Reserve

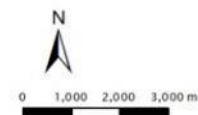


Legend

- Contours (30m)
- Black Hill Reserve
- Public land

Details

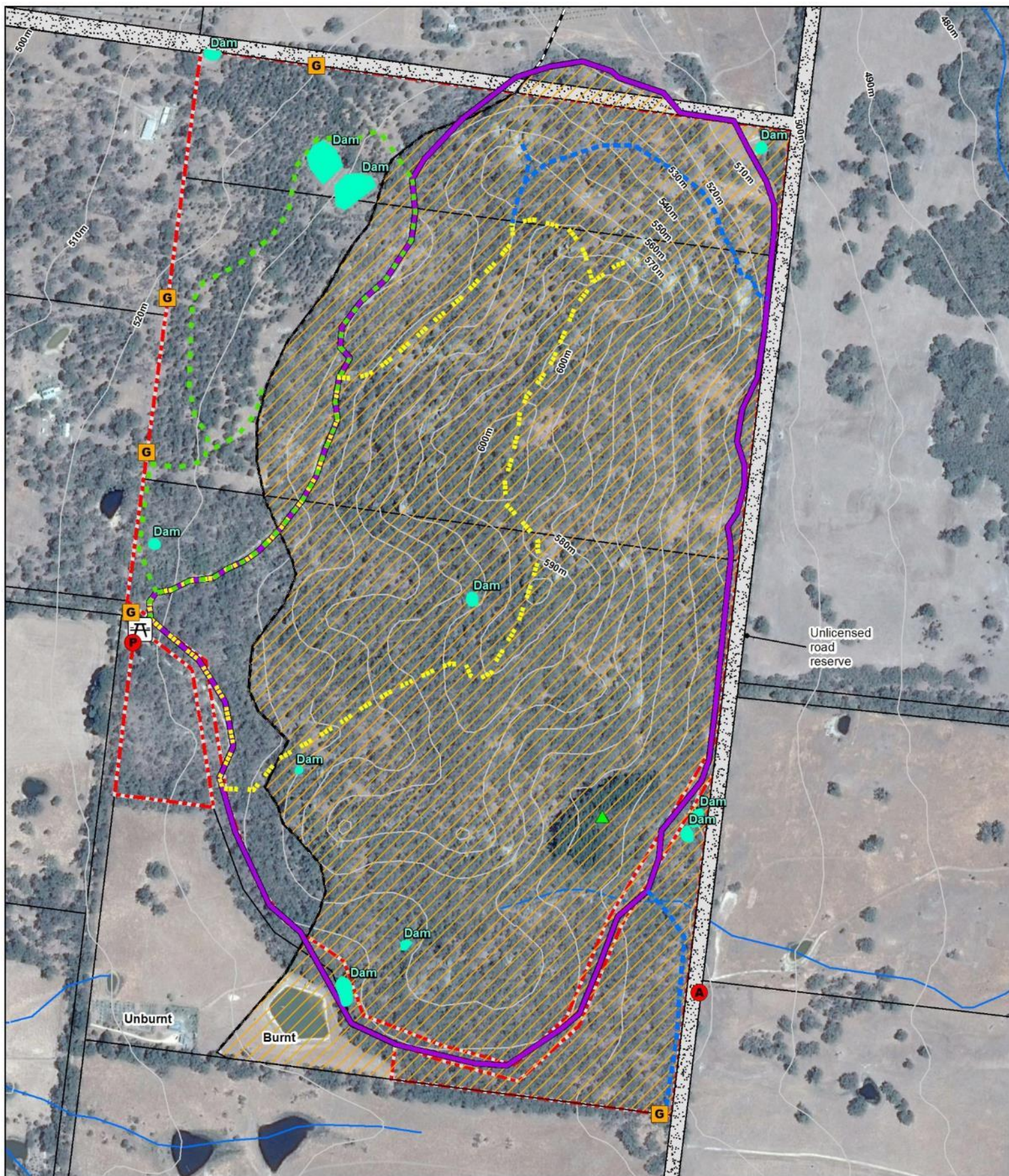
Mapping by: Karen McGregor & Colin Broughton
Date: 23/02/2016
Data Source: Aerial photography courtesy of NearMap



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Disclaimer

















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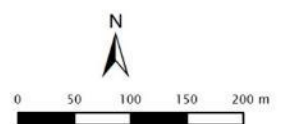
- | | |
|---|---|
|  Black Hill Reserve |  Watercourse |
|  Parcels |  Contours (10m) |
|  Fire Boundary |  Dams |
|  Alternate entrance with limited parking |  Unlicensed road reserve |
|  Car parking and main entrance | Tracks |
|  Gates |  Circuit track |
|  Picnic facilities |  Link track |
|  Pine plantation |  Revegetated area track |
| |  Ridge track |

Details

Data Source: Base layers courtesy of VicMap, Copyright © State of Victoria. Aerial photography from Google Earth Pro

Date: 17/11/2016

Map 2. Site Description Black Hill Reserve



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3. CULTURAL HERITAGE VALUES

A comprehensive summary of the history of Black Hill Reserve is available in the booklet *A Walk Through Black Hill Reserve* (Pictor 1987). The information presented below is a summary of information from the booklet and the Friends of Black Hills' website.

3.1 Aboriginal Cultural Heritage Values

No Aboriginal Cultural Heritage Study has been undertaken within the reserve.

According to the Friends Group, Melbourne University students undertook a two week archaeological survey in the reserve in 1982. They dug out caves, etc around the granite outcrops, but did not find much evidence of Aboriginal artefacts.

It is assumed that Aboriginals would have utilised the caves and rock shelters across Black Hill, however little is known at this stage.

There is evidence to suggest that Aboriginal people have lived in the Macedon Ranges region for at least 26,000 years.

The Taungurung tribes lived on lands that include the townships of Kyneton and Carlsruhe on the east side of the Campaspe River, and ranged through to Rushworth and Euroa in the north, extending east to Mt Buller (Visit Macedon Ranges, 2014). The Taungurung are the Registered Aboriginal Party for the area and are responsible for managing the cultural heritage of the area.

The Aboriginal Heritage Act 2006 requires preparation of a Cultural Heritage Management Plan prior to carrying out any development works on previously undisturbed land (with some exceptions as specified in the Act's Regulations). Cultural Heritage Permits are also required for works that may harm Aboriginal cultural heritage, but which do not require preparation of a Cultural Heritage Management Plan.

Revisions to the Aboriginal Heritage Act in 2016 also provide for the preparation of Aboriginal Cultural Heritage Land Management Agreements between a public land manager and the relevant Registered Aboriginal Party. These agreements can set out a list of management activities permitted under the agreement, as well as any other agreed consultation, cultural heritage management actions or other conditions. These agreements need to be informed by an Aboriginal cultural heritage assessment.

3.2 European Cultural Heritage Values

The following description provides a brief summary/timeline of the European history of Black Hill. *A Walk Through Black Hill Reserve* (Pictor 1987) provides a more detailed description of the reserve's history.

It is believed that the first European to sight Black Hill was Major Thomas L Mitchell who passed through the area on his way from Mount Alexander to Mount Macedon, during his great exploration of the southern district of Port Phillip, in 1836.

During the early European settlement of the district by pastoralists, prior to the construction of perimeter fences, the first settlers utilised landmarks to define the boundaries between properties. Black Hill, or as it was formerly known 'The Great Granite Hill'; was utilised to mark the boundaries between:

- Carlsruhe Stations and Barfold Run of Sir William Mitchell
- Pastoria Station (William Piper) was bounded on the north and west by ridges which meet at the saddle of Black Hill
- Black Hill also marked the northern boundary of Trio Station.

In 1872, a non-departmental school was established near the southern slope of Black Hill. In 1873, the school was leased to the Education Department, and in 1874 a new wooden building was constructed. The school closed briefly in 1910, and then re-opened on a half day basis in conjunction with the Metcalfe school. In 1915, both schools were combined on a two acre site to the north of Black Hill in Langley. The Langley Primary School is still in operation.

In 1855, a large part of Black Hill Reserve was declared a 'Timber Reserve', from where timber could be removed. In 1860, local farmers petitioned the Government to form a 'common' for their use and benefit. The 'farmers' common was gazetted in 1861, which covered a part of the reserve.

In the 1920s, in conjunction with the increase in road travel and road construction, a large part of the reserve became a granite gravel quarry, with the granite extraction lasting until the 1970's. The granite was extracted across most of the reserve, rather than in a large pit. The evidence of the quarrying is again evident (due to the vegetation loss associated with the 2015 bushfire) across most of the reserve creating a pitted moonscape environment.

In 1932, an application was made to purchase 50 acres of the timber reserve. After deliberation, the Shire Council decided to only grant 15 acres of the timber reserve, and refused permission to cut timber within the actual reserve.

Koalas from Phillip Island were released in the timber reserve in 1944, and there are remnants of this population in the surrounding countryside, though few are sighted in the reserve nowadays.

From 1960 to 1968, the Kyneton Car Club constructed a road from the south side of the saddle for use as a hill climb track; this track is now almost completely overgrown.

In the 1960s, so much timber and gravel had been extracted from the reserve, that older residents of the District remember the northern slopes as being almost completely bare. They remember that the granite outcrops were clearly visible from the road, and that the area was a moving mass of rabbits.

In 1964, Kyneton Shire commenced planting in the areas most affected by the gravel extraction. They planted 14,000 trees and shrubs, and also constructed dams to attract birds and wildlife, which could also be used for fire-fighting. This was achieved through Federal Government and Shire funding. Access to these areas was limited, and the vegetation slowly began to regenerate, spread and reclaim the hill.

In 1974 the Shire Council purchased 120 acres at the northern end of Black Hill (Crown allotments 10A and 10B), and resolved to develop the area as a sanctuary for fauna and flora.

3.2.1 Friends of Black Hill

In 1979, the Friends of Black Hill was formed, with a series of aims. The Friends Group is still very active in the reserve. The Friends of Black Hill were instrumental in undertaking early erosion control works across the reserve. They also undertook large scale plantings in eroded areas and installed extensive drainage works aimed at minimising water runoff across the slopes. Whilst some of these works/methods are not currently utilised, they were effective and have minimised erosion across the reserve.

Aside from the impacts of the bushfire, the Black Hill of today has minimal erosion, and the hillside and reserve is covered in both remnant and planted vegetation, creating a unique bushland reserve

Aims of the Friends of Black Hill

For interest, the original aims of the Friends Group are provided below (Pricor 1987):

- 1) *To generally protect the Black Hill Reserve that now exists*
- 2) *To continue planting Australian natives, particularly those adaptable to the climate*
- 3) *To combat problem areas ie: erosion and Gorse*
- 4) *To ensure closure to all types of vehicles*
- 5) *To coordinate census studies of plants, animals and birds, etc*
- 6) *To continue the Shire policy of usage for the benefit of naturalists, walkers and school groups, etc*
- 7) *To map thoroughly the reserve and delineate walking tracks to areas of particular geological or vegetation interests*
- 8) *To organise and assist with the projects undertaken on the reserve.*

4. METHODS

To prepare this EMP, the project methodology required literature reviews and liaison with both internal and external stakeholders, and then ecological fieldwork to determine the ecological values across the reserve and the management issues related to each of the values.

The 2015 bushfire has meant that some ecological values could not be fully identified and/or quantified, as the reserve is in a process of recovery.

4.1 Literature Review

The literature review was based on researching the literature outlined within the Project Brief and other relevant literature. Literature and other information reviewed included:

- Background Documents:
 - Lois Pictor (1987). *A Walk Through Black Hill Reserve*.
 - Kate Maltby (1995). Analysis of Black Hill Reserve.
 - Atlas Ecology (2011). Brief Vegetation Assessment and Net Gain Analysis of Black Hill Reserve, Kyneton
- Flora and fauna database searches including:
 - Victorian Biodiversity Atlas (DEPI)
 - EPBC Act 1999 database (Protected Matters Search Tool).
- GIS datasets including DSE datasets.

4.2 Consultations with Stakeholders

Consultation with both internal and external stakeholders was undertaken in conjunction with the literature review. Consultation was required to help understand the history of the site and to discuss ecological issues for the Reserve from a variety of perspectives.

Anecdotal information and post-bushfire photographs were utilised to obtain information and a visual image of what the reserve was like prior to the 2015 bushfire. This information was utilised to inform the fieldwork and the preparation of the EMP.

Table 2 lists the stakeholders who were consulted during the preparation of this EMP.

Table 2. Stakeholder Consultation Undertaken during EMP Preparation

Organisation	Contact	Type of Contact
Friends of Black Hill	Daryl Kellett and Louise Simpson	2 x site meetings (30/09/2015 and 29/01/2016)
MRSC– Environmental programs and Education Officer	William Terry	Site meetings (30/09/2015 and 15/12/2015) plus email contact
MRSC– Project Contact	Michelle Wyatt (Coordinator Policy Implementation)	Site meetings (24/02/2015 and 30/09/2015), plus email and phone calls
MRSC– Natural Resources Officer	Michelle Wyatt and Beau Kent	Project meeting plus email contact

4.3 Flora

A flora survey was undertaken to record the flora species (indigenous, exotic and naturalised) growing across the reserve. One comprehensive flora survey was undertaken on the 16/11/2015, with additional observations undertaken from September 2015 to January 2016, which is generally the best flora survey period, especially for herbaceous species and grasses.

Flora surveys (or flora observations) were undertaken on: 30/09/2015, 16/11/2015, 15/12/2015, 14/01/2016 and 29/01/2016.

An additional flora survey was undertaken on 1/11/2016 to identify any further flora species that had germinated in the second year, post the January 2015 bushfire.

Most planted species were not included within the flora species lists; as per database convention, planted species are not accepted in the database. However planted species that had become naturalised (and were self-seeding) were included. A list of species planted in the reserve is provided in Appendix 2.

Plant taxonomy for common and scientific names used in this report are generally in accordance with *A Census of the Vascular Plants of Victoria* (Walsh and Stajsic 2008) and/or from the Victorian Biodiversity Atlas (DEPI 2013).

Limitations of Flora Survey

The following considerations should be made regarding the limitations of the flora survey:

- As the survey was undertaken during spring, which is generally the best flora survey period, it means that any winter flowering and bulbous species (particularly exotic species such as Angled Onion **Allium triquetrum*) that may be growing in the Reserve will have been missed
- Some species, particularly orchid, lily and other herbaceous species that can only be observed for a limited period of time may not have been recorded during the assessments
- A one-off seasonal flora survey will never be able to 'capture' the full suite of indigenous grassy and herbaceous species growing within a bushland reserve, and
- Due to the topography of the site, some areas were not physically able to be inspected, which means species will have been missed.

With regard to these limitations, it is still considered that the majority of flora species within the reserve will have been recorded due to the number of fieldwork days.

4.4 Vegetation Categorisation, Classification and Quality

Vegetation in the Reserve was categorised into different types to facilitate collection of data. Vegetation in all sections of the Reserve was either classified as native or exotic.

Vegetation was assessed for its categorisation according to the *Permitted clearing of native vegetation – Biodiversity assessment guidelines* (DEPI 2013), then it's Ecological Vegetation Class and finally, its quality, through Indigenous Ground-storey Vegetation Quality mapping.

4.4.1 Vegetation Categories

The following categories of vegetation apply within the reserve:

Native Vegetation

Native Vegetation as per the Victorian Planning Provisions (Clause 72): plants which are indigenous to the reserve, including trees shrubs, herbs and grasses.

Exotic Vegetation

Exotic vegetation is vegetation dominated by weed species, where there is an area of vegetation, with or without trees, where more than 75% of the total understorey plant cover is weeds or non-native plants, such that less than 25% of the understorey cover is native

Whilst exotic vegetation is dominated by non-indigenous plant species, which in the context of indigenous species are mostly considered to be weed species; not all weed species are as threatening to indigenous vegetation as other weed species.

Naturalised Vegetation

Any plants that are native to Australia and/or Victoria, planted within the reserve which have self-seeded and/or regenerated. These include species that are considered invasive and are controlled as pest plants/weeds.

4.4.2 Ecological Vegetation Classes

Ecological Vegetation Classes (EVCs) are a method of systematic organisation of plant communities into common types that occur in similar environmental conditions throughout Victoria. Each vegetation type is identified on the basis of its floristic composition (the plant species present), vegetation structure (woodland, grassland, saltmarsh), landform (gully, foothill, plain) and environmental characteristics (soil type, climate).

DEPI EVC mapping (DEPI 2014a) was accessed to assess the EVC likely to occur on the study area. EVCs were then identified in the field according to observable attributes including dominant and characteristic species consistent with the benchmark descriptions (DEPI 2014b).

4.4.3 Vegetation Cover Mapping

Vegetation Cover mapping provides indicative data on the indigenous ground storey vegetation cover in bushland areas. Indigenous ground storey is focused upon, as 'bushland quality' is dependent upon the extent and level of intactness of the ground storey layer.

Vegetation Cover Mapping provides a useful guide for determining management priorities and the priority areas for management within bushland areas. Vegetation Cover Maps can also be utilised to monitor indigenous ground storey vegetation quality/cover across a reserve.

To undertake an assessment, the entire ground storey vegetation cover in an area is considered. The amount of 'indigenous' versus 'exotic' plant cover is then considered to determine the vegetation quality/cover category. Vegetation Cover Mapping is based on a four-colour coded rating system as presented in Table 3.

The vegetation cover mapping was also extended across the few areas within the reserve (in the north-west and north-east) which are currently mostly bare of trees/shrubs and/or have been recently revegetated with trees/shrubs in the last 5–10 years.

As the vegetation cover mapping is only concerned with indigenous ground storey vegetation, trees and shrubs are not considered, therefore the vegetation cover mapping does not 'pick up' the areas of the reserve with remnant, or planted, trees and shrubs. This does not mean that these areas do not contain habitat values, it just means they do not contain indigenous ground storey vegetation, which is utilised as an indicator of bushland health, quality and general 'intactness'.

Essentially the vegetation cover mapping has highlighted the areas within the reserve which were less (or not) impacted by the former gravel extraction activities, as these are the areas with a more intact indigenous ground storey vegetation cover. These areas are concentrated around the granite boulders and in some lower areas.

Table 3. Indigenous Vegetation Quality Mapping Categories

Colour	Indigenous Vegetation Quality
Red	<25% indigenous ground storey vegetation cover Areas where remnant vegetation has been severely degraded as a result of weed invasion to the extent it is almost completely replaced by exotic plant species
Orange	25–50% indigenous ground storey vegetation cover Areas where remnant vegetation is severely degraded although some remnant vegetation is evident
Blue	50–75% indigenous ground storey vegetation cover Areas of remnant vegetation with light to moderate infestations of weeds
Green	75%–100% indigenous ground storey vegetation cover Areas of remnant vegetation virtually free of exotic plants and where the native plant communities structure, species composition and diversity are comparatively intact

Limitations

Issues with vegetation cover mapping include the subjectivity between different assessors and the time of year in which the mapping is undertaken. As the mapping was undertaken from November to January 2015/16, and there was lots of ground storey regeneration, it is considered that the January 2015 bushfire has not significantly impacted the quality of the mapping.

Whilst the mapping should consider all ground storey plants (those below knee height), it was determined that any trees and/or shrubs regenerating from the bushfire would be ignored, as without seeds or fruiting material, it was impossible to determine if these plants were regenerating indigenous or from the planted native trees/shrub species.

4.5 Categorising Priority Weeds for Control

Weeds at Black Hill were categorised according to two methods; a site specific weed prioritisation system, and according to the Catchment and Land Protection (CaLP) Act.

4.5.1 Site Specific Weed Prioritisation

Across Black Hill, each pest plant species that was identified was categorised according to its level of threat and invasiveness within the area in which it was recorded. The location of each pest plant species within the Reserve, the numbers of each particular pest plant species present, the ecology of each pest plant species and other variable site factors (such as topography, access, etc) were considered in assigning each pest plant species a weed prioritisation code.

Refer to Table 4 below for the weed prioritisation categories used at Black Hill.

Table 4. Weed Prioritisation Categories

Weed Prioritisation Categories	Description of each Category
Keystone (K)	Totally dominate structurally and floristically/old populations that have reached the peak of their invasion potential in a given area <ul style="list-style-type: none"> Many species (flora and fauna) may have become dependent on the weed Work slowly and systematically from highest understorey indigenous vegetation quality areas outwards Remove mature specimens first Keep in mind buffers/habitat
Small patches (S)	Of variable risk, but easiest to eliminate as they are in small numbers Small patches or the only observed occurrence of a species in the site
S1	S1: Highest risk and priority for control. Eliminate from the site
S2	S2: Moderate risk and priority for control. Eliminate from the highest quality areas first
Ubiquitous species (U)	Scattered weeds of disturbed areas Hard to eliminate; look at management regimes Eliminate in high quality areas, But of lower priority elsewhere in the site

The weed categorisation categories are provided by Gidja Walker. These categories are separate to the noxious weed categories under the Catchment and Land Protection (CaLP) Act, as they are site specific.

4.5.2 Catchment and Land Protection (CaLP) Act 1994

Under the CaLP Act declared noxious weeds are categorised into four groups depending on their known and potential impact and specific circumstances for each region:

- ◆ State Prohibited Weeds (S) is either currently absent in Victoria or are restricted enough to be eradicated. The Victorian Government is responsible for their control.
- ◆ Regionally Prohibited Weeds (P) in the North Central Catchment Management Authority (CMA) area are not necessarily widespread but have the potential to become widespread. It is expected that weeds that meet this criteria can be eradicated from the region. It is the responsibility of the land owner to control these weeds on their land.
- ◆ Regionally Controlled Weeds (C) are usually widespread but it is important to prevent further spread. It is the responsibility of the landowner to control these weeds on their property.
- ◆ Restricted Weeds (R) include plants that pose unacceptable risk of spreading in the State or other Australian states and are considered to be a serious threat to primary production, Crown land, the environment and/or community health if they were traded in Victoria. Trade in these weeds and their propagules, either as plants, seeds or contaminants in other material is prohibited. If observed, landowners should contact DELWP and report their location so they can be eradicated and monitored.

4.6 Fauna

Due to the variables associated with fauna survey and the current fauna monitoring programs being undertaken within the Reserve, the focus of the EMP was on undertaking a fauna habitat assessment across the Reserve, establishing four two hectare bird census areas and recording incidental fauna observations whilst undertaking the fauna habitat assessment.

The focus was also upon obtaining the available data from current and previous spotlighting and monitoring activities, and compiling all known data on fauna within the reserve into one list.

Bird Monitoring

Four bird monitoring plots were established, to monitor changes in bird populations over the years. Ideally bird surveys would be undertaken in different seasons to observe and record different bird populations such as migrating birds either returning to Black Hill after summer or birds migrating from south to north in autumn/winter.

The bird monitoring data collection methods are based on the monitoring methods used to provide data for the Birdlife Australia Bird Atlas– the **2 hectare, 20 minute search** method:

This method is based on a defined 2 hectare area that can be used for future surveys and preferably would be surveyed once a season for at least one year. The coordinates of the search area are required, so that the precise location (area) can be re-visited and re-surveyed

The guidelines for the survey conditions include:

- Low wind day; that is wind velocity should be less than 10km/hour
- No rainfall; above a light intermittent drizzle
- No mist or fog; that would impede visibility
- Temperature above 10° C (or below average minimum for the season)
- Late spring/early summer survey; to be undertaken in the most optimal conditions in either November or December
- Survey within 3–4 hours of first light

The survey areas were defined through consultation with the MRSC Environment Programs and Engagement Officer, and are distributed across the Reserve.

Incidental Observations

The diurnal fauna assessment focused upon collecting any incidental fauna observations. They were based on visual and auditory observations of fauna either directly or indirectly through evidence such as scats, tracks, burrows etc.

The data from these incidental observations was compiled as a component of collating and updating all of the fauna information available for the Reserve.

Fauna Habitat Assessment

In conjunction with the general incidental diurnal fauna survey, habitat conditions across the reserve were mapped. These were based on threatened species data within the general landscape surrounding the reserve (based on a 5km radius around the reserve) to determine any likely threatened species habitat within the Reserve.

Limitations

Whilst the fauna surveying as a component of the EMP fieldwork was limited, it has been supplemented by fauna species lists from previous reports, consultation with the stakeholders, results from the current and previous fauna spotlight nights and monitoring results from cameras which have been installed within the Reserve for varying periods.

4.7 Mapping

Geographical positioning data collection in the field for the purposes of map display was carried out using a combination of a handheld GPS device, aerial photography and existing site survey plans. Determination of vegetation boundaries was undertaken using a combination of GPS data and ground-truthing with aerial photography.

Due to inaccuracy with GPS data the mapping should be considered approximate only.

5. ECOLOGICAL VALUES OF BLACK HILL

Black Hill is a mixed bushland reserve with remnant vegetation, planted native vegetation, indigenous revegetation, self-seeding native plants and exotic weedy plants. This mixture of vegetation, plus the impacts on the 2015 bushfire, has made defining the vegetation at Black Hill difficult.

The ecological values observed throughout Black Hill are presented below.

5.1 Ecological Vegetation Classes

DELWP Biodiversity Interactive Mapping

The vegetation within Black Hill has been broadly mapped by DELWP as containing a high coverage of indigenous vegetation which can be categorised into two EVCs:

- EVC 72: Granitic Hills Woodland (D), and
- EVC 175–62: *Granitic* Grassy Woodland (E).

DELWPs EVC mapping is broad scale and requires ground-truthing. It is indicative, to assist in determining the potential EVC's in an area based on landscape, topography and remaining vegetation cover.

Site Assessment

The site assessment determined that whilst these two EVCs do exist within the reserve, the extent of each EVC mapped by DELWP was not accurate. The site assessment also determined that a third EVC mapped as occurring to the south-east of the reserve along Pipers Creek (EVC 47: Valley Grassy Forest) also occurred along the south-west and southern perimeters on the shadier and moister side of the reserve.

EVC mapping in the reserve was difficult due to the extent of revegetation using native species and the impacts from the bushfire. The EVC mapping is indicative only, and was determined by the visible dominant remnant tree species, topography, aspect and soil types; observed across the reserve.

The Reserve falls within the Central Victorian Uplands Bioregion (DEPI 2014 [online]).

The extent of the EVCs across Black Hill is depicted in Map 3.

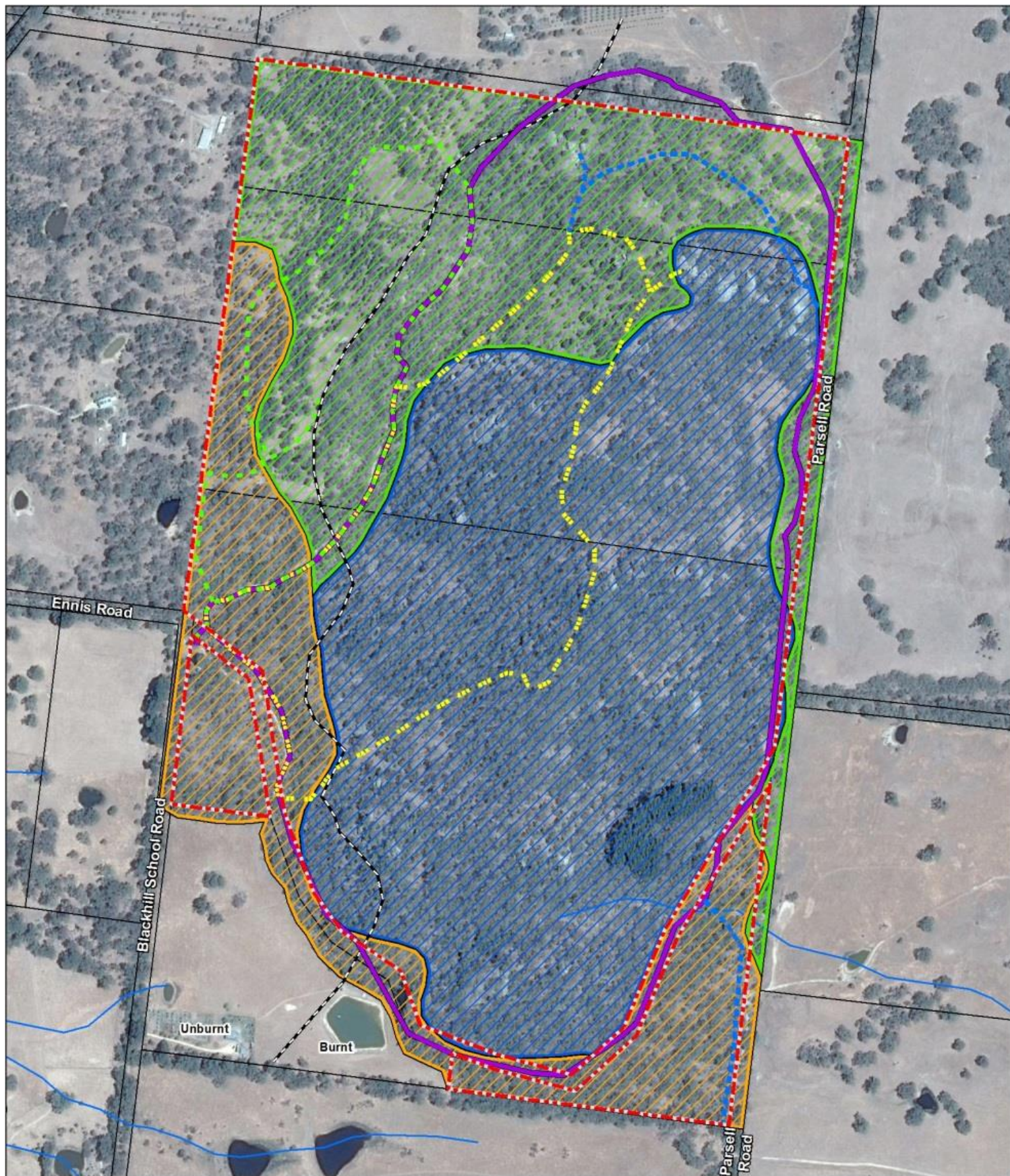
EVC Descriptions

Table 5 on the next page provides descriptions of the EVCs recorded at Black Hill based on the site assessments and DELWPs EVC benchmark descriptions.

Table 5. EVCs occurring at Black Hill

EVC No.	EVC	Bioregion Conservation Status	DELWP Benchmark Description	Location within the Reserve Dominant Visual Characteristics
47	Valley Grassy Forest	Vulnerable	<p>Valley Grassy Forest occurs under moderate rainfall regimes of 700–800mm per annum on fertile well-drained colluvial or alluvial soils on gently undulating lower slopes and valley floors.</p> <p>Open forest to 25m tall may carry a variety of eucalypts, usually species that prefer more moist or more fertile conditions over a sparse shrub cover.</p> <p>In season, a rich array of herbs, lilies, grasses and sedges dominate the ground layer but at the drier end of the spectrum the ground layer may be sparse and slightly less diverse, but with the moisture-loving species remaining (DSE 2004).</p>	<p>Located between the lower slopes and the reserve perimeter in the south-west and southern areas of the reserve.</p> <p>Dominated by indigenous Yellow Boxes <i>Eucalyptus melliodora</i> and Messmates <i>Eucalyptus obliqua</i>, with a few Candlebarks <i>Eucalyptus rubida</i> at the southern end of the reserve.</p> <p>There are numerous planted native eucalypts and shrubs in the EVC, which makes defining the exact boundaries with adjacent EVCs difficult. However the estimated extent of the EVC was determined by the presence of Yellow Boxes.</p> <p>The areas defined as EVC 47: Valley Grassy Forest mostly contained an abundance of wildflowers in spring, with a moderate to high (50–75%) indigenous ground storey vegetation cover, indicating that the soil had been less disturbed than in other areas of the reserve.</p> <p>Local residents have stated that the south east corner of the reserve contained some of the highest quality Valley Grassy Forest in the Kyneton area before the fire.</p>
72	Granitic Hills Woodland	Depleted	<p>Mainly restricted to granite outcrops and structurally consist of a low woodland to 10m high with the dominant trees often being stunted (DSE 2004).</p>	<p>Located along the ridge, granite outcrops and slopes of Black Hill.</p> <p>Dominated by Messmates. Narrow-leaf Peppermints used to grow along the ridge, but have been impacted by both the drought and the 2015 bushfire. Some regenerating saplings were observed on the ridge.</p> <p>It was difficult to determine whether this EVC extended between the ridge and the outlying granite outcrops due to the extent of planting, the former gravel extraction works and the impacts of the bushfire.</p> <p>It is likely that 'fingers' of EVC 47 or EVC 175 extended up the slopes of Black Hill in the 'valleys' between the granite outcrops, however this could not be confirmed due to impacts outlined above.</p>




EVC No.	EVC	Bioregion Conservation Status	DELWP Benchmark Description	Location within the Reserve Dominant Visual Characteristics
175_62	Granitic Grassy Woodland	Endangered	<p>A variable eucalypt woodland or open forest to 15m tall over a distinct large and medium shrub layer and diverse ground layer of grasses and herbs.</p> <p>It occurs on sites with moderate fertility on plains or weathered undulating granitic hills in areas with moderately high rainfall (>600mm per annum). (DSE 2004).</p>	<p>Located on the northern slopes of Black Hill, and along the eastern perimeter and north-west perimeter.</p> <p>Dominated by Manna Gums <i>Eucalyptus viminalis</i> with Messmates and scattered Yellow Boxes.</p> <p>Growing on the drier slopes and lower slopes of the reserve, with granitic gravel soils.</p> <p>Numerous native species have also been planted amongst the remnant eucalypts.</p> <p>These slopes appear more disturbed and eroded, potentially as the northern end of the reserve was heavily impacted by the bushfire.</p>



Disclaimer

Practical Ecology bears no responsibility for the accuracy and completeness of this information and any decisions or actions taken on the basis of the map. While information appears accurate at publication, nature and circumstances are constantly changing.

Legend

-  Black Hill Reserve
-  Parcels
-  Watercourse
-  Fire Boundary

Tracks

-  Circuit track
-  Link track
-  Revegetated area track
-  Ridge track

Ecological Vegetation Class

-  EVC 47: Valley Grassy Forest
-  EVC 175_62: Granitic Grassy Woodland
-  EVC 72: Granitic Hills Woodland

Indicative EVCs only due to high level of previous disturbance and extent of revegetation across the reserve.

Details

Data Source: Base layers courtesy of VicMap, Copyright © State of Victoria. Aerial photography from Google Earth Pro

Date: 23/02/2016

Map 3. Ecological Vegetation Classes Black Hill Reserve



Scale 1:4,750 (Page size A3)

5.3 Ground storey Vegetation Cover Mapping

To establish some baseline data regarding the 'ecological condition' of Black Hill, mapping of ground storey indigenous vegetation cover was undertaken, to provide indicative data on the extent and 'quality' of indigenous ground storey vegetation across the Reserve.

The entire reserve was assessed for vegetation cover mapping, including the most recent revegetation areas in the northern portion of the reserve.

The vegetation cover mapping compared the percentage of indigenous versus exotic ground storey vegetation present across the reserve, in 50 x 50m grids. As the mapping was concerned with the ground storey vegetation cover present; areas with granite outcrops were mapped as having a 'high' indigenous vegetation cover, even if there is only a small amount of actual vegetation present amongst the rocks.

2015 Results of the Mapping

The mapping illustrates that the indigenous ground storey vegetation cover was highest along the ridge, around the granite outcrop and in some areas at the base of Black Hill. These all appear to be areas that were not majorly impacted by the former gravel extraction activities. It would have been difficult to extract granite gravel along the ridge and near the larger granite outcrops. It is not clear why some of the lower areas of the reserve were less impacted by the former quarrying activities.

Surprisingly there was an indigenous ground storey cover under the most recent revegetation area in the north-west corner of the reserve. Whilst it was difficult to determine the exact extent of the indigenous ground storey cover due to the dry conditions and over grazing of the grasses by kangaroos. This area appeared to have a high cover of indigenous Wallaby and Weeping Grasses.

Whilst most of the dams across the reserve were dry, there was a high indigenous ground storey vegetation cover around the margins of the dams located in the southern portion of the reserve. These were the dams that still contained water during the drier months.

Map 4a on the following page depicts the 2015 indigenous ground-storey vegetation mapping in the Reserve.

2016 Results of the Mapping

A further day of indigenous groundstorey vegetation cover mapping was undertaken on 27/10/2016, to determine whether the groundstorey vegetation cover within the reserve had increased or decreased in indigenous versus exotic groundstorey vegetation cover, following a second year of post-bushfire regeneration. This was especially relevant considering spring 2015 was a very dry spring, whereas spring 2016 was a wet spring.

As the additional day of mapping was just whether the determine there were major differences in the groundstorey vegetation cover between 2015 and 2016, only approximately a quarter of the reserve was re-mapped based on areas selected by the Macedon Ranges Shire Council Natural Resources Officer.

The re-mapping showed some slight differences in the mapped boundaries of the higher quality areas (between 50–75% indigenous groundstorey vegetation cover) which were interpreted to be the result of the

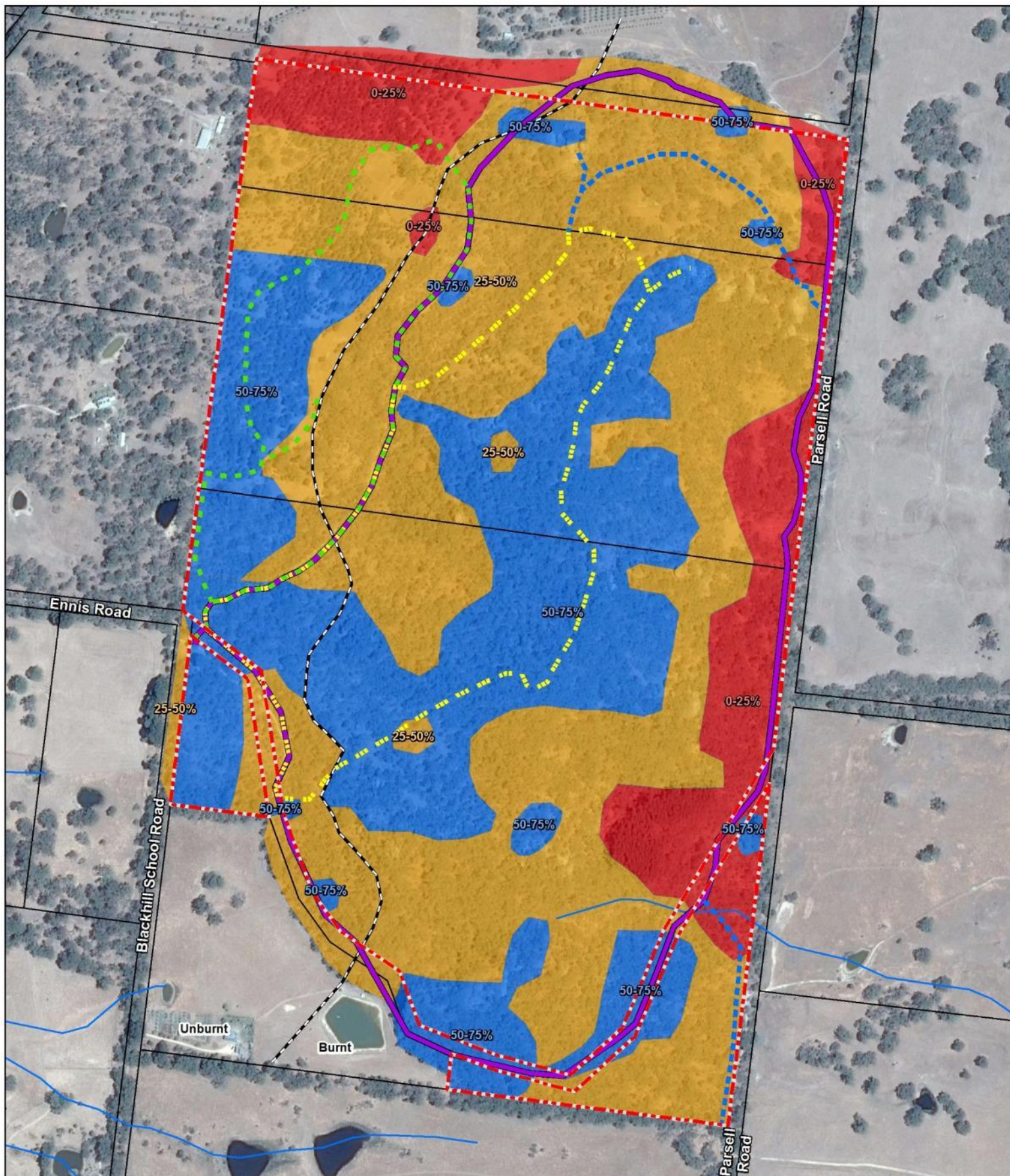
spring flush of annual exotic grasses, which were dominant across many areas of the Reserve due to the wetter spring conditions.

It was determined from the re-mapping that the mapping of indigenous vegetation groundstorey vegetation cover is influenced by seasonal conditions such as the spring flush of annual exotic grasses. As indigenous groundstorey vegetation cover mapping reflects the day the mapping is undertaken, any mapping will always reflect seasonal conditions. However seasonal conditions are also influenced by abnormally dry springs (2015) versus wetter springs the following year.

As the regeneration of the reserve is still in a dynamic state following the January 2015 bushfire, it was determined that the 2015 indigenous groundstorey vegetation cover mapping did reflect the general condition of the reserve, and that the Higher Groundstorey Quality Management Zones that were determined based on the mapping were still applicable with a few small additions (refer to Section 10.1).

It was recommended that any further re-mapping should not occur for a 5–10 year period to allow the regenerating trees and/or shrubs to grow, as the density of tree/shrub cover will also influence groundstorey vegetation cover though shading in the mid to longer term

Map 4b depicts the 2016 indigenous ground–storey vegetation mapping in the Reserve.



Disclaimer

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Legend

- Black Hill Reserve
- Parcels
- Watercourse
- Fire Boundary

Tracks

- Circuit track
- Link track
- Revegetated area track
- Ridge track

Indigenous Vegetation Groundstorey Cover

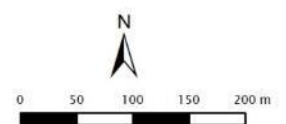
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Details

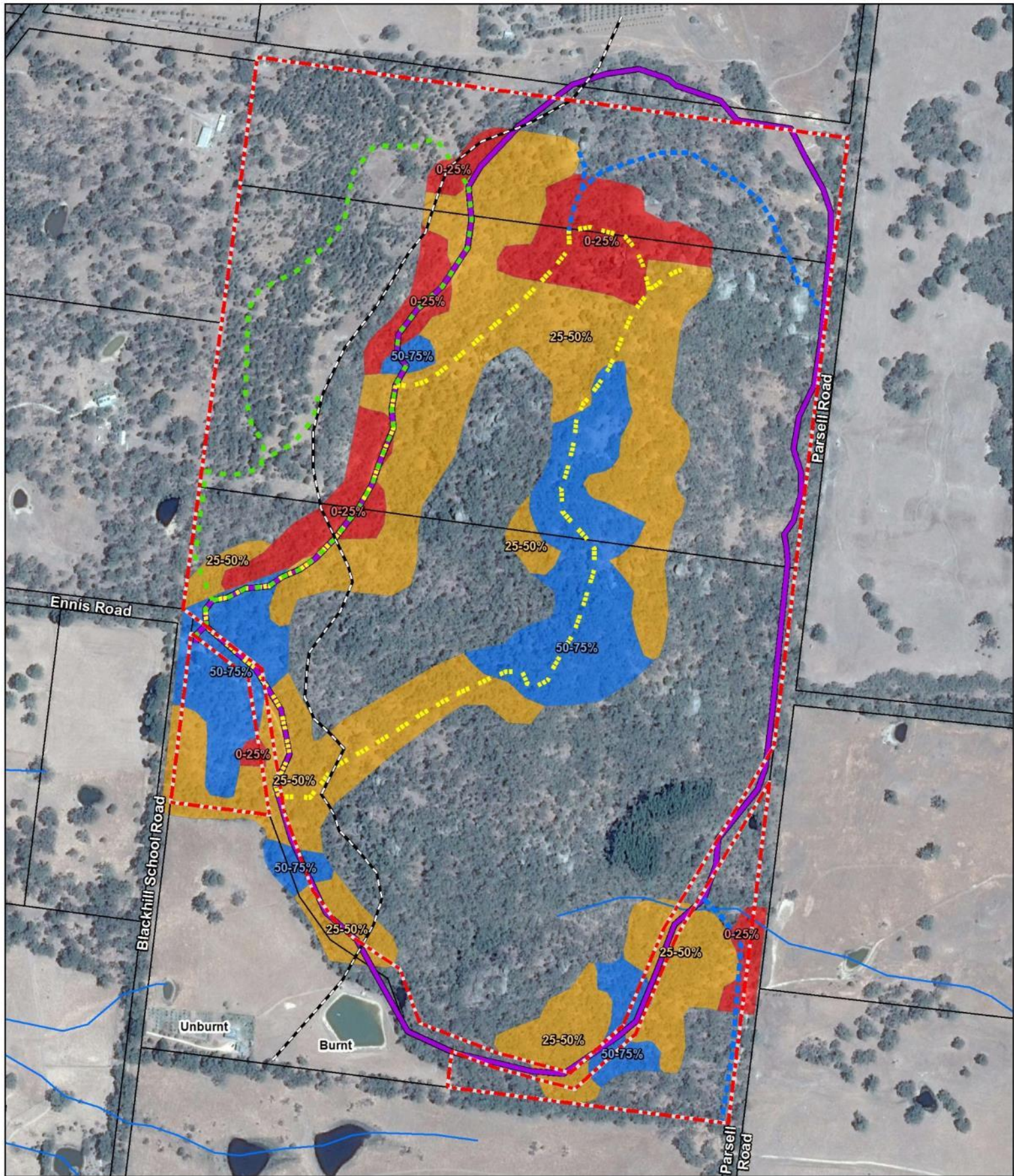
Data Source: Base layers courtesy of VicMap, Copyright © State of Victoria. Aerial photography from Google Earth Pro

Date: 8/11/2016

Map 4a. Indigenous Groundstorey Quality 2015 Black Hill Reserve Kyneton







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Disclaimer

Practical Ecology bears no responsibility for the accuracy and completeness of this information and any decisions or actions taken on the basis of the map. While information appears accurate at publication, nature and circumstances are constantly changing.




Legend

-  Black Hill Reserve
-  Parcels
-  Watercourse
-  Fire Boundary

Tracks

-  Circuit track
-  Link track
-  Revegetated area track
-  Ridge track

Indigenous Vegetation Groundstorey Cover

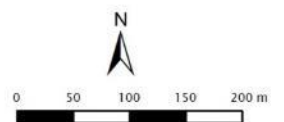
-  0-25%
-  25-50%
-  50-75%

Details

Data Source: Base layers courtesy of VicMap, Copyright © State of Victoria. Aerial photography from Google Earth Pro

Date: 8/11/2016

Map 4b. Indigenous Groundstorey Quality 2016 Black Hill Reserve Kyneton



Scale 1:4,749 (Page size A3)

5.4 Flora

A flora species list was collated across the Reserve. In addition to compiling a flora species list from the on-site assessments, the information from previous flora lists from a number of sources has also been collated. Previous data was gathered from:

- Lois Pricor (1987). *A Walk Through Black Hill Reserve*.
- Ern Perkins (2010). *Black Hill Plant List*.

The aim of compiling the current and previous flora data into the one list was to provide one source for referencing the flora of Black Hill, and to provide a framework for future flora surveys. The source (reference) and date of all the species listed has been noted in separate columns within the flora list/s.

The flora list has been updated with the additional flora species records collected on the 3/11/2016, which added an additional 82 flora species to the list, 57 which were indigenous species.

Planted native and/or indigenous trees and shrubs; have not been included in the species list, as per database conventions. Seedlings from any planted native and/or indigenous trees and shrubs that have grown and spread within the Reserve were recorded as naturalised species.

All flora species recorded within the site are listed in Appendix 1.

A list of planted species was compiled from Pricor (1987), and is presented separately in Appendix 2.

5.4.1 Significant Flora Species Recorded Within Black Hill

Overall, from the flora surveys eight rare and/or threatened flora species within Victoria (as defined in the *Advisory list of rare or threatened plants in Victoria – VROTS*) were recorded, including two species also listed under the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act and one species also listed under both the EPBC Act and the Victorian Flora and Fauna Guarantee (FFG) Act. Information on these eight species is provided on the next pages.

In addition to the flora surveys, a local resident also advised that they found a Late-flower Flax-lily, *Dianella tarda*, prior to the 2015 fire adjoining the circuit track near the revegetation area on the west side of the reserve. This species is classified as “vulnerable” under the Victorian *Advisory list of rare or threatened plants (VROTS)*. It is recommended that future flora surveys monitor for this species.

Due to vegetation fragmentation and clearing in the Black Hill region, and the vegetation loss caused by timber extraction and gravel quarrying within the actual reserve, **all indigenous flora species remaining in the reserve are considered to be at least of local significance**, and there are several species in the Reserve which are of Regional Significance, as determined by their frequency within the Central Victorian Uplands.

There are no legislative or permit requirements for VROTS (Victorian Register of Threatened Species) listed species. However there are permit requirements for FFG and/or EPBC listed species, especially if they are under threat.

Refer to Appendix 4 for the threatened flora species database records for a 5 kilometre radius around the reserve, from database records

The location of the significant flora species recorded within the reserve is depicted in Map 5.

5.4.2 Descriptions of the Significant Flora Species Recorded in Black Hill

Arching Flax-lily *Dianella sp. aff. longifolia* (Benambra)

The Arching Flax-lily was recorded growing near along the ridge near the Northern Lookout.

Two plants were recorded. Due to the lack of flowering material a positive identification could not be made in 2015, however in 2016 it was determined the plants were Arching Flax-lily.

Arching Flax-lily is considered to be Vulnerable (v) within Victoria according to VROTS.

Prostrate Mountain Flat-pea *Platylobium montanum ssp. prostratum*

Prostrate Mountain Flat-pea was growing as scattered plants in the main wildflower patch in the south-west of the reserve. Six plants were recorded, and it is a rhizomatous species that grows in patches approximately one metre squared.

This species is abundant in the Cobaw Ranges and Mount Disappointment, although only a few plants were recorded at Black Hill.

Prostrate Mountain Flat-pea is considered to be Poorly known (k) within Victoria according to VROTS.

Floodplain Fireweed *Senecio campylocarpus*

Floodplain Fireweed prefers wetland habitats, although it was recorded near the ridge. Scattered wetland plants (such as Common Loosestrife *Lythrum hyssopifolia*) were observed across the ridge area, and these plants have either germinated from windblown seed, or they are supported by the artificial depressions from quarrying that also occur near the top of Black Hill.

There is the potential that this species may die if its' habitat dries out over the summer months.

Floodplain Fireweed is considered to be Rare (r) within Victoria according to VROTS.



Floodplain Fireweed

Golden Cowslips *Diuris behrii*

Three locations of Golden Cowslips were recorded near the front entrance to the reserve.

Golden Cowslips are considered to be Vulnerable (v) within Victoria according to VROTS.

Pale-flower Crane's-bill *Geranium sp.*

The Pale-flower crane's-bill was recorded at the northern end of the site, near the small patch of Kangaroo Grass/grassland.

The Pale-flower Crane's-bill is considered to be Rare (r) within Victoria according to VROT's.

Winged Star-wort *Callitriche umbonata*

The Winged Star-wort was recorded to the south of the Ridge Track near the River Swamp Wallaby-grass. Both species were recorded in/near depressions in one of the bowl areas between the granite outcrops.

The Winged Star-wort is considered to be Rare (r) within Victoria according to VROT's.

River Swamp Wallaby-grass *Amphibromus fluitans*

River Swamp Wallaby-grass is listed as Vulnerable under the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act. It is a wetland species that requires depressions/wetlands which are at least moderately fertile and which have some bare ground, conditions which are produced by seasonally-fluctuating water levels, which are the conditions within the depressions located on the slopes of Black Hill.

The main threats to the species according to the EPBC Act listing for this species (DEE 2016) are:

Pastoral development, changing water regimes and invasion of remnant habitat by exotic grasses and weeds. *Amphibromus* spp. are very palatable to stock, and grazing and trampling has greater impact late in summer as water sources dry and become more accessible.

As the species is located within a conservation reserve, that is not available for stock grazing, and it is growing in a seasonally inundated depression, the species is considered relatively safe from threats at Black Hill. Periodic inspections of the recorded location should be undertaken to watch for any potential emerging threats.

Clover Glycine *Glycine latrobeana*

Clover Glycine is considered to be Vulnerable within Victoria according to VROT's, it is listed under the State Flora and fauna Guarantee Act and it is listed as Vulnerable under the Commonwealth EPBC Act.

The following threats have been identified for the species (DEE 2016):

- Small population size
 - While the distribution of Clover Glycine is wide, the population numbers are believed to be small.
- Inappropriate fire regimes
 - Clover Glycine is susceptible to regular late-spring and early summer burning. The intensity of a fire event may play a critical role in the survival of Clover Glycine, it has been suggested that repetitive fire management is the cause of Clover Glycine's absence from railway reserves, which are subject to repetitive burning.
- Grazing by native/introduced herbivores and stock

- Clover Glycine is a palatable species grazed by both native and introduced species; it is considered that grazing pressures along with cultivation and soil disturbance may be involved historically with the rarity of this species. Grazing pressure can also reduce the detectability of this species. Introduced pest species such as the European Rabbit *Oryctolagus cuniculus* also impact on Clover Glycine populations.
- Habitat fragmentation/loss
- Phytophthora Root Rot fungus
 - Phytophthora Root Rot (*Phytophthora cinnamomi*) is a water mould that causes roots in susceptible plants to rot, sometimes killing the plant in the process. Clover Glycine is considered one of the poorly understood taxa that are known to be susceptible to this mould.
- Weeds
 - Weeds are a likely threat to Clover Glycine populations, as they can out-compete native plants as weed species are often outside the range of their natural pests or diseases. Weeds can also reproduce and take advantage of disturbance events quickly, grow faster and smother native plants.

Management Information

Currently the Clover Glycine requires some weed control (even a couple of hrs of hand weeding) and fencing could be considered in future, as the species is susceptible to grazing pressures from rabbits and hares, which both occur in decent numbers in the Reserve.

5.4.3 Regionally Significant Flora Species

There are numerous flora species growing throughout the reserve that would be considered of Regional Significance within the Central Victorian Uplands (CVU) bioregion, as they have a frequency of occurrence of less than 5%. Low frequency of occurrence can also be due to insufficient sampling, so any analysis of frequency of occurrence data needs to be aware of these potential sampling inaccuracies.

A regionally significant flora species list was not compiled as a component of the EMP, however it is considered likely many of the recorded species would be regionally significant.

Significant Wetland Species

During the flora surveys, several indigenous wetland species were recorded growing in the ephemeral artificial depressions at the northern end of the reserve (created by the gravel quarrying). Many of these species had not been recorded in a 5km radius around the reserve previously.

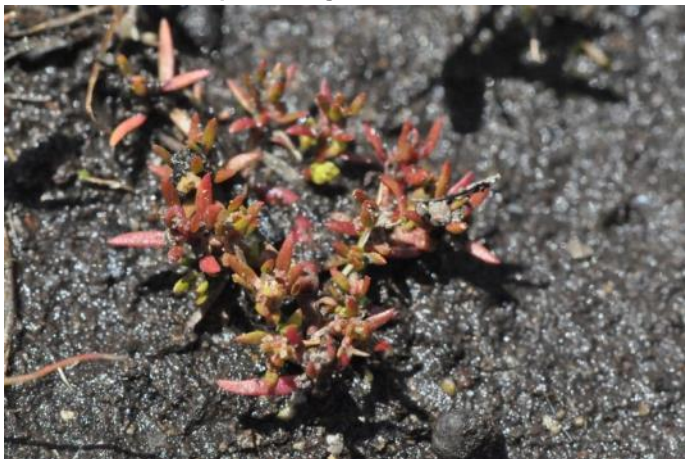
These species are considered to be regionally significant and are of botanical interest, as they have not been previously recorded in the local landscape. The names and photographs of these species are provided below (photographs provided by Karl Just):



Tuber Spike-sedge *Eleocharis atricha*



Austral Mudwort *Limosella australis*



Tiny Water-milfoil *Myriophyllum integrifolium*



Austral Pillwort *Pilularia novae-hollandiae*



Wetland Wallaby-grass *Rytidosperma semiannulare*



Floodplain Fireweed *Senecio campylocarpus*



Floating Club-sedge *Isolepis fluitans* var. *fluitans*

5.5 Fauna

The focus of the EMP fauna fieldwork was on:

- Establishing monitoring plots for avian species,
- Undertaking incidental fauna observations, and
- Mapping habitat for significant fauna species (based on the 5km database radius search using the Victorian Biodiversity Atlas).

The EMP was not focused on undertaking detailed fauna surveys, or undertaking surveys for threatened species.

Macedon Ranges Shire Council has implemented a fauna monitoring program for the reserve following the 2015 bushfire. The *Black Hill Fauna Monitoring Plan 2015* (Macedon Ranges Shire Council) was commenced to complement the flora and vegetation surveys that have been undertaken as a component of preparing this EMP, and to ensure effective decision making (and the recommendations made within this EMP) also consider the current wildlife populations that interact with the reserve.

The 2015 bushfire did impact on wildlife within the reserve, and the monitoring is also determining if species recorded previously are returning to utilise the reserve or not.

The Friends Group has also compiled fauna (and bird) lists of observations throughout the reserve, which are presented in their booklet (Pricor 1987).

Fauna Data Compilation

The fauna species recorded as a component of the EMP fieldwork were limited. To compensate for this lack of data collection, fauna data has been compiled from a number of other sources, to provide one source for

referencing the known fauna of Black Hill, and to provide a framework for future fauna data collation. These sources include:

- Prictor Lois (1987)
- Macedon Ranges Shire Council (2015)
- Friends of Black Hill (website and consultation)

A list of all of these records and observations has been compiled in Appendix 3 of this EMP.

The results of the habitat mapping and fauna data compilation, indicates that Black Hill supports a moderate diversity of fauna species and habitats.

Habitat Elements

The habitat elements observed within the Reserve included:

- Waterbodies (several small dams; including three with permanent water in the west and south-east of the reserve; and a few ephemeral dams/wetlands that contain water during high rainfall events or in the wetter seasons)
- Hollow trees (hollows occur in the large remnant trees that are scattered across the reserve)
- The Paperbark *Melaleuca spp.* thicket planted near the main entrance to the reserve
- The recent indigenous revegetation area in the north-west of the reserve
- The older and diverse (numerous Australian and Victorian species) native plantings across the remainder of the reserve
- Granite outcrops, and
- Single and patches of Large Old Trees

The fauna species habitat assessment is depicted in Map 7.

5.5.1 Significant Fauna Species Recorded in the Reserve

There are records of several threatened fauna species which have been recorded in the Reserve over the years. Some of these species are resident or annual visitors, whilst some others have not been recorded recently. Descriptions of these species are provided in Table 6 on the next page. The descriptions are limited to the status, habitat/area of the reserve recorded in, and usage of the Reserve (permanent, annual, periodic, occasional or vagrant) for each threatened species.

Refer to Appendix 5 for the threatened fauna species recorded in a 5 kilometre radius of the reserve, from database records. Two of the threatened fauna species recorded in a 5km radius of the reserve have also been recorded in the reserve; Brush-tailed Phascogale and the Brown Treecreeper.

Table 6. Significant Fauna Species at Black Hill

Common Name	Scientific Name	Status			Habitat	Probable/known usage of Reserve
		DELWP	FFG	EPBC		
BIRDS						
Brown Treecreeper	<i>Climacteris picumnus victoriae</i>	nt			Occurs in eucalypt woodlands, particularly open woodland lacking a dense understorey. Birds forage on tree trunks and on the ground amongst leaf litter and on fallen logs for ants, beetles and larvae	Resident, recorded utilising the nestboxes (MRSC 2015)
Powerful Owl	<i>Ninox strenua</i>	vu	L		All wooded habitat, foraging likely to be largely where acacias and older trees with hollows are present (where arboreal prey species such as possums are more likely to occur).	Irregular, some old pellets found near the front entrance (MRSC 2015), Previously the Friends Group has rescued one trapped in barbed wire and taken it to the local wildlife carers (MRSC 2015).
Rainbow Bee-eater	<i>Merops ornatus</i>			M	The species occurs in many types of habitat including woodland, shrubland, semi-cleared land and farmland; however it mainly occurs where eucalyptus species are dominant. It is almost entirely insectivorous and mostly occurs near to permanent water.	Listed Migratory species under the JAMBA treaty. Would be an occasional visitor.
MAMMALS						
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	vu	L		Areas with larger, older trees, logs, hollows and crevices Also recorded within the most recent revegetation area in the north-west of the reserve.	Resident. The remote cameras have recorded them throughout the reserve (MRSC 2015).
Conservation status of Threatened Fauna in Victoria (DELWP, ref.DEPI 2013) ex: Extinct, rx: Regionally Extinct, wx: Extinct in the Wild, cr: Critically Endangered, en: Endangered, vu: Vulnerable, nt: Near Threatened, dd: Data Deficient Definitions of Conservation Status Codes can be found on the DELWP website under Advisory List of Rare or Threatened Fauna					Conservation status under EPBC Act 1999: EX: Extinct, CR: Critically endangered, EN: Endangered, VU: Vulnerable and CD: Conservation dependant M: Migratory Species listed under the Act Conservation status under FFG Act 1988: L: Listed, N: Nominated, I: Invalid or ineligible and D: Delisted	

5.5.2 Koalas at Black Hill Reserve

There is another occasional visitor to the reserve, the Koala *Phascolarctos cinereus*; that is not listed as a threatened species in Victoria, but is considered to be an 'iconic' species within Black Hill.

A population of Phillip Island koalas was released in the timber reserve portion of Black Hill in 1944.

As outlined in the Friends Group booklet, there have been several sightings of koalas during spotlighting excursions, and it seems there are quite a number inhabiting the reserve, especially around the perimeter where there are large Manna Gums (Pricor 1987).

Since the 2015 bushfire, one koala was photographed by Council Officers several weeks after the bushfire, in the area behind the pine forest. It appeared to be in good health (MRSC 2015).

It appears that koalas are still infrequent visitors and users of the reserve, and it is likely that the bushfire impacted the majority of their former habitat. Their presence should continue to be monitored, to determine if they still utilise the reserve when the vegetation has regenerated in 5 to 10 years' time.

5.6 Bird Census Data

One monitoring tool that was implemented in the Reserve as a component of this EMP was the establishment of four bird census areas using the Birds Australia preferred 2 hectare search area bird census methodology. This method is based on a defined 2 hectare area and usually involves a 20 minute search, where all birds heard and/or observed in the pre-defined search area are recorded on the Bird Census form.

The bird census areas were established in a variety of habitats across the reserve and include:

- Area 1: the unburnt remnant and planted vegetation near the main entrance off Blackhill School Road
- Area 2: on either side of Circuit Track in the south-east corner of the reserve adjacent to the pine plantation and two of the permanent dams
- Area 3: along Ridge Track commencing at The Monolith and heading westward over the hill
- Area 4: near the north-west corner of the reserve in the recent revegetation area

This EMP collected the initial data for these four areas, and the purpose of establishing the areas was to initiate regular bird observations in these areas. It is preferable that the surveys are undertaken on a quarterly basis; however the minimum would be on an annual basis.

Map 6 depicts the four bird census locations.

Refer to Appendix 4 for the initial bird census data.

5.7 Summary of Black Hill's Ecological Values

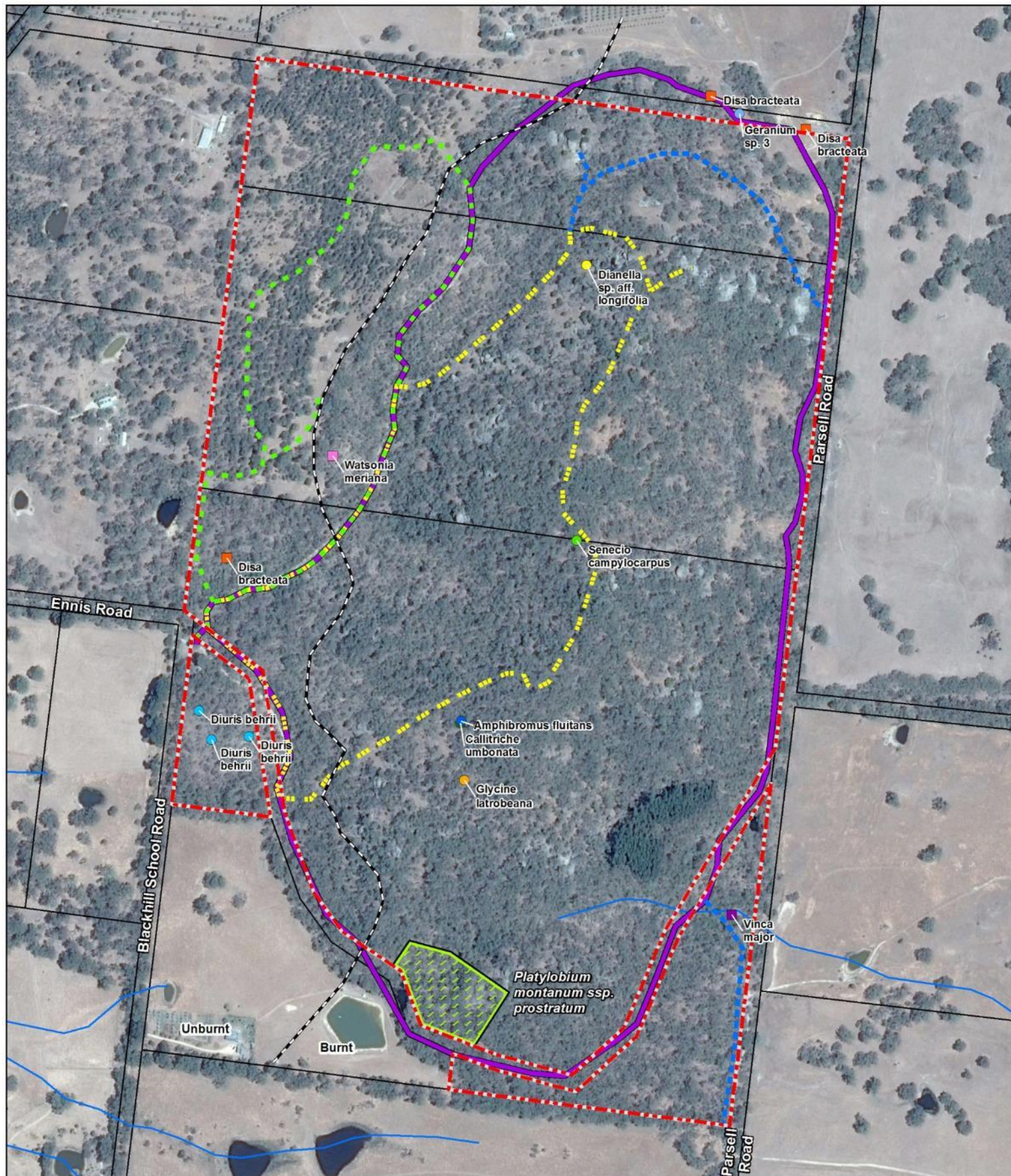
As outlined throughout this Section of the EMP, there are numerous ecological values within Black Hill, with regard to its' landscape/geology, vegetation, flora and fauna species. The following Table provides a summary of the ecological values that are currently known at Black Hill.

It is acknowledged that the bushfire may have impacted on some/many of these values, and that the extent of these impacts is still being determined.

Table 7. Ecological Values of Black Hill

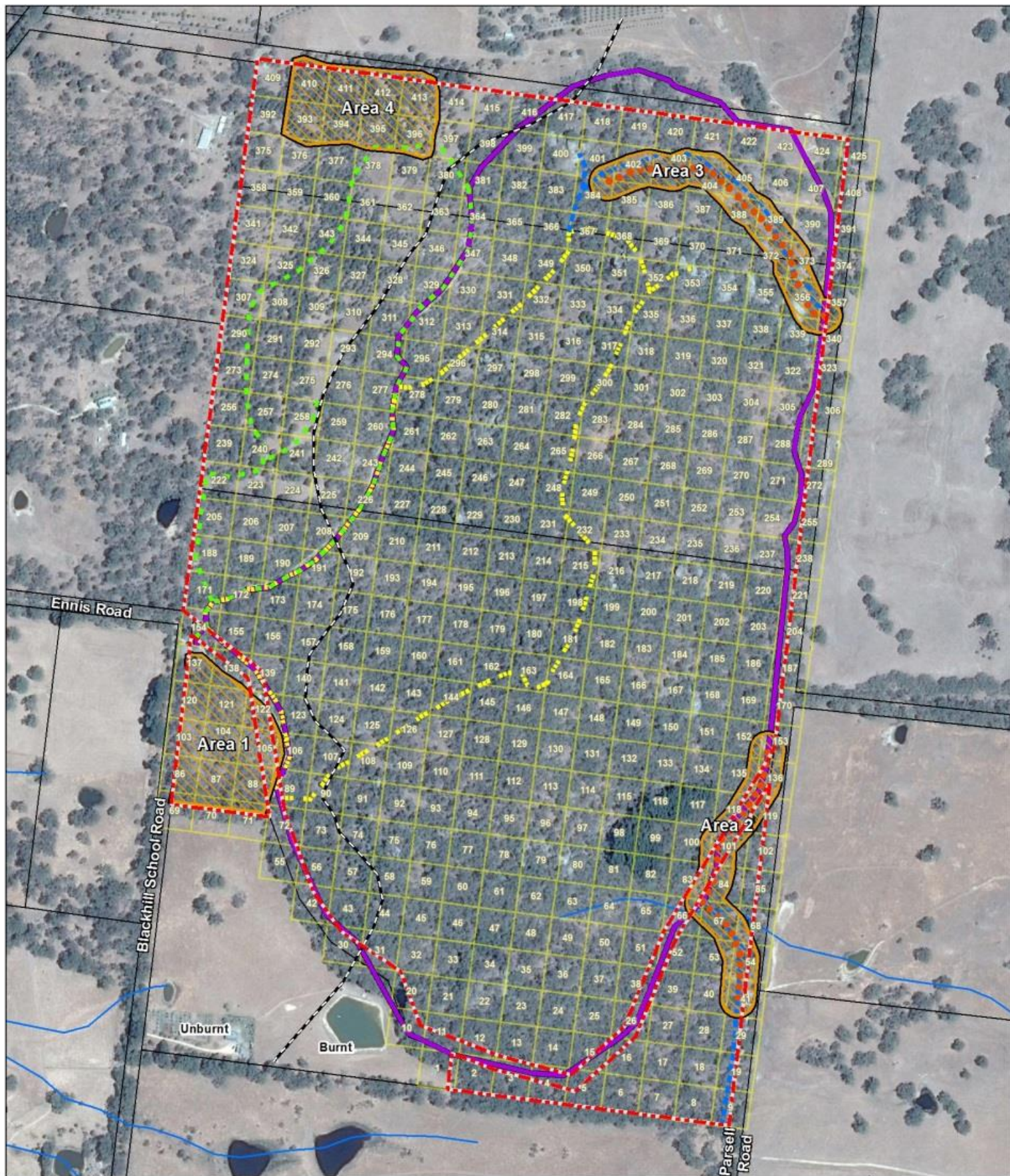
Ecological Value	Status	Location Comments
Geology and Landscape		
Granite outcrops	N/a	Landscape features within the reserve and local area
Dams– permanent	N/a	A series of dams were constructed by the Kyneton Shire in 1964 to attract birds and wildlife that could also be used for fire protection. The permanent dams provide habitat for amphibians and a water source for fauna within and adjacent to the reserve.
Artificial Depressions– ephemeral	N/a	The artificial depressions have resulted from the gravel quarrying. These depressions provide temporary habitat and water, and are also a source of habitat for the regionally significant wetland flora species (refer to Section 3.4.1)
Large Old Trees	N/a	Remnants of the pre-quarrying landscape. Some are still visible growing on 'islands' of the original soil level prior to the quarrying, depicting the depth of the quarrying around them. Provide habitat for birds, bats and arboreal mammals
Vegetation		
EVC 47: Valley Grassy Forest	Vulnerable in the CVU bioregion	Vegetation growing on the 'shadier/moister' side of the reserve; to the south-west and south
EVC 72: Granitic Hills Woodland	Depleted in the CVU bioregion	Vegetation growing on the ridge and slopes of Black Hill
EVC 172_62: <i>Granitic Grassy Woodland</i>	Endangered in the CVU bioregion	Vegetation growing on the north facing drier slopes to the north, north-east and north-west of Black Hill
Flora		
Arching Flax-lily <i>Dianella sp. aff. longifolia</i> (<i>Benambra</i>)	Vulnerable in Victoria	2 plants growing on the upper slopes of Black Hill near ridge and the Northern Lookout
Prostrate Mountain Flat-pea <i>Platylobium montanum ssp. prostratum</i> ,	Poorly known in Victoria	6 scattered plants growing amongst the main wildflower patch in the south-west of the reserve
Floodplain Fireweed <i>Senecio campylocarpus</i> .	Rare within Victoria	1 plant growing near the ridge line, in an atypical place for a wetland species

Ecological Value	Status	Location Comments
Clover Glycine <i>Glycine latrobeana</i>	Vulnerable in Victoria Listed under the State FFG Act Vulnerable under the Commonwealth EPBC Act	Growing near ridge Potentials threats from weeds and rabbit/hare grazing
Golden Cowslips <i>Diuris behrii</i>	Vulnerable in Victoria	At least three plants/growing in three locations Growing near front entrance to reserve
Pale-flower Crane's-bill <i>Geranium sp., 3</i>	Rare in Victoria	One plant Growing near northern end of reserve
River Swamp Wallaby-grass <i>Amphibromus fluitans</i>	Vulnerable under the Commonwealth EPBC Act	Growing in depression to the south of the ridge track near the Winged Star-wort
Winged Star-wort <i>Callitriche umbonata</i>	Rare in Victoria	Growing to the south of the ridge track near the River Swamp wallaby-grass
Fauna– Threatened Species		
Brown Treecreeper <i>Climacteris picumnus victoriae</i>	Near threatened in Victoria.	Resident within the reserve, that utilises the nestboxes.
Powerful Owl <i>Ninox strenua</i>	Vulnerable in Victoria Listed under the FFG Act (1988)	All wooded habitat
Rainbow Bee-eater <i>Merops ornatus</i>	Listed as a Migratory species under the EPBC Act	Would be an occasional visitor, as it is a migratory species.
Brush-tailed Phascogale <i>Phascogale tapoatafa</i>	Vulnerable in Victoria	Areas with larger, older trees, logs, hollows and crevices Also recorded within the most recent revegetation area in the north-west of the reserve.
Fauna–Iconic Species		
Koala <i>Phascolarctos cinereus</i>	Not listed as threatened in Victoria	Population has persisted, but numbers have been variable over the years.
Common Wombat <i>Vombatus ursinus</i>	Not listed as threatened in Victoria	One wombat was recently sighted in the remote cameras that have been established within the reserve (early 2016)



Disclaimer












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Legend

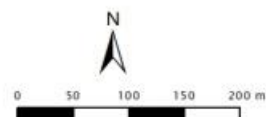
- | | |
|--|--|
|  Black Hill Reserve | Tracks |
|  Parcels |  Circuit track |
|  Watercourse |  Link track |
|  Fire Boundary |  Revegetated area track |
|  50m grid |  Ridge track |
|  Bird survey areas | |
|  Bird survey tracks | |

Details

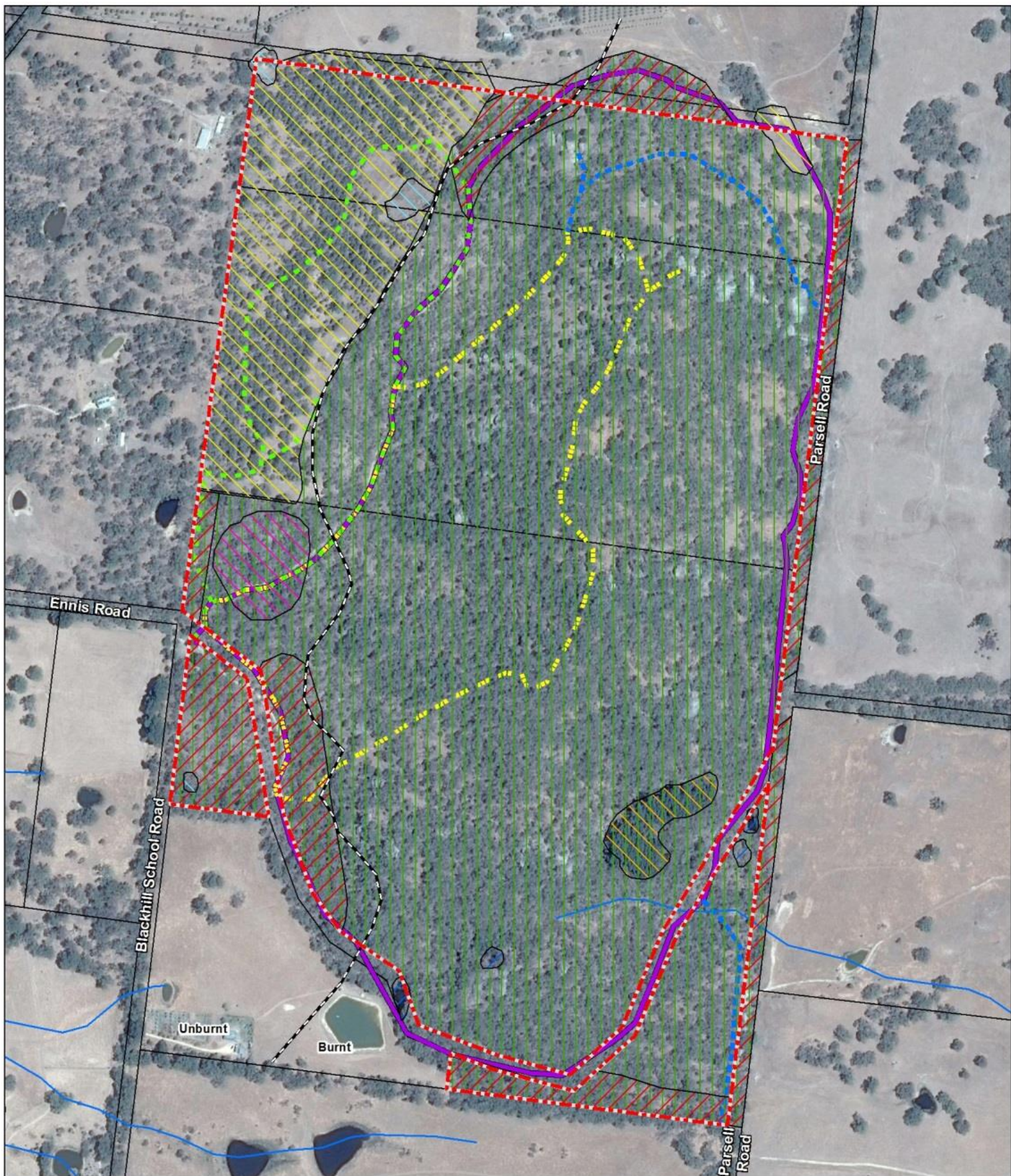
Data Source: Base layers courtesy of VicMap, Copyright © State of Victoria. Aerial photography from Google Earth Pro

Date: 23/02/2016

Map 6. Bird Census Black Hill Reserve











Scale 1:4,750 (Page size A3)



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Legend

-  Black Hill Reserve
-  Parcels
-  Watercourse
-  Fire Boundary
- Tracks**
-  Circuit track
-  Link track
-  Revegetated area track
-  Ridge track

Fauna habitat

-  Remnant vegetation and older native plantings
-  Younger revegetation
-  Hollow trees
-  Melaleuca thicket
-  Pines
-  Ephemeral wetland
-  Permanent wetland

Details

Data Source: Base layers courtesy of VicMap, Copyright © State of Victoria. Aerial photography from Google Earth Pro

Date: 23/02/2016

Map 7. Fauna Habitat Assessment Black Hill Reserve



0 50 100 150 200 m

Scale 1:4,750 (Page size A3)

6. PEST PLANTS AND ANIMALS

Pest plant and animals play a significant role in Victoria's natural bushland environments and agricultural industry and as a result have received equally significant attention from both government and non-government sectors. Black Hill Bushland Reserve is located in a fragmented and predominantly cleared rural landscape and the impacts of pest plants and animals on the reserve's ecological values will require a strategic on-going management commitment. Management actions at the reserve should be well defined and targeted to ensure successful treatment is achieved. The impacts of both pest plant and pest animal can often be hard to recognise and hard to measure, therefore it is often to take into consideration a range of information pertaining to a functioning ecosystem before making decisions regarding suitable management.

This section of the EMP outlines and discusses the pest plant and animal issues at Black Hill. It also provides a series of management recommendations for the reserve.

6.1 Pest Plants

Background

The site assessments of Black Hill revealed that the majority of the reserve has been subject to past land disturbance which has had a major impact on the flora within the reserve. The 2015 bushfire has also impacted on plant growth and in many areas of the reserve it was difficult to determine whether regenerating woody species were from indigenous or planted native stock. As a result most regenerating trees and shrubs were not identifiable in the burnt areas of the reserve.

As outlined previously, Black Hill is a bushland reserve with a mixture of remnant vegetation, planted Australian and Victorian native flora species and indigenous revegetation. This mixture is primarily a response to controlling erosion from the former quarrying activities, and it is also attributable to the long history of revegetation within the reserve (which began in the 1960's) and it also reflects changes in 'landscaping fashion' with regards to the use of native versus indigenous flora species.

As a result, there are large areas of the reserve that are dominated by variety of native tree and shrub species that did not naturally occur in the area. These species have regenerated and spread across the reserve resulting in an increased density of canopy and shrub species. Due to these factors, and that the mixture of remnant and planted woody vegetation has created a large variety of habitats which supports a larger diversity of fauna species, careful decisions need to be made regarding what is and is not a woody pest plant in the context of the current Black Hill landscape.

Non-planted invasive woody weed species were found sparsely throughout the reserve due to the on-going weed control efforts of the Council and the Friends of Black Hill community group. These include Blackberry, Gorse, Hawthorn, Horehound and Sweet Briar.

There are numerous grassy and herbaceous weed species within the reserve and as such there were many areas that were dominated by these weeds. Species of significance in this category include and is not limited to Slender Thistle, Spear Thistle, Skeleton Weed and Wild Watsonia.

Determining Pest Plant Species at Black Hill

The approach to determining pest plant species in Black Hill has been based on several approaches:

- Any exotic species (trees, shrubs and grasses/herbaceous); including those listed under the CaLP Act; are considered to be pest plants
 - Some exotic plants are more invasive than others, so the priority is on the invasive exotic species
- For the planted native species, their 'weediness' was determined based on their location in the reserve, and their level of invasiveness, as determined through literature (Carr et al, 1992).
- With regards to location, the indigenous ground storey vegetation mapping was utilised to define the 'better' and 'worst' quality bushland areas across the reserve
- With regards to invasiveness, the level of invasiveness was determined based on a planted natives' known ability to spread and structurally dominate remnant bushland

The 2015 bushfire through thinning the vegetation in the reserve has provided an opportunity to control invasive native species in the areas of the reserve with greater than 50% indigenous ground storey vegetation cover. This opportunity should be capitalised upon, before the regeneration of trees/shrubs becomes too thick or the regenerating plants grow too high (greater than 1 to 2 metres high).

Current Weed Control Works

Council and the Friends group have undertaken weed control works with a heavy focus on Gorse **Ulex europaeus*, and the bulbous Wild Watsonia * *Watsonia meriana* var. *bulbillifera*. There are very few exotic woody or bulbous weed species in the reserve, aside from a few small regenerating patches. This indicates that, to date, the woody weed control works have been effective.

Council records indicate Gorse control has occurred since 2004. In recent years, Council has focused on the larger patches of gorse on the North-east fence line of the reserve. The follow-up weed spraying of gorse has occurred in the unburnt area near the front entrance of the reserve heading north towards the revegetation area.

Neither the Council nor the Friends Group have undertaken any grassy/herbaceous weed control works, and in the areas of the reserve with greater than 50% indigenous ground storey vegetation cover, it is the weedy grasses/herbaceous species that pose the greatest threat to indigenous vegetation such as the wildflowers, lilies and orchids.

Weed Prioritisation Categories

All of the exotic, and some naturalised, species recorded at Black Hill through the site assessments, and from the known planted native species (Pictor 1987), have been compiled into Table 8.

Table 8 summarises the following information:

- Lifeform of each of these species (tree, shrub, grass, herb, thistle, lily, orchid, scrambler/climber or bulbous species),

- Weed category, utilising the weed categories outlined in Section 3.5, and also repeated at the bottom of Table 8,
- The environmental weed status of the naturalised native plant species according to Carr et al. (1992), and
- Provides an indication whether the more invasive weed species (K, S1 and S2) should be controlled across the reserve or only in areas mapped as containing Higher Quality Bushland.

Overall the weed categorisation of the reserve from the 2015 flora survey identified:

- **(K)** – Three Keystone species – all exotic grass species that structurally dominate large areas of the reserve, especially those areas mapped as containing less than 50% indigenous ground storey vegetation cover
- **(S1)** – Fifteen S1 species, that is weedy species that are listed under the CaLP Act, or serious invasive weeds that are in such low numbers that they can be easily eradicated from the reserve
- **(S2)** – 27 S2 species, that is weedy species that are also a priority for control, but they are more widespread within the reserve, or planted native species that should be eliminated from the areas of the reserve with greater than 50% indigenous ground storey vegetation cover, whilst the opportunity exists and they mostly consist of regenerating trees/shrubs after the bushfire, and
- **(U)** – The remainder (49) species are considered to be ubiquitous, widespread mostly exotic grasses and herbaceous species that are not highly invasive, that are growing amongst indigenous species, and controlling them may lead to more damage towards the surrounding vegetation.

A further 24 exotic species were added to the weed species list from the 2016 flora survey. The weed prioritisation for these species has been added to the end of Table 8. Of the additional 24 species, six were identified as S2 species and the remaining 18 were identified as Ubiquitous species.

The aim of the weed prioritisation is not to imply some weeds are not worthy of controlling, but to highlight the higher from the lower priorities for control.

Table 8. Weed Prioritisation at Black Hill

Origin	Scientific Name	Common Name	Lifeform	Weed Category	Carr et al. (Risk category)	Applicable to?	
						Entire Reserve	Higher Quality Bushland Zone only
#	<i>Acacia baileyana</i>	Cootamundra Wattle	Shrub	S2	V	–	Yes
#	<i>Acacia floribunda</i>	White Sallow-wattle	Shrub	S2	P	–	Yes
#	<i>Acacia howittii</i>	Sticky Wattle	Shrub	S2		–	Yes
#	<i>Acacia longifolia</i> subsp. <i>Longifolia</i>	Sallow Wattle	Shrub	S2	V	–	Yes
#	<i>A. longifolia</i> subsp. <i>sophorae</i>	Coast Wattle	Shrub	S2	V	–	Yes
#	<i>Acacia pravissima</i>	Ovens Wattle	Shrub	S2	V	–	Yes
*	<i>Acacia prominens</i>	Gosford Wattle	Shrub	S2	S	–	Yes
#	<i>Acacia provincialis</i>	Wirilda	Shrub	S2	–	–	Yes

Origin	Scientific Name	Common Name	Lifeform	Weed Category	Carr et al. (Risk category)	Applicable to?	
						Entire Reserve	Higher Quality Bushland Zone only
#	<i>Acacia terminalis</i>	Sunshine Wattle	Shrub	S2	–	–	Yes
*	<i>Acetosella vulgaris</i>	Sheep Sorrel	Herb	U	–	–	–
*	<i>Agrostis capillaris</i> var. <i>capillaris</i>	Brown-top Bent	Grass	K	–	Yes	–
*	<i>Aira caryophyllea</i> subsp. <i>caryophyllea</i>	Silvery Hair-grass	Grass	U	–	–	–
*	<i>Aira cupaniana</i>	Quicksilver Grass	Grass	U	–	–	–
*	<i>Aira elegantissima</i>	Delicate Hair-grass	Grass	U	–	–	–
*	<i>Anagallis arvensis</i> var. <i>arvensis</i>	Scarlet Pimpernel	Herb	U	–	–	–
*	<i>Anagallis arvensis</i> var. <i>caerulea</i>	Blue Pimpernel	Herb	U	–	–	–
*	<i>Anthoxanthum odoratum</i>	Sweet Vernal-grass	Grass	K	–	Yes	–
*	<i>Aphanes arvensis</i>	Parsley Piert	Herb	U	–	–	–
*	<i>Arctotheca calendula</i>	Cape Weed	Herb	S2	–	–	Yes
*	<i>Avena barbata</i>	Bearded Oat	Grass	U	–	–	–
*	<i>Briza maxima</i>	Large Quaking-grass	Grass	K	–	Yes	–
*	<i>Briza minor</i>	Lesser Quaking-grass	Grass	U	–	–	–
*	<i>Bromus diandrus</i>	Great Brome	Grass	U	–	–	–
*	<i>Bromus hordeaceus</i> subsp. <i>hordeaceus</i>	Soft Brome	Grass	U	–	–	–
*	<i>Bromus rubens</i>	Red Brome	Grass	U	–	–	–
#	<i>Callistemon citrinus</i>	Crimson Bottlebrush	Shrub	U	–	–	–
	<i>Callistemon rugulosus</i>	Scarlet Bottlebrush	Shrub	U	P	–	–
*	<i>Carduus tenuiflorus</i>	Winged Slender-thistle	Thistle	S1	–	Yes	–
*	<i>Centaurium erythraea</i>	Common Centaury	Herb	U	–	–	–
*	<i>Cerastium glomeratum</i> s.l.	Common Chickweed	Herb	U	–	–	–
*	<i>Chondrilla juncea</i>	Skeleton Weed	Herb	S1	–	Yes	–
*	<i>Cicendia quadrangularis</i>	Square Cicendia	Herb	U	–	–	–
*	<i>Cirsium vulgare</i>	Spear Thistle	Thistle	S1	–	Yes	–
*	<i>Conyza bonariensis</i>	Flaxleaf Fleabane	Herb	U	–	–	–
*	<i>Crataegus monogyna</i> subsp. <i>monogyna</i>	Hawthorn	Shrub	S1	–	Yes	–
*	<i>Cynosurus echinatus</i>	Rough Dog's-tail	Grass	U	–	–	–
*	<i>Cyperus eragrostis</i>	Drain Flat-sedge	Sedge	U	–	–	–
*	<i>Disa bracteata</i>	South African Orchid	Orchid	S1	–	Yes	–
*	<i>Erodium botrys</i>	Big Heron's-bill	Herb	U	–	–	–
#	<i>Eucalyptus globulus</i> subsp. <i>globulus</i>	Southern Blue-gum	Tree	U	–	–	Yes
#	<i>Eucalyptus leucoxydon rosea</i>	Red-flowered Yellow-Gum	Tree	U	N	–	Yes
#	<i>Eucalyptus tricarpa</i> subsp. <i>tricarpa</i>	Red Ironbark	Tree	U	–	–	Yes
*	<i>Gamochaeta purpurea</i> s.l.	Purple Cudweed	Herb	U	–	–	–
*	<i>Gladiolus undulatus</i>	Wild Gladiolus	Bulbous	S1	–	Yes	–
*	<i>Grevillea hybrids</i>	Grevillea hybrids	Shrub	S2	–	–	Yes
#	<i>Grevillea rosmarinifolia</i>	Rosemary Grevillea	Shrub	S2	S	–	Yes

Origin	Scientific Name	Common Name	Lifeform	Weed Category	Carr et al. (Risk category)	Applicable to?	
						Entire Reserve	Higher Quality Bushland Zone only
#	<i>H. drupacea</i>	Sweet Hakea	Shrub	S2	V	–	Yes
#	<i>Hakea salicifolia</i>	Willow-leaf Hakea	Shrub	S2	V	–	Yes
#	<i>H. sericea s.l.</i>	Bushy Needlewood	Shrub	S2	S	–	Yes
*	<i>Holcus lanatus</i>	Yorkshire Fog	Grass	U	–	–	–
*	<i>Hordeum glaucum</i>	Northern Barley-grass	Grass	U	–	–	–
*	<i>Hypochaeris glabra</i>	Smooth Cat's-ear	Herb	U	–	–	–
*	<i>Hypochaeris radicata</i>	Flatweed	Herb	U	–	–	–
*	<i>Isolepis hystrix</i>	Awed Club-sedge	Sedge	U	–	–	–
*	<i>Isolepis levynsiana</i>	Tiny Flat-sedge	Sedge	U	–	–	–
*	<i>Juncus capitatus</i>	Capitate Rush	Rush	U	–	–	–
#	<i>Kunzea ericoides spp. agg.</i>	Burgan	Shrub	S1	–	–	Yes
*	<i>Lactuca serriola</i>	Prickly Lettuce	Herb	U	–	–	–
*	<i>Leontodon taraxacoides subsp. taraxacoides</i>	Hairy Hawkbit	Herb	U	–	–	–
*	<i>Lolium perenne var. perenne</i>	Perennial Rye-grass	Grass	U	–	–	–
#	<i>M. armillaris subsp. armillaris</i>	Giant Honey-myrtle	Shrub	S2	V	–	Yes
#	<i>Melaleuca decussata</i>	Totem-poles	Shrub	S2	S	–	Yes
	<i>Melaleuca hypericifolia</i>	Hillock Bush	Shrub	S2	S	–	Yes
#	<i>Melaleuca parvistaminea</i>	Rough-barked Honey-myrtle	Shrub	S2	–	–	Yes
#	<i>Melaleuca styphelioides</i>	Prickly Paperbark	Shrub	S2	–	–	Yes
*	<i>Moenchia erecta</i>	Erect Chickweed	Herb	U	–	–	–
*	<i>Oxalis articulata</i>	Sourgrass	Herb	U	–	–	–
*	<i>Petrorhagia dubia</i>	Velvety Pink	Herb	U	–	–	–
*	<i>Phalaris aquatica</i>	Toowoomba Canary grass	Grass	S2	–	–	Yes
*	<i>Pinus radiata var. radiata</i>	Radiata Pine	Tree	S2	–	Yes	–
*	<i>Plantago lanceolata</i>	Ribwort	Herb	U	–	–	–
*	<i>Poa bulbosa var. bulbosa</i>	Bulbous Meadow-grass	Grass	U	–	–	–
*	<i>Prunus cerasifera</i>	Cherry Plum	Shrub	S2	–	–	Yes
*	<i>Romulea minutiflora</i>	Small-flower Onion-grass	Lily	U	–	–	–
*	<i>Romulea rosea</i>	Common Onion-grass	Lily	U	–	–	–
*	<i>Salix cinerea</i>	Grey Sallow	Tree	S1	–	Yes	–
*	<i>Solanum nigrum s.l.</i>	Black Nightshade	Herb	U	–	–	–
*	<i>Sonchus asper s.s.</i>	Rough Sow-thistle	Thistle	U	–	–	–
*	<i>Sonchus oleraceus</i>	Common Sow-thistle	Thistle	U	–	–	–
*	<i>Stellaria media</i>	Chickweed	Herb	U	–	–	–
*	<i>Trifolium arvense var. arvense</i>	Hare's-foot Clover	Herb	U	–	–	–
*	<i>Trifolium campestre var. campestre</i>	Hop Clover	Herb	U	–	–	–
*	<i>Trifolium cernuum</i>	Drooping-flower Clover	Herb	U	–	–	–
*	<i>Trifolium dubium</i>	Suckling Clover	Herb	U	–	–	–
*	<i>Trifolium glomeratum</i>	Cluster Clover	Herb	U	–	–	–
*	<i>Trifolium subterraneum</i>	Subterranean Clover	Herb	U	–	–	–

Origin	Scientific Name	Common Name	Lifeform	Weed Category	Carr et al. (Risk category)	Applicable to?	
						Entire Reserve	Higher Quality Bushland Zone only
*	<i>Ulex europaeus</i>	Gorse	Shrub	S1	–	Yes	–
*	<i>Vellereophyton dealbatum</i>	White Cudweed	Herb	U	–	–	–
*	<i>Vicia sativa subsp. nigra</i>	Narrow-leaf Vetch	Herb	U	–	–	–
*	<i>Vinca major</i>	Blue Periwinkle	Scrambler	S1	–	Yes	–
*	<i>Vulpia bromoides</i>	Squirrel-tail Fescue	Grass	S2	–	Yes	–
*	<i>Vulpia myuros f. myuros</i>	Rat's-tail Fescue	Grass	S2	–	Yes	–
*	<i>Watsonia meriana</i> var. <i>bulbillifera</i>	Bulbil Watsonia	Bulbous	S1	–	Yes	–
Weed Species added from the 2016 Flora Survey							
#	<i>Acacia pravissima</i>	Ovens Wattle	Shrub	S2	–	–	Yes
#	<i>Dodonaea viscosa subsp. cuneata</i>	Wedge-leaf Hop-bush	Shrub	S2	–	–	Yes
#	<i>Melaleuca armillaris subsp. armillaris</i>	Giant Honey-myrtle	Shrub	S2	–	–	Yes
*	<i>Agrostis stolonifera</i>	Creeping Bent	Grass	U	–	–	–
*	<i>Bromus madritensis</i>	Madrid Brome	Grass	U	–	–	–
*	<i>Callitriche palustris</i> var. <i>palustris</i>	Swamp Water-starwort	Herb	U	–	–	–
*	<i>Cardamine hirsuta s.l.</i>	Common Bitter-cress	Herb	U	–	–	–
*	<i>Cerastium comatum</i>	Levantine Mouse-ear Chickweed	Herb	U	–	–	–
*	<i>Cicendia filiformis</i>	Slender Cicendia	Herb	U	–	–	–
*	<i>Crassula alata</i> var. <i>alata</i>	Three-part Crassula	Herb	U	–	–	–
*	<i>Crassula natans</i> var. <i>minus</i>	Water Crassula	Herb	U	–	–	–
*	<i>Galium aparine</i>	Cleavers	Herb	U	–	–	–
*	<i>Galium murale</i>	Small Goosegrass	Herb	U	–	–	–
*	<i>Genista monspessulana</i>	Montpellier Broom	Shrub	S2	–	Yes	–
*	<i>Helminthotheca echioides</i>	Ox-tongue	Herb	U	–	–	–
*	<i>Lamarckia aurea</i>	Golden-top	Herb	U	–	–	–
*	<i>Lathyrus tingitanus</i>	Tangier Pea	Herb	U	–	–	–
*	<i>Myosotis discolor</i>	Yellow-and-blue Forget-me-not	Herb	U	–	–	–
*	<i>Parentucellia latifolia</i>	Red Bartsia	Herb	U	–	–	–
*	<i>Paspalum distichum</i>	Water Couch	Grass	U	–	–	–
*	<i>Poa annua</i>	Annual Meadow-grass	Grass	U	–	–	–
*	<i>Stellaria pallida</i>	Lesser Chickweed	Herb	U	–	–	–
*	<i>Verbascum virgatum</i>	Twiggy Mullein	Herb	S2	–	–	Yes
*	<i>Vicia hirsuta</i>	Tiny Vetch	Grass	S2	–	–	Yes
Key to Weed Categories (Gidja Walker)							
K– Keystone Requires strategic control and habitat replacement for each identified species		S1– Small Patch Highest Priority for Control	S2– Small Patch Second Priority for Control		U– Ubiquitous Scattered weeds of disturbed areas, hard to eliminate. Eliminate in high quality areas, Lower priority across the site		
Key to Weed Categories (Carr et al.)							
V– Very serious threat to one of more vegetation communities in Victoria		S– Serious threat to one of more vegetation communities in Victoria	P– Potential threat to one of more vegetation communities in Victoria		N– Not a threat, but may have negative visual impact		

6.2 CALP Act Weeds

There are a number of invasive weeds listed under the *Catchment and Land Protection (CaLP) Act 1994* growing at Black Hill. Under the CaLP Act declared noxious weeds are categorised; depending on their known and potential impact and specific circumstances for each region; into State Prohibited Weeds (S), Regionally Prohibited Weeds (P), Regionally Controlled Weeds (C) or Restricted Weeds (R).

Table 9 below lists the declared noxious weeds observed at Black Hill.

Table 9. Declared Noxious weeds occurring at Black Hill Reserve

Scientific Name	Common Name	CaLP Act Control Category	Site Weed Prioritisation	Location within Reserve
<i>*Carduus tenuiflorus</i>	Slender Thistle	R	S2	Growing across the reserve, especially on Black Hill
<i>*Chondrilla juncea</i>	Skeleton Weed	R	S1	One plant growing along the ridge, near the summit
<i>*Cirsium vulgare</i>	Spear Thistle	C	S2	Growing across the reserve, especially on Black Hill
<i>*Crataegus monogyna</i>	Hawthorn	R	S1	A few small, scattered plants on the lower slopes in the north-west and northern parts of the reserve
<i>*Salix spp.</i>	Willow	R	S1	A few plants growing around one of the dams on the eastern perimeter of the reserve near the pine plantation
<i>*Ulex europaeus</i>	Gorse	C	S1	Small patches across the reserve; mostly controlled but there is some regeneration
<i>*Watsonia meriana var. bulbillifera</i>	Wild Watsonia	R	S1	Small patches; mostly at the northern end of the reserve

6.3 Pest Animals

It can be assumed that pest animals, particularly foxes, rabbit and rodents, have been utilising Black Hill Reserve since their introduction over a century ago. However, only until recently has the MRSC begun to collect and collate a formalised dataset for purposes of environmental management. This data has been collected through use of remote cameras, spotlight nights and incidental observations. Information for this Environmental Management Plan was gathered during consultation with MRSC staff, the Friends Group and through incidental observations. The main pest animals identified within the Reserve, and some information about them, is provided below.

Pest Animal	General Information pertaining to Reserve
Rabbits	In recent times rabbits have been recorded exclusively in the northern half of the reserve, particularly within the revegetated area (north-west corner) and along the northern boundary fence. Anecdotal evidence suggests rabbits are found in neighbouring properties as well as the broader surrounding area. Surveys have historically included spotlighting and daytime mapping of scratchings, latrines ('buck heaps') and warrens across the Reserve. It is possible rabbits are not as currently prevalent due to the paucity of vegetation after the bushfire. Rabbit control was conducted at the reserve by MRSC in 2015 and 2016 (MRSC 2015).
European Hare	Hares have a fluctuating population within the reserve. Currently (January 2016), there has been an explosion in the population, however it is expected that the population will decrease. Hares are not considered to be a major problem within the reserve by the Friends Group (meeting with Friends Group 29/01/2016).
Feral cats	The occasional feral cat has been observed within the reserve by members of the Friends Group and on remote cameras installed by Council.
Dogs	Unaccompanied domestic dogs are known to enter the reserve on occasion, and at night, as observed by members of the Friends Group. Unaccompanied domestic dogs have been known to attack wildlife and are considered problematic (meeting with Friends Group 29/01/2016). No wild dogs have been recorded at the reserve.
Rodents	Rodents are common near the outcrops of boulders where shelter can be obtained among the numerous small crevices found among the rocks (Pricor, 1987).
Red Fox	Foxes are known predators of native animals and known spreaders of weed seeds. They have a huge impact on native fauna across the State. According to data from the MRSC (2015), Red foxes are high in numbers and active in all areas of the reserve. The level of impact they have at the reserve is yet to be determined as data collection is ongoing and in perpetuity.
Feral Pig	A piglet was captured in the reserve in early 2015 (MRSC 2015), however there is no other evidence to suggest feral pigs are utilising the reserve.
Exotic birds	Exotic birds such as Blackbirds have only been observed in small numbers at the Reserve, mainly around the picnic areas/main entrance of the Reserve. These birds are associated with urban areas. As a rural bushland Reserve they are not expected to be in large numbers or to cause major impacts. However their numbers should be monitored to determine if they are increasing in population size. If they are, then they should be controlled before they become problematic.
European Honey Bee	European Honey Bees have been observed at the reserve. These bees can have negative impacts on biodiversity by occupying habitat hollows and compete with native pollinators for pollen.

Pest Animal	General Information pertaining to Reserve
European Wasp	European Wasps have been a problem in recent years in the Kyneton area. Populations can fluctuate according to the seasonal conditions.

Control Programs

Rabbit control programs have been undertaken in the reserve and surrounding road reserves over the last few years, which involved fumigating and closing their warrens.

A non-poison fox baiting program has also been conducted over 2015 and 2016 to assess whether fox baits would be taken by native fauna or not. During this trial no baits were taken by native fauna.

At this stage, no control programs are being undertaken for other pest animal species.

7. CLIMATE VARIABILITY

Managing the impacts of climate change is a challenge for all land managers, impacting species distribution and abundance as well as ecosystem processes. The North Central region is projected to experience hotter, drier weather in the future. Depending on the level of greenhouse gas emissions experienced, average temperature increases of 1.3° C to 2.6° C are expected with 6% to 11% reduced rainfall (Victorian State Government, 2014).

This change in climactic conditions is likely to alter the spread and density of flora and fauna species, including weeds and pest animals. While some species will decline or disappear, others will prosper and spread. Changes to rainfall will impact creeks and rivers, as well as associated aquatic life. The hotter, drier conditions are also likely to result in more frequent, high severity fires; while changes in rain patterns could result in more intense storm events.

An adaptive management framework will assist Council to respond to the changing conditions. This involves implementing a comprehensive and robust monitoring framework that enables Council to identify changes in biodiversity values and develop management actions that respond to new threats identified.

Black Hill Reserve with its' diversity of indigenous and planted native flora species is an ideal reserve to be utilised to monitor the suitability of different native flora species from different climatic regions of Australia, in the North central region. One issue with this is that the records regarding the specific locality of most of the planted species have probably been lost through time, so no research would have complete data.

8. FIRE MANAGEMENT AND RECOVERY

The need for fire risk management is integral to the overall management of Black Hill, especially considering the recent January 2015 bushfire that impacted approximately 80% of the reserve.

According to local knowledge, there has been several major bushfires in the local area in 1865, 1918, 1922 and 1944 (Pictor 1987). It is not known whether these bushfires impacted the reserve or not. The January 2015 bushfire was ignited by a lightning strike that burnt approximately 80% of the reserve, with only a thin strip along the north-west, west and south-west perimeters remaining unburnt.

Most recently, another bushfire in January 2016, burnt 110 hectares, within one kilometre of the reserve along and around Blackhill School Road, just to the south of the reserve.

Approximately 90% of the reserve is covered by a *Bushfire Management Overlay (BMO)*. The BMO seeks to reduce the risk to life and property by requiring vegetation modification and use of specific construction standards within areas deemed “defendable space”. Aside from the picnic shelters and park furniture located near the main reserve entrance off Blackhill School Road, there are no other structures within Black Hill reserve. There are several private dwellings located in the adjacent properties.

As the BMO is concerned with implementing bushfire protection measures through vegetation modification and specific construction methods, it is not that relevant to the general bushfire management of Black Hill. If there are ever any plans to construct a building within the reserve, then the requirements of the BMO will be relevant.

The reserve is vulnerable to bushfires, and there is nothing that can be done to eliminate the possibility that another bushfire will occur in the reserve. Therefore this section is concerned with implementing fuel management measures, and in providing information to assist in bushfire recovery based on the vegetation types recorded within the reserve, and their benchmark fuel loads.

8.1 Bushfire Recovery

As the reserve was not viewed prior to the 2015 bushfire, this EMP cannot comment on whether the vegetation within the reserve will regenerate as it was prior to the bushfire. It was evident from talking to the Friends Group, that there is some concern that the trees and shrubs in some areas are not regenerating as thickly as they were prior to the bushfire.

What the EMP can comment upon, it that regeneration of ground storey, shrub and tree species is occurring across the reserve; and that in some areas it appears that the regeneration of woody species will be quite dense in the next 5 to 10 years. There are also other areas of the reserve that are not currently regenerating as densely.

It appears that the difference between the density of regeneration corresponds with the areas of the reserve that have retained more intact (not regenerating as densely) remnant vegetation, and the areas of the reserve that were more impacted by the gravel quarrying and were planted with native species (regenerating densely).

Considering these correlations between the higher and lower quality indigenous ground storey vegetation cover areas of the reserve, and the general density of post-fire regeneration, the opportunity now exists

to manage the bushfire recovery across the reserve according to EVCs, especially with regard to tree density and recruitment benchmarks, along with benchmark fuel loads.

The bushfire has provided the opportunity to make some decisions regarding the future direction of bushland management across the reserve, including:

- Should regenerating non-indigenous vegetation (from former planted stock) be removed in some areas of the reserve?
- Should only indigenous species be planted in the future?
- Should there be a moratorium on planting in the reserve (in the burnt areas) for the next 5 years to assess the regeneration before making any planting decisions?

To provide data on these management considerations, monitoring plots should be established across the different landscapes and indigenous ground storey vegetation quality areas of the reserve, to measure the density of regeneration (ground storey, shrub and tree layers), the species present (indigenous, naturalised/planted stock or exotic), and the percentage cover of the species present. This data should provide the information needed, on which to base these decisions.

This data can be collected in the plots that have already been established by the Council (refer to the Flora Monitoring section below), or additional plots can be established.

Some background information to consider with regards to bushfire recovery management includes:

EVC Benchmarks

Benchmark information with regard to the Large Old Tree density and percentage Tree Canopy Cover for the three EVCs present within the reserve is presented in Table 10. This information suggests that most of the reserve is likely to have had a low and open tree cover, as a result of the dry conditions and poor soil conditions.

In the higher quality bushland areas of the reserve, if there are no erosion issues, the opportunity now exists to achieve the open bushland cover that is likely to have occurred in the past, by removing regenerating native tree and shrub species.

Table 10. Tree and Canopy Cover Benchmark Densities at Black Hill

EVC No.	EVC	Large Tree Density (per Hectare)	Tree Canopy Cover (%)	DELWP Benchmark Description
47	Valley Grassy Forest	20 trees with a dbh > 70cm/hectare	20%	Open forest to 25m tall may carry a variety of eucalypts, usually species that prefer more moist or more fertile conditions over a sparse shrub cover (DSE 2004).
72	Granitic Hills Woodland	15 trees with a dbh > 60cm/hectare	15%	Mainly restricted to granite outcrops and structurally consist of a low woodland to 10m high with the dominant trees often being stunted (DSE 2004).
175_62	Granitic Grassy Woodland	15 trees with a dbh > 70cm/hectare	15%	A variable eucalypt woodland or open forest to 15m tall over a distinct large and medium shrub layer and diverse ground layer of grasses and herbs (DSE 2004).

Flora Monitoring

Flora monitoring was also started at Black Hill Reserve in the immediate post-fire period. Five sites were selected in unburnt, low intensity burnt and high intensity burnt areas. Indigenous and introduced species were identified and recorded in 2 x 10 metre quadrats. All flora species within the plots were recorded, along with the percentage cover for each species. The plants recorded at each site will be monitored for species richness post fire and for any change in density cover over time.

Due to the differences in fire severity throughout the reserve, it is hoped these observational changes will demonstrate flora recovery after the fire event. It is expected that the most severe fire affected areas will regenerate at a slower rate than the less intense locations, so the monitoring surveys are carried out 3–4 times a year as seasonal surveys to capture the flowering periods for different flora species.

It is anticipated that the outcomes of the post fire monitoring will show:

- An increase or decrease of species richness based on fire severity
- Any new native or introduced species that have emerged/germinated as a result of the fire
- Changes in recruitment and density of each flora species

No time limit has been set on these surveys as these monitoring plots can be surveyed over longer periods of time.

Weed Management, Flora Monitoring and Revegetation

The under storey across most of the reserve was dominated by Sweet Vernal Grass and Large Quaking Grass prior to the 2015 fire. It was hoped that the fire may have reduced the cover of these species, but post-fire monitoring shows both species are reappearing after the fire. Management of these weeds and other grassy perennial weeds can be prioritized around vegetation quality present in the under storey.

Weed management across Black Hill Reserve requires a weed management strategy alongside a revegetation plan that will focus on improving areas with low quality vegetation by replacing weeds with native species. Weed management requires the removal of naturalised shrubs, and grassy/herbaceous weeds to prevent weeds from establishing within these areas.

The naturalised shrubs within the reserve are mostly considered to be environmental weeds, depending on their level of invasiveness and their ability to alter the vegetation composition. Ideally, some of these weeds would be removed entirely from the reserve over time and gradually replaced with local indigenous species. However there are two main issues associated with this potential management action:

- Large areas of the reserve contain these naturalised species, and it would be very resource intensive to remove and replace them with indigenous species; and
- The reserve supports a diversity of fauna, which may be due to the variety of food resources available indicating that these fauna species have no preference for local Wattles.

It would be detrimental to fauna populations recolonising the burnt areas to remove all the weedy wattles at the same time. Any removal of the naturalised Wattles should be staged and should include revegetation with suitable indigenous species and / or aim to protect the under storey vegetation present.

Council and / or the Friends Group could work towards planting more indigenous under storey species in heavily disturbed areas by experimenting with weed removal and revegetation in strategically located revegetation plots as well as undertaking flora monitoring to better understand how the site is regenerating.

Two planned surveys of the reserve during spring could determine areas suitable for these revegetation plots. These plots should target the removal of weeds and replanting of native grasses. The plots should be about 5 x 10 metres and tagged with a star picket and GPS. These plots do not need to be fenced, as they should be located where there are very few native wild flowers and in areas that are heavily weed infested or contain mainly bare earth. Some of these plots can be located in unburnt areas where there is revegetation or indigenous canopy species, but an absence of native grasses.

The flora monitoring sites should be fenced exclusion plots located on the edges of the higher quality vegetation zones or burnt areas to manage naturalized environmental shrubs, introduced grasses and herbaceous weeds. The monitoring plots could be used to work out a methodology to limit the spread of these weeds but also manage these areas in stages.

All revegetation should be from local indigenous species and the revegetation list should be based on the EVCs identified in the different areas of the reserve.

It is unknown whether the fauna herbivory predation is contributing to the spread of Sweet Vernal Grass, as it is non-palatable. Herbivory predation may be eating the more palatable native species surrounding tussocks of Sweet Vernal Grass, opening up space for the Sweet Vernal to spread and dominate. The fire may have impacted on the Sweet Vernal Grass coverage across the reserve. The monitoring plots will be essential in assessing the change in the under storey vegetation and composition in the short to medium and longer term.

Fuel Types

With regards to fuel loads, EVCs have been categorised into different vegetation categories to express the fuel types (Tolhurst 2007). The fuel types for the EVCs recorded at Black Hill are presented in Table 11 below, along with the fuel characteristics, and the benchmark tonnes/hectare of surface, elevated and bark fuel loads expected within each of the EVCs.

The benchmark fuel load figures indicates that the EVCs present within Black Hill would typically have low elevated (shrub layer) and bark (tree layer) fuel loads, as would be expected in a dry open woodland environment. With the density of regenerating trees/shrubs in some areas of the reserve, it is possible these fuel loads may be exceeded, which should be monitored.

Table 11. Benchmark Fuel Types and Fuel Loads at Black Hill

EVC No.	EVC	Fuel Type	Description	Fuel Characteristics	Surface	Elevated	Bark
47	Valley Grassy Forest	9	Woodland Grass/Herb-rich	Surface fuels dominated by grass and herbs	7.4	0.8	2.4
72	Granitic Hills Woodland	8	Dry Open Forest shrub/herbs	Dry forest with open understorey (northern jarrah)	8.7	1.8	1.8
175_62	Granitic Grassy Woodland	9	Woodland Grass/Herb-rich	Surface fuels dominated by grass and herbs	7.4	0.8	2.4

Post-bushfire Regeneration and Fuel Load Monitoring

Measurements of the surface, elevated and bark fuel should also be undertaken in each of the monitoring plots; that should be established to collect data on bushfire recovery and fuel density at Black Hill. The plots should be monitored at least annually for the next five years (until 2020), before any decisions are made regarding undertaking any further planting within the reserve. If there is still is not clear evidence, the monitoring should continue for another five years beyond 2020.

Due to the complexity of the reserve, and its' previous history of timber and gravel extraction, further planting may be required if the slopes of Black Hill begin to erode. This maybe in direct contrast with the typical densities of vegetation relevant to the three EVCs recorded at Black Hill. This is a management issue that may have to be addressed in the future, and having data on regeneration densities and fuel loads in different areas of the reserve would assist with this decision making.

At this stage, without adequate post-bushfire monitoring data, it is difficult to make bushland management recommendations regarding expected bushfire recovery within the reserve.

To provide contrasting data, some monitoring plots should also be established in the unburnt areas of the reserve, to determine if regeneration loads are beyond the vegetation density that occurred in the reserve prior to the 2015 bushfire.

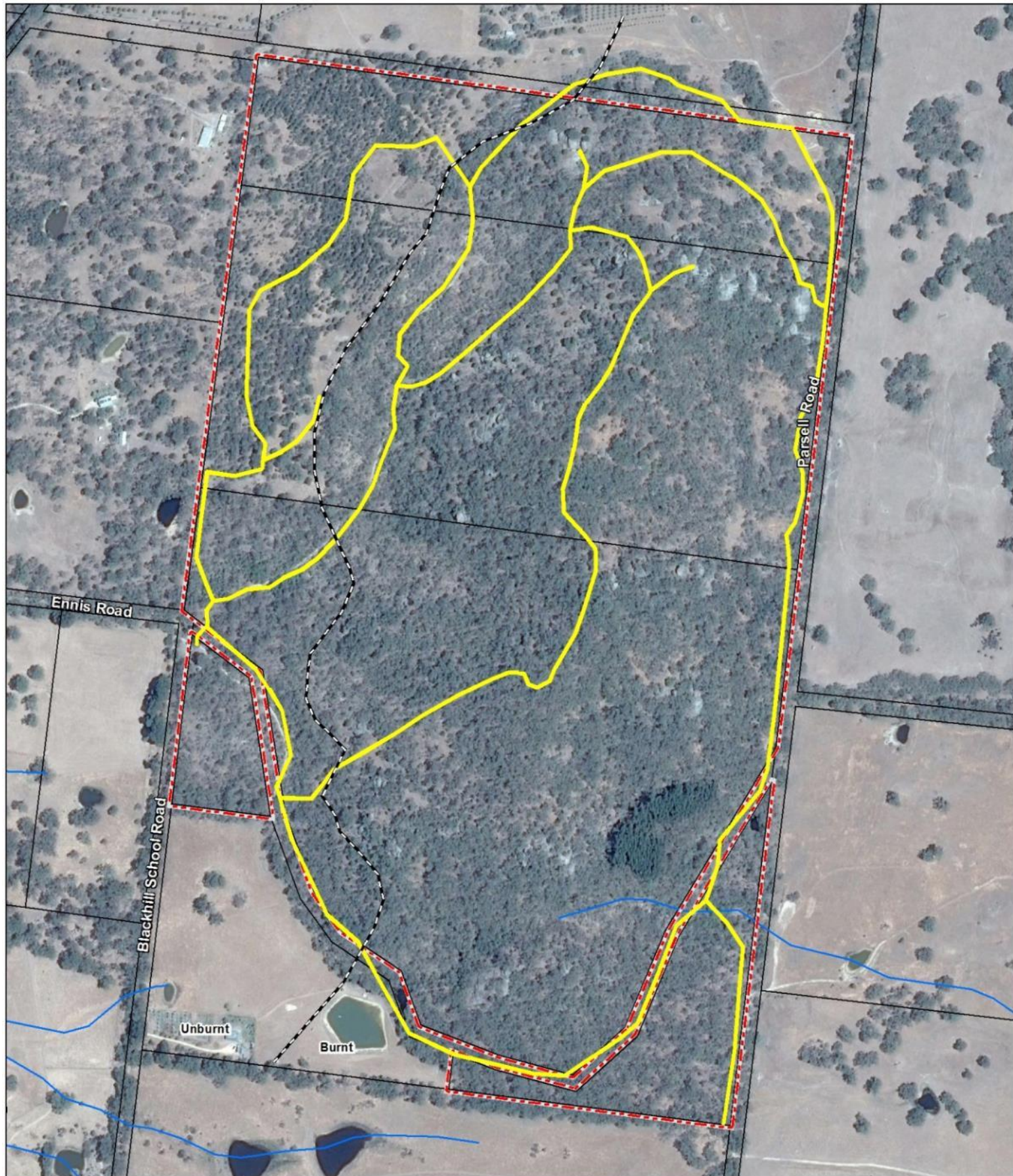
Once at least five years of data has been collected, it should be possible to analyse the data and determine whether there are some areas of the reserve where regenerating native species can be removed, and where some planting maybe required.

Prescribed Burns

No prescribed burns had been undertaken at Black Hill prior to the 2015 bushfire, to manage fuel loads, as the reserve is considered too delicate for prescribed burning (Maltby 1995).

Considering the landscape, topography and mixture of vegetation, undertaking any prescribed burns within the reserve would be difficult to undertake without the risk of the burn breaking containment lines. In conjunction with this, the previous activities undertaken within the reserve need to be considered, as prescribed burns would reduce the vegetation cover in areas of the reserve, which could lead to further erosion management issues.

Considering this, prescribed burning is not recommended within the reserve.




Disclaimer

Practical Ecology bears no responsibility for the accuracy and completeness of this information and any decisions or actions taken on the basis of the map. While information appears accurate at publication, nature and circumstances are constantly changing.

Legend

-  Black Hill Reserve
-  Parcels
-  Watercourse
-  Fire Boundary

Management Zones

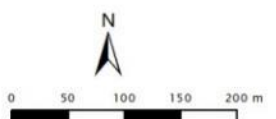
-  Track Management Zone

Details

Data Source: Base layers courtesy of VicMap, Copyright © State of Victoria.
Aerial photography from Google Earth Pro

Date: 22/07/2016

Map 8. Fire Risk Management Black Hill Reserve



Scale 1:4,750 (Page size A3)

9. SWOT ANALYSIS

The following provides an analysis of the strengths, weaknesses, opportunities and threats to ecological values within the reserve.

Strengths	Weaknesses
<ul style="list-style-type: none"> Number of areas within the reserve with good cover (greater than 50%) of indigenous ground storey vegetation Diversity of fauna habitat provided through the range of indigenous and planted native vegetation and rocky outcrops The meandering walking tracks provide access to nature for the local community The Friends of Black Hill Reserve are an active group Spectacular panoramic views are available from the ridge of Black Hill, especially after the bushfire Previous works, including revegetation, have stabilised soil erosion across the reserve The granite boulders provide a stunning landscape feature Fauna monitoring activities such as use of wildlife cameras and spotlighting nights, since 2015 bushfire The diversity of fauna and flora present. Presence of threatened species including three Federally listed species: Clover Glycine <i>Glycine latrobeana</i>, River Swamp Wallaby-grass <i>Amphibromus fluitans</i> and the Rainbow Bee-eater <i>Merops ornatus</i>. 	<ul style="list-style-type: none"> The lack of park infrastructure in the burnt areas of the reserve and poorly maintained fencing in some locations The Friends Group has a number of older members whose capacity to be involved is likely to decline over time Lack of on-site information about the site's natural or cultural heritage values Lack of well presented, comprehensive information about prohibited activities Limited data regarding native fauna species inhabiting the reserve or existing pest animal activity, especially prior to the 2015 bushfire Lack of old trees means that limited habitat (i.e. tree hollows) exist for native fauna, in the revegetation areas The pine plantation in the south-east corner of the reserve which is coming to the end of its life The extent of revegetation areas across the reserve with non-indigenous species Lack of surveillance due to irregular Council presence within the reserve Track layout / design and associated drainage works that channel rather than disperse water flows, leading to erosion and weed invasion in drainage ditches Lack of knowledge about Fungi present at the site The loss of vegetation and declining tree health due to the 2015 bushfire Lack of knowledge about the site's Aboriginal Cultural Heritage values.
Opportunities	Threats
<ul style="list-style-type: none"> Construction of new park infrastructure in the burnt areas of the reserve Utilising the woodland EVCs that naturally occurred in the reserve for future revegetation, rather than the dense canopy provided by the planted vegetation in some areas of the reserve 	<ul style="list-style-type: none"> Encroachment of weeds and invasive non-indigenous species into areas of remnant native vegetation Introduction of weeds and pathogens from outside the site from walkers and other users

Opportunities	Threats
<ul style="list-style-type: none"> • Installation of new signs to advise visitors of permitted and prohibited activities and provide information about the site's natural and cultural heritage values • Installation of nest boxes to provide habitat for marsupial species that would otherwise use tree hollows 	<ul style="list-style-type: none"> • Inappropriate visitor behaviour such as dogs off the lead, horses, motorbikes and fire wood collection • Pest animals such as rabbits, feral cats and foxes
Opportunities	Threats
<ul style="list-style-type: none"> • Reviewing the track design and layout to reduce erosion and improve their sustainability. • Promotion of the site's Aboriginal and European cultural heritage • Implementing a coordinated program of fauna and flora monitoring to better understand the reserve's natural values and the impact of different management actions • Implementing coordinated weed and pest animal control programs • Supporting the Friends Group to continue to play an active and positive role in the reserve 	<ul style="list-style-type: none"> • Soil erosion, particularly until the site fully recovers from the 2015 bushfire • Reduced involvement of the Friends Group should member capacity or interest decline

10. BLACK HILL MANAGEMENT ZONES

The following section of the report discusses the management issues that have been identified at Black Hill. Recommendations regarding each of these management issues are also provided, which have then been utilised to define management principles across the different areas of the reserve.

To provide a framework for the effective implementation of the management principles, Management Zones have been designated across the reserve based on areas with similar uses and purposes.

Overall five Management Zones have been identified which are described below.

10.1.1 Higher Quality Bushland Zone (HQBZs)

The higher quality Bushland Zones have been determined based upon the indigenous ground storey vegetation cover mapping method outlined in Sections 2.4.3 and 3.3.

Areas with greater than 50% indigenous ground storey vegetation cover (blue category) are considered to represent the higher quality bushland within the reserve, as these areas still contain remnant ground storey vegetation, and remnant shrubs and trees, indicating they have been less disturbed than other areas of the reserve.

Overall five main areas with higher quality bushland were identified in the reserve, with an additional two smaller areas identified in 2016 as Zone 6:

Zone 1

Around the main entrance along the western perimeter of the reserve:

- This area contains a diversity of indigenous grasses and herbaceous species
- This area was not burnt during the 2015 bushfire
- There are some planted native trees/shrubs, mostly closer to the walking track
- This area extends to the northern side of the Circuit Track.

Zone 2

In the recent revegetation area in the north-east of the reserve, the indigenous ground storey vegetation cover is high, but not very diverse, as the vegetation mostly consist of Wallaby Grass and Weeping Grass, with some indigenous herbaceous species. This area was not burnt in the 2015 bushfire

Zone 3

The main wildflower patch in the south-west of the reserve:

- According to the Friends group this area contains many of the wildflowers, lilies and orchids that grow within the reserve, in spring and early summer
- The area was burnt in the 2015 bushfire
- There appears to be a less dense shrub cover in this area

Zone 4

Along the ridge and around the granite outcrops (burnt area):

- A high cover of indigenous ground storey vegetation was mapped along most of the length of the Ridge Track
- It appeared to correlate with areas that were not quarried for gravel, possibly due to the presence of large granite boulders
- This area extended down amongst the granite boulders to the north of the Ridge Track, and to a lesser extent to the south of the Ridge Track
- This is the largest area with a high cover of indigenous ground storey species within the reserve
- All of this area was burnt in the 2015 bushfire

Zone 5

A small area of Kangaroo Grass at the northern end of the reserve (burnt area):

- Whilst only a very small area, this area contains the only patch of Kangaroo Grass *Themeda triandra* recorded within the reserve
- This area provides an example of what the ground storey vegetation cover would have been at the northern end of the reserve, in the area containing EVC 175_62: *Granitic* Grassy Woodland prior to the impacts from the previous timber and gravel extraction activities

Zone 6

Two small areas added following the 2016 re-mapping of some ground storey vegetation within the Reserve.

Both areas are adjacent to the Circuit Track; with a higher cover of indigenous herbaceous species than the surrounding weedy areas.

10.1.2 Lower Quality Bushland Zones (LQBZs)

This zone is represented in the areas coloured with orange or red in the indigenous ground storey map (refer to Map 9). These areas contain less than 50% indigenous ground storey vegetation cover, and are dominated by exotic grasses/herbaceous species.

These areas were impacted by the gravel quarrying to a larger extent than the areas with greater than 50% indigenous ground storey vegetation cover.

These areas are predominantly located on the slopes of Black Hill, in the valleys between the granite outcrops, and on the lower slopes around the perimeter of the reserve.

10.1.3 Track Management Zones (TMZs)

This Zone applies to the tracks that have been constructed within the reserve:

- Circuit Track
- Ridge Track
- Revegetated Area Track

Management is required to maintain the track surfaces, steps and access to the main features of the reserve; the Eastern and Northern Lookouts and The Monolith. Management works are also required in the next 5–10 years to remove regenerating trees/shrubs from the tracks in the burnt areas, and for limb safety management over the tracks, in the longer term.

The Friends Group has placed chopped/fallen branches alongside some sections of track, especially along the Revegetated Area Track, which is useful in defining the track route. These branches require some maintenance/replacement on an irregular basis.

In conjunction, regeneration from the bushfire is causing dense stands of tree/shrub to regenerate alongside and within some sections of the tracks. Maintenance will be required for the next 5–10 years, until the vegetation stabilises, to remove this vegetation growing on the track and along either side of the track.

10.1.4 Dam Zones (DZs)

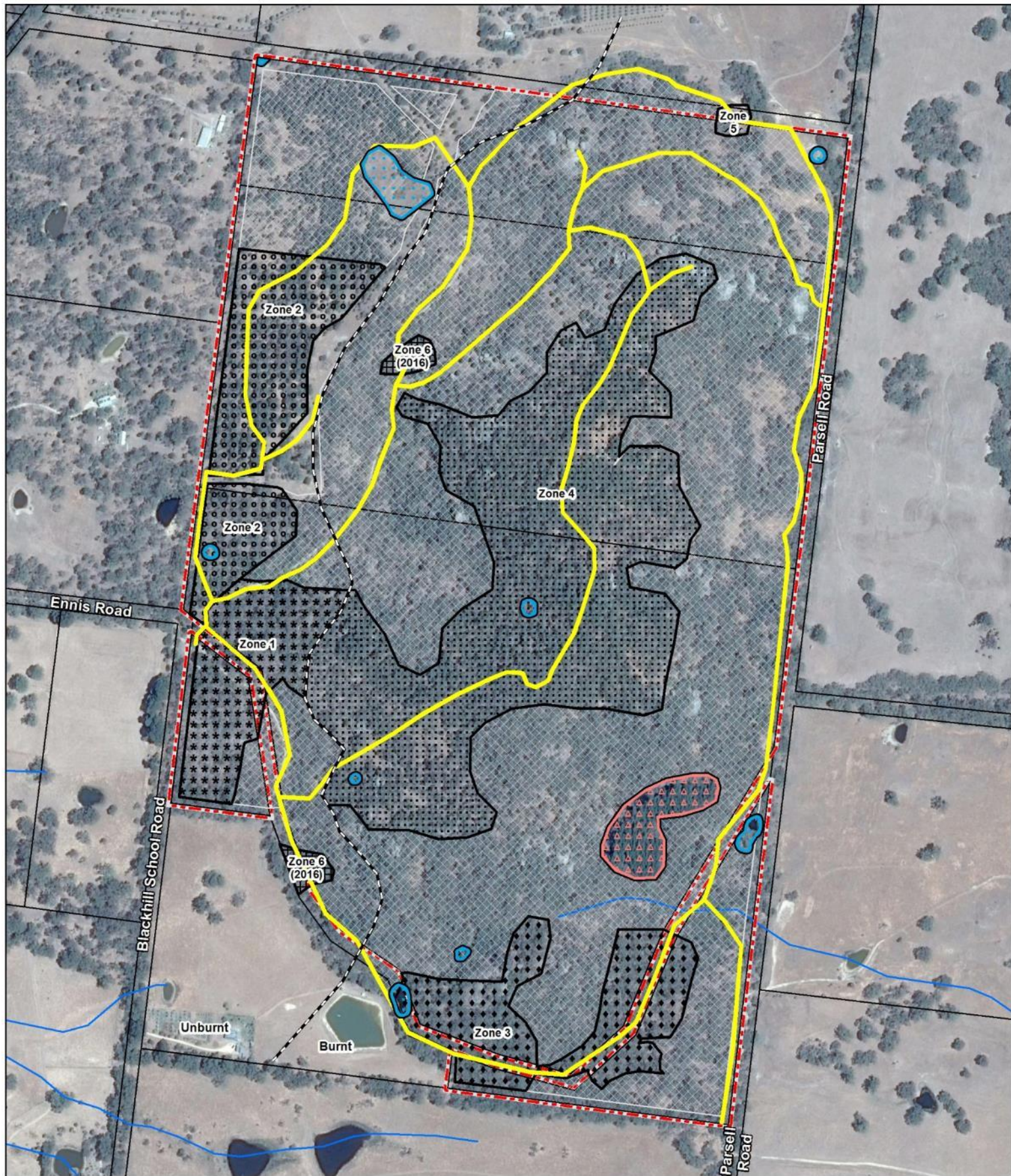
There are several dams within the Reserve, most of which have a combination of fauna habitat and water storage functions.

Three of the dams contain permanent water, whilst the remainder are ephemeral, filling during wet seasons or heavy rainfall events. The ephemeral ‘dams’ are mostly artificial depressions created as a result of the former quarrying activities.

10.1.5 Pine Plantation Zone (PPZ)

The pine plantation has been defined as a Management Zone as it is the largest area of exotic vegetation within the reserve, and it will need to be managed in the near–future as the burnt mature pines gradually fall over creating an ‘empty’ space within the reserve.

Refer to Map 9 (following page) for the location of the management zones at Black Hill Reserve.



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Legend

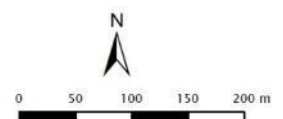
- | | |
|-------------------------|-------------------------------------|
| Black Hill Reserve | Lower Quality Bushland Zone |
| Parcels | Higher Quality Bushland Zone |
| Watercourse | Zone 1 |
| Fire Boundary | Zone 2 |
| Management Zones | Zone 3 |
| Dam Zone | Zone 4 |
| Track Management Zone | Zone 5 |
| Pine Plantation | Zone 6 (2016) |

Details

Data Source: Base layers courtesy of VicMap, Copyright © State of Victoria. Aerial photography from Google Earth Pro

Date: 23/11/2016

Map 9. Management Zones Black Hill Reserve



Scale 1:4,750 (Page size A3)

11. BLACK HILL ECOLOGICAL MANAGEMENT ISSUES

This Section of the EMP provides a detailed discussion of Black Hill's ecological values, and other reserve management issues. Recommendations that should be incorporated into the reserves management are outlined under the discussion of each management issue.

To provide a framework for the effective implementation of these management recommendations within the reserve, Management Zones have been designated across the reserve based on areas with similar uses and purposes, as outlined in the previous Section of this EMP. The management issues outlined in this EMP are current for 2016. As this EMP is implemented, and as the current management issues are addressed; other management risks may emerge. Therefore this EMP should be reviewed after 10 years (in 2026).

Whilst all attempts have been made to consider current management issues and practices, there will be management issues that arise which could not be foreseen. Therefore the recommendations should not be considered to provide all of the details required for the ecological management of Black Hill Reserve. The management objectives and vision for the reserve (Sections 1 and 2.2) provide the overarching guidance for future management decisions, particularly for unforeseen issues and ideas that are not directly addressed in the EMP.

11.1 Weed Control

Woody and Scrambler/Climber Weeds

Whilst a number of high priority weeds for control (S1 and S2 species) have been identified in all areas of the Reserve, these weeds predominantly occur as single infestations or in small numbers. There are no large scale woody or scrambler/climbing weed infestations within the Reserve.

To maintain the current low amounts of infestations within the reserve, annual 'weed sweeps' to monitor for re-infestations and to control any 'missed' plants will always be required..

Grassy/Herbaceous Weeds

The main weed issue at Black Hill is the Keystone weedy grass species (and potentially some Keystone weedy herbaceous species) which occur across the Reserve, but are most problematic in the areas with greater than 50% remnant indigenous ground storey vegetation cover, especially amongst the remnant wildflowers, lilies and orchids.

Control of these grasses is difficult as they are structurally dominant and are small plants that are hard to target individually. Large scale control of Keystone weedy grass species would result in the loss of some indigenous species, and the resultant germination from the soil seed bank could favour weedy over indigenous species.

Generally, weed control of Keystone grasses is difficult to achieve without dedicated effort, high labour costs (in hours worked) and years of 'slow' and patient work. Controlled burns have been used with some degree of success; however the resultant germination of weed seeds after a burn can quickly out-compete

the indigenous species, especially if there was a higher cover of weedy grass species to begin with. This is evident in the cover of exotic grasses in the lower quality areas of Black Hill.

One partially 'successful' method is based on the Bradley method: determining the areas with the highest indigenous vegetation cover and concentrating on hand weeding and spot spraying of small areas within and surrounding these higher cover areas. This slowly increases the amount and extent of indigenous vegetation cover. This method is slow and can be problematic. Hand weeding is laborious, and the surrounding vegetation gets trampled.

Other methods include brush cutting exotic grasses before they set seed, to reduce the seed set, or using hand-held burners to remove seed heads off annual grasses before they set seed. Hand-held weed burners are especially effective for Large Quaking-grass **Briza maxima* which dominates large areas of the reserve.

Recommendations

Rec 4. Implement a strategic weed control program that:

- *firstly prioritises treatment of CaLP Act, S1 and S2 weeds in the higher quality bushland areas*
- *secondly aims to treat CaLP Act and S1 weeds in the lower quality areas*
- *aims to control exotic grasses and herbaceous species in a 5m to 10m buffer around the higher quality bushland areas prior to them setting seed*
- *utilises the species prioritisation in Tables 8 and 9 to guide other weed control activities*
- *includes follow up weed control and an annual 'weed sweep' to treat any germinating or 'missed' plants*

Rec 5. Consider the removal of regenerating planted native trees and shrub species in the higher quality bushland areas of the reserve, based on the monitoring plot data (refer to Sections 11.4 and 11.7)

11.2 Bushland Management Techniques

All vegetation requires some degree of management, which is dictated by the EVC, level of disturbance, soil type, and moisture levels. Vegetation management is complex and involves the interaction of numerous management actions.

Indigenous vegetation management is typically focused on bushland regeneration and/or revegetation techniques, or a mixture of both. Whilst not specifically outlined, the role of vegetation in providing habitat is considered within bushland management techniques.

Due to the large degree of disturbance at Black Hill, early bushland management (from the 1960s) commenced with large scale planting programs to stabilise the eroded slopes of Black Hill. This and other actions such as restricting access to the three walking tracks and fencing the reserve, has been successful in stabilising the reserve. However, it has also created a landscape of mixed indigenous and planted bushland. This landscape has then been further impacted by the 2015 bushfire, which has temporarily altered the previously densely vegetated reserve to an open landscape that is in a state of flux and currently regenerating, with as yet unknown quantities of remnant and planted species.

Future management should focus on protecting and enhancing the higher quality sections of the reserve as a priority and controlling declared noxious weeds across the site.

11.2.1 Buffers

Buffers approximately 5–10 metres wide, depending on the surrounding topography should be established around the Higher Quality Bushland Zones, to reduce seed spread from the lower quality buffer zones into the higher quality zones.

Ideally the exotic grasses/herbaceous ground storey vegetation in the buffer zones would be slashed/brushcut prior to seed set, avoiding scattered indigenous species.

Recommendations

See Rec 4 for recommended actions for weed control in buffer areas.

11.2.2 Bushland Management Techniques – Higher Quality Bushland

Aside from controlling invasive CaLP Act, exotic S1 species, and native regenerating S2 species in the higher quality bushland areas, control of the exotic ground storey grasses/herbaceous species is also required.

In some areas, this will be difficult work due to the mixing of exotic and indigenous ground storey species. The weed control works will need to be focused upon sensitive weed control either via spot spraying of grassy/herbaceous weeds, and hand weeding of grassy/herbaceous weeds, which is difficult and resource intensive bushland management work, or hand-held weed burners to control annual exotic grasses.

For the regenerating native tree/shrub species to be controlled, recommended control would be via spot spraying, cutting and painting or drilling and filling, depending on the size of the species to be controlled and the surrounding vegetation and topography.

Cut plant matter can be left in situ to decompose. If the cut plant matter is likely to present a risk in terms of smothering indigenous ground cover or spreading seed, then it should be double bagged and disposed of off-site.

Recommendations

See Rec 4 for recommended actions for weed control.

Rec 6. Remove any large volumes of cut plant matter if they present a risk to regenerating indigenous ground storey or if the plants have seeded. Leave small volumes in situ.

11.2.3 Bushland Management Techniques – Lower Quality Bushland

In the lower quality bushland, the ground storey is dominated by exotic grasses/herbaceous species. There are some scattered indigenous ground storey species growing amongst the weeds.

Considering the extent of lower quality bushland across the reserve, works in these areas are a lower priority than in the higher quality bushland areas. Priority works in these areas include controlling all CaLP Act listed and S1 weeds only.

As the lower quality bushland areas tend to correspond with the most impacted areas of the reserve from the previous gravel extraction and timber harvesting activities, it is not recommended that regenerating native species (S2 weeds) are removed, as they stabilise slopes and other eroded areas.

Recommendations

See Rec 4 for recommended actions for weed control.

Rec 7. Retain all planted species, as they are stabilising the slopes and other eroded areas

11.2.4 Revegetation Works and Programs

Planting/revegetation has been undertaken across all areas of the Reserve, for many decades to stabilise the impacts from the former timber and gravel extraction works.

As the reserve is in a state of flux, and is slowly regenerating after the bushfire, it is recommended that any proposed planting be postponed for the next five years, to provide the opportunity to observe how the reserve is regenerating post-fire, the regenerating tree/shrub densities across the reserve and the proportion of regeneration of indigenous versus planted tree/shrub species.

This recommendation does not apply to the revegetation that is planned for the north-west corner of the reserve in 2016 that is being undertaken by the Friends Group.

Recommendations

Rec 8. Postpone any further plantings within the reserve for the next five years (until 2020)

Rec 9. Implement the proposed management zones to define areas within the reserve that are no longer appropriate for planting

11.3 Future Revegetation at the Reserve

If revegetation is determined appropriate in some areas of the reserve after 2020, following monitoring of the bushfire regeneration across the burnt areas of the reserve (refer to Section 8.4), then it should be based on the EVC where the proposed revegetation works are to occur. This includes:

- Planting the appropriate tree and shrub species and densities appropriate for that EVC
- Ensuring that existing indigenous ground storey vegetation is considered and not impacted when planning and undertaking any revegetation works
- Undertaking revegetation only in areas with less than 25% indigenous ground storey vegetation to prevent impacting surrounding native ground storey vegetation

The development of management principles for each Management Zone, the EVC Mapping and utilising the indigenous ground storey vegetation cover map (refer to Map 4) are all new management tools that can now be used to direct any future proposed revegetation within the Reserve.

Recommendations

Rec 10. Limit future revegetation to areas with less than 25% remnant indigenous understorey vegetation cover

Rec 11. Only use indigenous species appropriate to the EVC in any future revegetation works

11.3.1 Revegetation Templates

Revegetation templates suitable for each EVC are required to provide guidance for suitable species and the planting densities within the Reserve. Revegetation templates are required for:

- EVC 47: Valley Grassy Forest
- EVC 72: Granitic Hills Woodland
- EVC 175_62: *Granitic* Grassy Woodland

Whilst DELWP has prepared revegetation templates for some of these EVCs, these are generic templates that have been prepared for all vegetation types across Victoria; they do not consider local conditions. The DELWP generic templates also do not consider suitable revegetation (with regards to appropriate species and densities) in the variety of possible bushland conditions that occur in bushland reserves, such as patches with an existing dense canopy cover, limited shrub cover and little to no indigenous ground-storey cover.

Considering the variety of bushland conditions at Black Hill– areas with higher quality indigenous ground storey vegetation, areas with lower quality indigenous ground storey vegetation, areas with regenerating indigenous trees/shrubs, areas with mostly native regenerating trees/shrubs, unburnt areas of the reserve, etc; it is apparent that the generic templates do not apply across the reserve. Templates need to be designed to complement the existing bushland conditions and to reflect management objectives.

This EMP recommends that planting/revegetation works be postponed in the reserve until 2020, to determine how the reserve has regenerated post-fire. At this stage it is unknown whether some revegetation works may be required in the future in areas with poor post-fire tree and shrub regeneration.

Recommendations

Rec 12. Develop Revegetation Templates based on EVCs and appropriate planting densities for the EVCs occurring at Black Hill, to account for the site specific conditions, prior to undertaking any future revegetation works

11.4 Flora Monitoring

Monitoring Plots

To monitor the post-fire regeneration across the burnt areas of the reserve, it is recommended that a series of 10 x 10m monitoring plots be installed and monitored on an annual basis. The pre-existing monitoring plots installed by the Council post-fire can also be utilised to gather monitoring information as outlined below.

General information on the intent of the monitoring plots is provided below:

The monitoring plots should be based in both the higher and lower quality bushland areas in the three different EVCs (5–10 plots per area). The plots should be located across the topography of the reserve; along the ridge, on the slopes, in the valleys between granite outcrops, on the lower slopes, on the flat ground and in the pine plantation. They should also be located in both burnt and unburnt areas, to collect baseline data. The baseline data should include:

- A species list (indigenous, exotic and planted vegetation)
- The percentage cover of each species present (based on the Braun blanquet scale)
- The cover of bare earth, leaf litter and bryophytes/lichen, weed versus indigenous species
- The amount of exotic versus indigenous versus naturalised (planted) vegetation
- A photograph of the plot (via a defined photo point), and
- Any land management issues, such as erosion or regenerating plants being eaten by grazing herbivores

All percentage data should be collected in 10% increments, and one corner of the plot should be permanently marked with a capped start picket, and the location GPSed and mapped so replicable data is collected from the same site.

The five monitoring plots installed by Council post-fire facilitate collection of some of this baseline data, however additional data is required to provide a more holistic snapshot of post-fire regeneration across the reserve, especially when the small trees/shrubs that are currently knee-height or below grow in the areas of the reserve with higher quality indigenous ground storey vegetation. There is a possibility that some of the indigenous ground storey vegetation will be lost if there is a dense re-growth that shades and outcompetes the ground storey vegetation.

The data collected from the monitoring plots will indicate whether the reserve is regenerating according to the benchmark densities for the appropriate EVCs, and whether any future revegetation will be required or not.

It is acknowledged that revegetation greater than the benchmark densities may be required in the lower quality bushland areas, which were subject to more disturbances from gravel quarrying, to stabilise the slopes if there is insufficient regeneration, or if erosion is noted.

It is noted that there is little information available about the presence and diversity of fungi in the reserve. Understanding this component of the eco-system would be useful to guide future management.

As outlined previously, a local resident also advised that they had found a Late-flower Flax-lily prior to the 2015 fire adjoining the circuit track near the revegetation area on the west side of the reserve, a VROTS species listed as “vulnerable”. It is recommended that future flora surveys monitor for this species.

Recommendations

Rec 13. Prepare a Flora Monitoring Plan that:

- *includes use of monitoring plots and other techniques to track change within the reserve over time.*
- *enables monitoring of the reserve's recovery following the 2015 bushfire.*
- *includes a threatened species section, including monitoring of Floodplain Fireweed to ascertain if it survives outside its' usual habitat range*
- *monitors for presence of the Late-flower Flax-lily in the previous location adjoining the Circuit Track near the revegetation area on the west side of the reserve,*
 - *to determine if the species is still present following the 2015 bushfire, as per the observation by the local resident.*
- *establishes an annual program of data collection if possible.*

Rec 14. Investigate opportunities to undertake fungi surveys within the Reserve, potentially in partnership with tertiary institutions and existing networks utilising the established 'FungiMap' (www.fungimap.org.au)

11.4.1 Significant Flora Species

As outlined in Section 5.4.1, there are eight VROTS and/or FFG/EPBC Act listed threatened species and a number of regionally significant wetland species growing at Black Hill. These species are growing in low numbers or in niche habitats. As outlined above, there is also the potential for the VROTS listed Late-flower Flax-lily to occur within the reserve. The presence/absence of this species needs to be confirmed.

The Arching Flax-lily was recorded along the ridge, as was the Floodplain Fireweed. Whilst the Floodplain Fireweed was recorded out of its expected habitat range and may not survive near the ridge, the two Arching Flax-lilies should be managed to conserve and increase the population.

The Arching Flax lilies are located outside the Higher Quality Bushland Zone. Whilst no specific management zone has been defined around the Arching Flax-lilies, sensitive weed control works should be undertaken to ensure the plants do not become engulfed by weeds or regenerating trees/shrubs.

The additional five threatened species recorded in the 2016 flora survey; Geranium sp 3, Golden Cowslips, River Swamp Wallaby-grass, Clover Glycine and Winged Star-wort are all located in a Higher Quality Bushland Zone. Therefore the general management of the Zone to conserve and increase the indigenous ground storey vegetation cover through sensitive and strategic weed control works will also maintain these threatened species.

In the case of the Clover Glycine, it was noted that the plant/s require weeding and that fencing should be considered in the future to manage grazing threats from rabbits/hares.

The Prostrate Mountain Flat-pea was recorded in the main wildflower patch in the south-west of the reserve, which is another Higher Quality Bushland Zone. Therefore the general management of the patch to conserve and increase the wildflowers through sensitive and strategic weed control works will also maintain the Prostrate Mountain Flat-peas.

The regionally significant wetland species were recorded in one or more of the small artificial depressions located mostly in the northern end of the reserve. Generally these depressions appear to contain dried out grassy/herbaceous species, and they only 'revive' in periods of wetter weather/heavy rainfall, when the plants growing within them rehydrate. When proposing any works that may affect these artificial depressions, attention should be given to what is actually growing within them; and whether the works will impact on the depression or not.

Refer to Map 5 for the location of some of the threatened flora species at Black Hill.

Recommendations

Rec 15. Ensure anyone undertaking management works near the significant species along the ridge in the Higher Quality Bushland Zones are aware of the location and appearance of the threatened flora species

Rec 16. Undertake sensitive weed control to conserve and increase the populations of all the threatened flora species: especially the Clover Glycine and Arching Flax-lily.

Rec 17. Ensure any proposed works to the artificial depressions across the reserve consider the indigenous flora species growing within them

Rec 18. Consider defining the threatened species on-the-ground (via stakes or survey tape) so that their location is clear to anyone working in their general vicinity

Rec 19. Consider installing fencing around the Clover Glycine to protect it from grazing threats.

See Rec 13 for recommended actions relating to monitoring for threatened flora.

11.5 Tracks and Drainage

As outlined under the original aims of the Friends Group (Pictor 1987– refer to Section 5.2.1), one aim was to delineate walking tracks throughout the reserve. To meet this aim, the Friends Group was instrumental in installing the three existing walking tracks.

Since the installation of these tracks, the Friends Group has also been instrumental in the maintenance and upkeep of the tracks, undertaking works such as weed control along the tracks, maintaining ditches adjacent to some tracks to manage run off and erosion, maintaining the Ridge Track steps, re-building steps as required and thinning saplings and removing limbs alongside the tracks, however the Friend's Group capacity to undertake all of the track maintenance works is diminishing. Details of the track maintenance works undertaken by the Friends Group is provided on the next page.

Two of the tracks are pedestrian access only – the Ridge and Revegetated Area Tracks – whilst the Circuit Track is also a management vehicle access track.

In conjunction, the 2015 bushfire also caused a lot of damage to the walking tracks, with most of the pine steps requiring replacing, along with the branches that had been placed adjacent to the tracks to define

their edge and stabilise the tracks. The initial works to repair the tracks and stairs was undertaken by the Friends Group, Macedon Ranges Shire Council, and inmates from Loddon Prison and the Malmsbury Youth Justice Centre. Due to the bushfire, track maintenance will be ongoing for the next 2–10 years until the vegetation regrowth across the reserve stabilises.

Walking track classifications

According to the Australian Walking Track Grading System¹, the walking tracks at the reserve would be classified as follows:

- **Ridge Track** – Grade 3 (short steep hills; formed track, some obstacles; sign posted; some bushwalking experience recommended; many steps)
- **Circuit Track** – Grade 2 (gentle hills; formed track, however not suitable for wheelchair access; clearly sign posted; no experience required; occasional step)
- **Revegetated Area Track** – Grade 2 (gentle hills; formed track, however not suitable for wheelchair access; clearly sign posted; no experience required; occasional step)

These classifications help determine suitable infrastructure and maintenance standards. They can also be used when describing the tracks on brochures and other publications.



Some log replacement alongside the tracks has occurred utilising burnt logs



Shrub regrowth on and alongside the Ridge Track (near the Northern Lookout)

¹ *Users guide to the Australian Walking Track Grading System*, Department of Sustainability and Environment, date unknown



Weed infested drainage ditch (Sep 2016)



Water pooled along the Circuit Track at the south end of the reserve following high rainfall (Sep 2016)



Modified drainage ditch along the Circuit Track at the south end of the reserve (Sep 2016)



Concentrated water flows along the Circuit Track (Sep 2016)



Erosion along Ridge Track, near the intersection with the Revegetation Track



Erosion along Ridge Track, near the intersection with the Revegetation Track

Track Maintenance and Drainage

As the walking tracks are constructed of the granitic gravel which naturally occurs across Black Hill, the tracks are susceptible to erosion and washing away during rainfall events. Over the long, dry summer, the walking tracks tend to powder due to heavy usage. In the wetter months, the dust is then washed downhill causing localised track erosion. In conjunction, the washing away then creates low points where water pools on the tracks causing further erosion and safety issues.

To combat these issues, ditches have been constructed along/near some of the tracks. The soil disturbance and nutrient loads within these ditches attract weeds, become blocked during high rain fall events and can exacerbate erosion issues.

Currently two members of the Friends Group undertake half a day of track maintenance works per week. This half a day of work a week involves maintaining the tracks for erosion, maintaining the steps and cleaning out and maintaining the ditches. As discussed during the stakeholder consultation, the Friends Group's capacity to undertake all of the track maintenance works is diminishing, and they would like to obtain assistance from Macedon Ranges Shire Council (MRSC) with the labour required to undertake the track maintenance works.

The drainage and erosion issues are further exacerbated by the design and layout of the track which, in some cases is fairly steep and follows the fall of the land, resulting in the concentration of water flows rather than the dispersal of flows across the track tread. At the base of the site water pools along the Circuit Track and does not seem to have a strategic outflow.

Most track design guidelines advise against directing or concentrating water flows, instead recommending maintaining natural drainage patterns and avoiding flat areas. They also recommend avoiding gradients

steeper than 10% (1 in 10) and incorporating switchbacks, out-sloping tread and drain outlets that direct water away from the tread².

A long term solution to the drainage issues is required to maintain the safety of the trail network, reduce the need for ditches and minimise maintenance requirements in the future. This would involve a review of the trails by a suitably qualified engineer or trail design consultant to determine whether any modifications are required to better direct water flows.

In the meantime, minor works could be implemented on a regular basis (e.g. twice a year) and after heavy rainfall can be implemented to direct water off the tracks. This could take the form of small mitre drains or similar works. These measures would minimise the need for the Friends group to undertake maintenance works as currently occurs.

Walking Track Steps

There are approximately 200 steps along the Ridge Track. The majority of the steps are pine, although there are also a few sections where steps were constructed from granite. In the 2015 bushfire, all but two of the pine steps were burnt. Whilst all the steps have been replaced, the Friends Group has always ensured that the steps are maintained in good condition. They have maintained the dirt level in each step, so that the track and top of the step are level, and they have also ensured the steps are straight; to remove tripping hazards.

Vegetation Growth alongside the Tracks

Prior to the bushfire, vegetation growth adjacent to the tracks was removed to reduce potential snake harbour.

Now with the flush of tree/shrub regeneration following the bushfire, there are sections of the track where trees/shrubs are regenerating in dense patches alongside and on the track, which need to be removed and maintained until the regeneration has stabilised.

Tree Safety Maintenance Works

After the 2015 bushfire, arboricultural assessments were undertaken of all (burnt) trees growing along the tracks, and unsafe trees/branches and limbs were removed.

In the longer term (10–20 years), as the trees/shrubs that are now regenerating along the tracks mature, tree safety inspections may be required again for safety purposes.

If limbs are removed for safety purposes, the chopped branches/trees should be retained in-situ near the tracks, to provide habitat for ground dwelling fauna and to stabilise the slopes against erosion.

² *Sustainable Recreational Trails Guidelines*, Government of South Australia, date unknown; *Guidelines for Trail Planning, Design and Management*, G21 Geelong Regional Alliance, date unknown; *Ontario's Best Trails Guidelines and Best Practices for the Design, Construction and Maintenance of Sustainable Trails for all Ontarians*, Trails for all Ontarians, 2006.

Recommendations

- Rec 20. Review the design of existing walking tracks and identify possible changes and / or management requirements to improve long term drainage outcomes and minimise the need for drainage ditches.*
- Rec 21. Until the design and layout of site's existing walking tracks has been reviewed and any changes implemented, undertake track maintenance works at least twice a year and after heavy rainfall (such as installation of mitre drains) to control erosion and ensure public safety along the walking tracks*
- Rec 22. Commence removing patches of dense tree/shrub regeneration on the tracks and on either side of the tracks (in the Track Management Zones)*
- Rec 23. Retain existing larger trees/shrubs, all ground storey indigenous vegetation and some regenerating, individual trees/shrubs in the Track Management Zones for shade and aesthetics, etc*
- Rec 24. Undertake regular tree safety inspections and tree/limb removal as required, for public safety purposes in the Track Management Zones, and retain any chopped trees/limbs in-situ near the walking tracks*

11.6 Maintenance of Other Park Infrastructure

The other park infrastructure at Black Hill includes the picnic shelter, picnic benches and facilities at the main entrance to the reserve, the seats that used to be scattered around the walking tracks (these were burnt during the bushfire) and the fences and gates.

The park furniture was mostly installed by the Friends Group through grants and funding provided by MRSC.

The Friends Group also maintains the perimeter fences, although, as most damaged fencing was replaced after the 2015 bushfire, this is not currently a large maintenance task.

Recommendations

- Rec 25. Develop a Facilities Management Plan that sets out annual maintenance requirements for all infrastructure including picnic facilities, tracks and fencing and identifies the location and specifications for any additional facilities that may be required in the future*
- Rec 26. Replace the picnic tables and benches along the walking tracks that were destroyed in the 2015 bushfire*

11.7 Fire Prevention

The aim of fire management at the reserve is to prevent fire from spreading to or from the reserve. To achieve this, it is important that fire vehicles are able to safely access the reserve in order to suppress fire activity on or close to the site's periphery. The Circuit Track provides this opportunity while also functioning as a containment line.

The defensible space for dwellings on adjoining properties is adequately provided for on private property. Even so, it is recommended that dense plantings be avoided on boundaries near existing dwellings.

Fuel management along the Circuit Track has been incorporated into the management requirements within the Track Management Zones for the Circuit Track only. The objective of designating fuel management areas along Circuit Track is to define the exact location and width of these areas and to ensure that other land management uses (such as revegetation) do not overlap with fuel management practices.

The following management practices have been adapted from the fire management standards for access tracks for other Council reserves:

1. Ensure the Circuit Track is maintained such that it facilitates movement of large format fire vehicles, namely:
 - a. Vegetation and branches are removed to create an envelope of 4.5m wide x 4.5m high along the track itself.
 - b. Trees are evaluated for their potential to fall on crews working in the Area, and
 - c. Passing bays are provided to allow trucks to pass each other. CFA Guidelines require passing bays for vehicles every 200m as a minimum. Each bay should be 20m long and 6m wide.

From a practical perspective, the location of large granite boulders (especially along the eastern side of the reserve), will limit where some passing bays can be located. From a biodiversity perspective, the indigenous ground storey vegetation cover map should be utilised to determine areas with less than 50% indigenous ground storey vegetation cover, and passing bays should only be located in these areas. No mature trees with a diameter at breast height greater than 40cm should be removed to widen Circuit Track.

There should be no revegetation in the fuel management areas/Track Management Zone along Circuit Track.

In terms of public access to the reserve on high fire danger days, it is recommended that any planned events or working bees be rescheduled on Severe, Extreme or Code Red days, and on Total Fire Ban days.

Recommendations

Rec 27. Implement fuel management areas and works along the Circuit Track taking into account the location of granite boulders, large trees and indigenous ground storey vegetation cover when determining where to locate passing bays

Rec 28. Do not undertake revegetation or plantings in the fuel management areas alongside the Circuit Track

Rec 29. Do not hold planned events or working bees on Severe, Extreme, Code Red or Total Fire Ban days,

11.8 Bushfire Recovery

The January 2015 bushfire devastated approximately 80% of the reserve, burning all vegetation layers and only leaving some burnt trees remaining. Anecdotal evidence and pre-bushfire photographs indicate that many areas of the reserve were vegetated with a dense shrub and tree layer. Post-bushfire, many of the trees and shrubs were burnt, although there were large amounts of tree/shrub regeneration across the

reserve. During the time of the site assessments, it was difficult to determine if the tree/shrub regeneration was from indigenous or planted native species.

Currently the focus of bushfire recovery should be upon monitoring the different landscapes and indigenous ground storey vegetation quality areas of the reserve to measure the density of regeneration (ground storey, shrub and tree layers), the species present (indigenous, naturalised/planted stock or exotic), and the percentage cover of the species present. Without adequate post-bushfire monitoring data, it is difficult to make bushland management recommendations regarding expected bushfire recovery within the reserve. As outlined previously, new monitoring plots can be established or the data collected from the existing plots established by Council post-fire. The plots should be monitored at least annually for the next five years (until 2020), before any decisions are made regarding undertaking any further planting within the reserve.

The data collected can help determine whether removal of regenerating planted species is required in some areas of the reserve, and whether further planting is required or not to aid bushfire recovery.

In addition, measurements of the surface, elevated and bark fuel should also be collected in each of the monitoring plots, based on the *Overall Fuel Hazard Assessment Guide* (DSE, 2010). This is to measure the different fuel loads in the vegetation layers, as fuel loads often increase during post-fire regeneration.

If significant erosion issues are observed in the reserve during this period, planting may be required to stabilise the slopes. If so, revegetation should be based on indigenous species only. An Erosion Monitoring Plan should also be prepared to guide any erosion stabilisation planting if it is required.

Recommendations

Rec 30. Monitor erosion on the burnt slopes and implement appropriate erosion control measures as required.

See Rec 13 for recommended actions relating to post-bushfire flora monitoring.

See Rec 5 for recommended actions relating to removal of regenerating non-indigenous planted species.

See Rec 8 for recommended actions about postponing plantings until 2020 until the site's natural regeneration after the bushfires have been assessed.

11.9 Tree Safety Assessments and Arboreal Fauna

When tree/limb assessments are undertaken in the Track Management Zones, consideration needs to be given to fauna, their habitat requirements and the inadvertent potential to injure or kill animals present in lopped limbs. Many dead and/or larger limbs contain hollows or cracks, and smaller limbs can also contain cracks, which contain roosting and breeding habitat.

Currently no tree removal or limb lopping can occur without applying for a planning permit.

As many Australian fauna species are nocturnal, it is likely that they will be sleeping during daylight hours when limb/tree removal works are undertaken. In the cooler months some species, such as bats, also enter a state of torpor. It is unlikely these species would have the time to waken and react if their home was being removed in winter.

It is critical that limbs and/or trees be inspected for fauna prior to undertaking any removal works. If fauna presence/use is detected then, depending on the species and use, it may be appropriate to:

- Postpone the limb removal until any nesting species have left the nest
- Decide not to proceed with the limb removal
- Translocate the animal to an adjacent tree/habitat (following DELWP guidelines)
- If possible, retain the section of removed limb with a hollow, and securely install it as an additional, 'natural' nest box in an adjacent healthy tree/limb.
- If this is not feasible, limbs removed should be kept intact where possible, and placed on the ground to help establish large hollow log habitat in areas where none are present.

Advice on pruning techniques that retain hollows or provides the opportunity for new hollows is available on the Australasian Bat Society website: <http://ausbats.org.au/tree-pruning-and-bats/4569171779>).

Limb/Tree Fauna Inspections

Appropriate procedures for fauna inspections prior to limb/tree removal works and for the handling and relocation of displaced fauna should be implemented to remove the potential for inadvertent harm to arboreal fauna during any tree maintenance works. Protocols may vary depending on the species detected (birds, bats and/or arboreal mammals) and use (roosting or breeding). Some fauna management guidelines for future limb/tree removal works include:

- Adopt the pruning techniques recommended by the Australasian Bat Society
- Aim to undertake limb removal in warmer months when fauna is more active
- Aim to only undertake urgent limb removal works in the cooler months
- Create noise disturbance prior to limb removal to encourage fauna to waken and leave the affected tree/limb
- If fauna is breeding, postponed limb removal until young have left the nest

Recommendations

Rec 31. Ensure fauna inspections are undertaken prior to undertaking limb/tree removal works.

11.10 Indigenous Fauna Management at Black Hill

There are many indigenous fauna species that have been recorded at Black Hill (refer to Appendix 4), including:

- 70 bird species,
- Nine mammal species (including numerous micro-bats, which have not been identified to species level),
- Six reptile species,
- Four amphibian species and
- Seven invertebrate species.

In addition, four of these species are considered to be threatened in Victoria, one is listed under the *FFG Act (1988)*, and another is listed as a migratory species under the *EPBC Act (1999)*.

The collated fauna lists presented in Appendix 3, illustrate that Black Hill has high faunal diversity, which is a reflection of the variety of habitat available across the reserve, including: rock formations, large old trees with hollows, forest, open woodland, dense shrubby areas, grassland and dams.

Current MRSC Fauna Surveys

MRSC is undertaking a number of fauna monitoring and surveys, as directed through the *Black Hill Fauna Monitoring Program*, which was implemented following the 2015 bushfire. The monitoring includes:

- Nest box surveys
- Spotlighting surveys,
- Remote fauna camera surveys,
- Frog surveys,
- Owl Pellet dissections, and
- Incidental observations.

Indigenous Fauna Management

Some challenges with indigenous fauna management that have been highlighted during the EMP fieldwork and consultations include:

- The lack of information regarding the presence, or abundance of smaller (ground-dwelling) mammals, reptiles, amphibians and invertebrates
- The lack of a central data collation and management system to store and analysis information collected from previous surveys, and to coordinate future on-going surveys
- Maintenance of the perimeter fence
- Pest animal management
- Managing threatened species versus managing overall faunal habitat values
- Domestic dogs and cats entering the Reserve at night, and
- Potential impacts of removing weedy habitat.

Indigenous fauna management is complex; many species are interconnected (especially through the food cycle), and there is a general division between generalist and niche fauna species. There are a general suite of fauna that are present across most landscapes that can adapt to human disturbances and modified landscapes. Generally fauna management does not need to consider these species. It is the niche habitat species that require understanding and specialised management, and it is these species that are generally hard to detect within a reserve.

To understand the fauna in a bushland reserve requires on-going targeted surveying, that is appropriate for the species being surveyed for, and the on-going management of a data collation system.

11.10.1 Threatened and Iconic Native Fauna Species Management

Two threatened species are known to reside within the reserve; the Brush-tailed Phascogale and the Brown Treecreeper. The Brush-tail Phascogale is listed as threatened under the Flora and Fauna Guarantee Act 1988 and the Brown Treecreeper is listed as “near threatened” on the Victorian State Government’s Advisory List. The current *Black Hill Fauna Monitoring Plan* monitors these two species.

The site also provides potential habitat for other threatened species such as the Brown Toadlet, Powerful Owl and Rainbow Bee Eater.

The fauna monitoring program should be continued to provide on-going data about threatened species within the reserve.

Since the 2015 bushfire, the Brush-tail Phascogale has been recorded in the revegetation area in the north-west of the reserve. The Brown Treecreeper occurs across the reserve. Whilst the 2015 bushfire impacted on large areas of habitat, there is still suitable habitat for both species in the north-east and east of the reserve. Whilst bushfire cannot be prevented, current management should focus on maintaining ideal habitat conditions for both these species, whilst the vegetation and habitat across the rest of the reserve regenerates. As both are woodland species, the management recommendations in this EMP which seek to enhance the woodland landscape with mostly indigenous species should result in the required habitat for both these species.

The scope of the *Black Hill Fauna Monitoring Plan* should be increased to also include bat, amphibian and reptile surveys, to capture more data about species within the reserve, including any potential threatened bat, amphibian and/or reptile species. If there is little knowledge about the locations, habitat usage and breeding of threatened fauna species within a reserve, then there is the possibility that management practices can have unintended consequences on these species. Therefore knowledge is required about species and their usage of the Reserve, to assist in general management recommendations for the reserve, and in specific fauna species management recommendations.

Recommendations

Rec 32. Continue implementation of the Black Hill Fauna Monitoring Plan to facilitate the ongoing collection of data and information about the presence and absence of species, population densities and population changes.

Rec 33. Develop Native Fauna Management Plans for the reserve as required, with sections on both non-threatened (common) and threatened species, including bats. The section on threatened species will need to be prepared once more information on threatened species within the reserve is known/available.

11.10.2 Fauna Monitoring Data Management

The main source of information about the reserve's fauna is contained in the Prictor booklet (Prictor 1987) and subsequent data collected as a part of implementing the *Black Hill Fauna Monitoring Plan*.

This EMP has attempted to collate the fauna information that could be sourced (refer to Appendix 3). This information should be incorporated into Council's existing Natural Resource Management Database or similar which is updated with new information as it becomes available.

It is recommended that significant sightings of rare or threatened species be submitted to the Victorian Biodiversity Atlas, the Atlas of Living Australia and BirdLife Australia's Atlas of Australian Birds to facilitate community access to this information.

Council should also prepare regular fauna monitoring reports that document the outcomes of fauna monitoring activities.

Recommendations

Rec 34. Store data relating to the site's fauna in Council's existing Natural Resource Management Database or similar and complement with maps, GIS layers and other databases as required.

Rec 35. Utilise fauna data when planning/undertaking management works to determine if additional fauna assessments and mitigation measures are required.

Rec 36. Submit sightings of rare or threatened species to the Victorian Biodiversity Atlas, the Atlas of Living Australia and BirdLife Australia's Atlas of Australian Birds.

Rec 37. Prepare regular fauna monitoring reports that document the outcomes of fauna monitoring activities

11.11 Nest Boxes

There are numerous nest boxes located throughout the Reserve, which were initially installed by the Friends Group in response to the lack of larger trees with hollows across the reserve. After the 2015 bushfire over 80 of the nestboxes were destroyed. MRSC has replaced at least 50 of the nestboxes and commenced inspecting them on a monthly basis as a component of implementing the *Black Hill Fauna Monitoring Plan*. A pole-mounted inspection camera is used to check inside each box, so no ladders are needed, which reduces OH&S concerns and impacts on animals that may be present within the boxes.

It is known that Sugar Gliders, Brush-tail Phascogales, Brushtail Possums, Australian Owlet Nightjars and Brown Treecreepers currently utilise the nest boxes (MRSC 2015).

It is recommended that the nestboxes continue to be inspected on a regular basis. Checking the nest boxes four times a year would be ideal.

Apart from the monitoring program the nest boxes should remain undisturbed.

Opportunity also exists to utilise the nest boxes as a community engagement tool by involving local schools and community groups in the inspection program. Signage along the walking tracks near nest boxes would also enhance community knowledge about their purpose and function.

Recommendations

Rec 38. Continue to inspect the existing nestboxes on the site on a regular basis as a part of the implementation of the Black Hill Fauna Monitoring Plan

Rec 39. Install signage along the walking tracks under some of nest boxes, to provide information about their use in the Reserve.

11.12 Micro Bats

The Black Hill Fauna Survey Results (MRSC 2015) indicates that there are several species of micro bats in the reserve. It is recommended that a bat survey be undertaken within the reserve, or that an anabat be installed at several locations, to gather initial data on bats at Black Hill.

Once initial data has been collected, an annual bat survey should be incorporated into the on-going fauna monitoring program

Recommendations

See Rec 33 for recommended actions relating to fauna monitoring, including for bats.

11.13 Pest Animal Management

Pest animal management at the reserve aims to assist council in meeting the reserve's ecological objectives. There are many factors that need to be considered before any control measures are implemented. Existing relationships between all flora and fauna should be identified and understood to ensure that introduced pest animal control techniques do not have an adverse impact on current ecological function. Other considerations may include landscape context, topography, available resources, presence of threatened species, visitor usage and adjacent landholder activity.

Surveys have been undertaken at the reserve using remote cameras, spotlighting and incidental observations. Results from these surveys have shown the presence of rabbits, foxes and black rats. For successful pest animal control programs, initial pest animal numbers are needed, and once control has occurred, monitoring to follow up on post-control numbers is required to determine if the program has been successful. Once numbers have been reduced, then on-going control is required to ensure other pest animals do not move into the reserve.

Successful pest animal control programs should be on-going and can be resource intensive. If undertaken in conjunction with other management practices such as harbour removal or predator proof fencing, treatment effectiveness can be dramatically increased. Baseline data can also play a critical role in measuring the success of a pest animal program and can assist in the development of strategic direction.

Scat collection and analysis is currently been undertaken to determine the diet of foxes in the reserve.

Adjacent landholders and their land management practices also have an impact upon the reserve, especially with regards to pest plants and animals, and domestic animals (cats and dogs) entering the reserve.

Any planned pest control works, ideally should be undertaken in conjunction with adjacent landholders, as pest animals are a landscape management issue as well as a site specific issue.

Education and consultation needs to be incorporated into the ecological management and planning at Black Hill, especially with regards to uncontrolled domestic animal incursions into the reserve. Working in cooperation with the adjacent landholders on pest plant and animal management should lead to a decrease in these issues for both parties.

Rabbits

Rabbit control is best achieved when done as part of a synchronously coordinated rabbit control program undertaken throughout the local area. Management of rabbits across a site also needs to involve an integrated approach using a combination of methods most suitable to the site. Current methods have included fumigation and hand collapse. Potential methods include baiting, warren ripping, implosion and shooting.

It is imperative that during any rabbit control regime, precautions are taken to reduce the impacts to native vegetation and native wildlife and domestic animals.

These precautions may include:

- Ensuring any trapping of rabbits is carried out in accordance with the requirements of the Prevention of Cruelty to Animals Act 1986 (POCTA) and associated regulations (DEDJTR 2015)
- Adherence to selected poison MSDS and labels

- Using an appropriately qualified service provider experienced in various techniques for rabbit control
- Considering the impacts of chosen control techniques on indigenous vegetation and site of Aboriginal cultural heritage sensitivity.

Any contractors or other personnel undertaking rabbit control need to do so in accordance with statutory requirements, including training and permit requirements associated with the purchase and application of rabbit poisons and baits, including record keeping requirements. The delegated land manager has the ultimate responsibility for ensuring that any contracted or voluntary works comply with all statutory and legislative requirements associated with pest animal control.

Foxes: Control of foxes requires an integrated and coordinated approach with land managers in the broader area. The major methods of fox control include baiting, shooting and soft-jaw trapping. All of these methods need to be undertaken by appropriately skilled and qualified personnel. There are also concerns with baiting programs, as baiting can impact on domestic dogs and some indigenous fauna species, especially if undertaken in reserves close to residential properties.

No active fox control has been undertaken at the reserve in recent times as additional data collection regarding their impact is being collected by Council. In particular, a non-poison baiting program was implemented in autumn 2015 to determine whether the bait would be taken by native wildlife and, in particular, Brush-tailed Phascogale. The study found that no native species took the bait. The findings were presented at the Victorian Weed and Pest Animal Conference in June 2016 and subsequently published in the *Plant Protection Quarterly*.

Recommendations

- Rec 40. Continue to collect baseline data on native and introduced fauna to assist in development of a targeted pest animal program through increased understanding of ecological relationships within the reserve (refer to Black Hill Fauna Monitoring Plan)*
- Rec 41. Prepare and implement a targeted pest animal management program specific to an identified pest species such as rabbits, foxes and feral cats*
- Rec 42. Monitor the outcome of pest animal control efforts to determine level of success and evaluate program for future implementation.*
- Rec 43. Undertake community engagement aimed at encouraging surrounding land owners to implement complementary pest animal control works.*
- Rec 44. Conduct research into successful reserve fencing that allows for the movement of native wildlife and prevents cats and other pest animals from entering the reserve.*

11.14 Domestic Dogs and Cats

According to the Friends Group, domestic dogs and cats enter the Reserve at night from adjacent properties, attacking wildlife, including the Swamp Wallabies. Domestic animals have also been detected

in the reserve through the remote cameras, which have recorded up to 10 roaming domestic dogs and one cat.

This is a common problem in bushland reserves. The two main management responses to tackling the issue are constructing predator-proof perimeter fencing or undertaking on-going education/consultation with nearby landholders. Both are difficult to achieve: one involving a large initial funding commitment to construct the fence, and then an on-going funding commitment for monitoring and maintenance; and the other requiring attitudinal and behavioural change.

Any solutions to the issue need to be undertaken in cooperation with the adjacent landholders. It is likely some of them are unaware their domestic animals can enter the Reserve at night or are unaware of their impacts. Others may be aware of their impacts but not convinced, or concerned.

Under Council's Local Law infringement notices can be issued to owners whose dog is caught wondering at large. With regards to cat control, both feral and domestic cats are currently managed via the existing cat trapping program run through MRSC. In April 2017 Council was reviewing its Domestic Animal Management Plan which may result in changes to local regulations about dogs on lead, and dog and cat confinement.

Recommendations

Rec 45. Continue to implement shire-wide campaigns encouraging land owners to secure their pets.

See Rec 42 and 45 for recommended actions relating to pest animal management, including of feral cats.

11.15 Adjacent Unused Road Reserves

There are several unused road reserves which surround Black Hill Reserve that contain remnant vegetation and are connected to the reserve. These comprise:

- An unused road reserve along the reserve's eastern perimeter (an extension of Blackhill Road– Parsell Road). This road reserve is not licensed to any adjoining property. There is a double fence between Black Hill Reserve and the adjacent property, creating a double barrier to fauna movement.
- Council should consider incorporating this unformed section of road reserve into the reserve's boundary. If this cannot be achieved, then at least the internal fence between the reserve and the unused road reserve should be removed, to reduce the barriers to faunal movement. If the road reserve is ever formed, then the fence would have to be re-instated, however this is unlikely to occur as creating a road along the unformed Parsell Road reserve would require large amounts of vegetation removal.
- A road reserve along the northern perimeter of the reserve which is licensed to the adjoining land owner. It is noted that the property boundary information from VicMap is incorrect and that the boundary fence actually extends along the south boundary of the unmade road reserve. A map showing a more accurate alignment of the north boundary and road reserve is provided in **Figure 2**.
- A road reserve which extends at right angles from the unused Parsell Road eastward through the adjacent private property. This road reserve is licensed to one of the adjoining land owners and connects with remnant vegetation on the adjoining private property that is located along a waterway. It appears that the waterway and its' linear strip of vegetation is fenced off from livestock. The potential

to create, or enhance, a wildlife corridor from Black Hill Reserve to the waterway along this unformed road reserve should be investigated, as a means of providing faunal corridors across the landscape into and out of Black Hill Reserve.



Figure 2. Cadastre replot along north boundary of reserve

Recommendations

- Rec 46. Remove the fencing between the eastern perimeter of the reserve and the adjacent unformed road reserve to reduce the barriers to fauna movement into/out of the reserve*
- Rec 47. Investigate incorporating the unformed Parsell Road reserve into the reserve*
- Rec 48. Investigate creating a wildlife corridor along the unformed road reserve to the east of the reserve*

11.16 Perimeter Fencing

Following the 2015 bushfire, large sections of the perimeter were burnt and required replacement. Originally much of the perimeter fence was a four wire stranded stock fence. Following the fire, some fencing has been replaced with ring lock, which is not considered as good for wildlife. Originally, the replacement fence after the bushfire contained barbed wire for the top strand, although this has been removed, as barbed wire is a wildlife hazard.

Currently, there is a large pile of fencing wire from the replacement works located along the western perimeter of the reserve. This pile should be removed as it provides rabbit harbour and is unsightly.

The perimeter fencing has not been replaced in the unburnt section of the reserve, along the western and south-western perimeters of the reserve. In these areas some maintenance works are required as the fence is deteriorating. The unburnt section includes the main entrance into the reserve.

Reserve Front Entrance

At the main entrance into Black Hill, the Friends Group has installed a post and rail fence around the car parking area. There is the existing four wire stranded fence on either side of the post and rail fence, and both sides are in poor condition.

To increase the aesthetics of the main entrance, the Friends Group wishes to extend the post and rail fence to the end of the car park (and to the corner of the reserve) in the north-west corner, a length of approximately 30 metres.

To the south-west, the Friends group wishes to replace the existing rundown fence with a new four strand wire fence to the end of the section of perimeter fence that runs adjacent to Blackhill School Road, a section approximately 200 metres long. Funding and labour are required to undertake both projects. The existing fence requires repair/replacement as it has snapped wires and holes in it. The Friends group wishes to replace it with a four strand wire fence to match other fencing that exists around the perimeter of the reserve.

It appears that the actual perimeter of the reserve and the perimeter fencing are not aligned along some boundaries. It is, therefore, recommended that the fencing and actual boundaries be surveyed to identify any misalignment issues. If there are alignment issues, then the perimeter fencing may require re-alignment or some of the adjacent unused road reserves could be incorporated within the reserves' boundaries.



Post and rail fence could be continued to the road sign, for fencing consistency at the entrance to the reserve

Reserve Secondary Entrance

The second entrance to the reserve is located at the end of the formed section of Blackhill Road (or Parsell Road). There is limited car parking at this entrance, and due to the lack of visual surveillance the back gate is frequently vandalised.

Currently horses, motor bikes and tracks have entered the reserve at various times through this secondary entrance. Recently some park users have used the secondary entrance to enter the reserve and construct a mountain bike track behind the pine plantation. It appears that the track is no longer being utilised, for the moment.

A solution is required to controlling access at the secondary entrance to the reserve. The Friends Group has suggested installing a stile or swing gate at the entrance to restrict vehicle access, as both a stile or swing gate would need to be installed on fence posts which are securely installed in the ground, and which would be harder to remove/vandalise than a gate.

Recommendations

Rec 49. Remove the pile of wire along the western perimeter of the reserve

Rec 50. Undertake maintenance works along the unburnt sections of perimeter fencing

Rec 51. Investigate upgrading the current fencing at the entrance to the reserve by:

- *Extending the post and rail fence to the north-west*
- *Replacing the fence to the south-west with a four strand wire fence*

Rec 52. Adjust the access arrangements at the secondary entrance to the reserve (Parsell Road) to prevent vehicle, motorbike, mountain bike and horse access.

11.17 Predator-proof Fencing

Whilst the current farm style perimeter fencing has prevented most access to Black Hill and has allowed most of the reserve to revegetate, the fencing is easy to damage/cut, and people are accessing the reserve for purposes such as horse riding, collecting firewood and motor bikes. In addition, the current fencing allows the movement of both indigenous fauna and pest animals into and out of the reserve.

One potential solution to restrict human access (and therefore activities) to defined access point; which could also restrict pest animal movements (in conjunction with pest animal control works); is the consideration of predator-proof fencing around the perimeter of the reserve.

Predator proof perimeter fencing is used in many areas of Australia (and New Zealand) for a variety of management purposes such as preventing entrance of pest and domestic animals, increasing indigenous fauna species numbers and diversity, and maintaining populations of threatened fauna species

However there are a number of considerations associated with these fences. Aside from their construction costs, predator-proof fences need to be inspected daily and maintained regularly, pest animal control programs are needed to eliminate existing pest animal species inside the fence, and they can limit movement of ground dwelling native fauna such as wombats and echidnas unless appropriate gates are installed. As most predator-proof fences are constructed to manage threatened species, there has not been much consideration and research of the impacts on more common ground dwelling fauna species.

Construction and management of a predator proof fence, including regular (daily) inspections and ongoing wildlife management, would require substantial resources. This resource allocation is only considered necessary if conducted as part of a threatened species introduction program which achieves the additional benefits of protecting critically endangered species. Further details about the threatened species introduction program explored in 2014 are outlined in Section 11.26.

Recommendations

See Rec 44 regarding investigating installation of a predator proof fence in conjunction with a threatened species introduction program.

11.18 Wildlife Friendly Fencing

When the perimeter fence was re-instated following the 2015 bushfire, barbed wire was placed along the top of the fence. It was subsequently removed as large macropods (kangaroos and Wallabies) can become entangled in barbed wire leading to a slow death.

Barbed wire is a major hazard for wildlife. Each year thousands of animals face a cruel death or permanent injury from entanglement on barbs, usually on the top strand. More than 75 wildlife species have been identified in Australia as occasional or regular victims of barbed wire fences, especially nocturnal animals such as bats, gliders and owls. Many fail to see the fence, or cannot clear the height under windy conditions. Most of those rescued are too severely damaged to return to the wild.

There are also other fencing hazards. Kangaroos get hung up in fences that are too high, whether plain or barbed, a situation made worse by the bottom strand of the fence being too low. Wetlands fenced too close to the waterline prevent wetland birds from landing or taking off, especially cranes (WWW 2010).

Fencing requirements depend on what is being fenced, why and the livestock being managed. Therefore fauna friendly guidelines vary according to the fencing requirements of a reserve and adjacent landholders. There are a variety of considerations including:

- No barbed wire (entanglement issues)
- Visibility (so fauna does not collide with the fence)
- Position of bottom wire (so ground dwelling fauna does not become tangled)
- Mesh size and position (so animals don't become trapped in the mesh)
- Variety of fauna in the landscape and free movement, especially in events such as flood or bushfire
- Position of fencing in relation to water and feeding sources

Additional information about wildlife friendly fencing can be accessed from <http://wildlifefriendlyfencing.com/WFF/Home.html>

Recommendations

Rec 53. All future fencing should be designed to minimise injury to wildlife.

11.19 Dog walking within the Reserve

According to the Friends Group, approximately 50% of all reserve users are dog walkers. The majority of walkers keep their dogs on lead, and remove their poo. Most dog walkers tend to remain on the Circuit Track. Dogs are allowed in the Reserve on a lead. There is one sign stating that dogs should be on-leash at all times.

No 'dog poo' bags/disposal bins are provided as Council has a "take your rubbish" home policy for all bushland reserves. This applies to rubbish as well as dog excrement. Clause 43 of Council's Local Law

requires that a person in charge of an animal carry litter devices and dispose of animal excrement on Council land. It is recommended that these regulations be re-enforced on new or updated reserve signs.

The one sign is located at the main entrance, which has at least 15 other signs, in at least four different styles. It is easy to miss the 'Dogs Must be Leashed' sign amongst the myriad of other signs.

Whilst dog walking is a popular recreational use of Black Hill, dogs have the potential to chase wildlife, and their poo and scent marking act as 'predator scents' to many indigenous fauna, which may alter indigenous fauna's behaviour and movement patterns.

The main issue at Black Hill is how to enforce the 'dogs on lead' rule, and how to ensure people are responsible for their dogs whilst in the reserve. Regular patrols by the Council's rangers would be beneficial.

Recommendations

See Rec 62 (below) regarding installation of signs, including signs advising that owners should pick up after their dogs and that dogs must be on leads at all times.

See Rec 54 (below) regarding increasing the surveillance of the reserve to facilitate greater compliance with the reserve's regulations.

11.20 Surveillance within the Reserve

Aside from weekly maintenance works undertaken by some members of the Friends Group, and the monthly monitoring for the Fauna Monitoring Plan, there is no regular, official management presence at Black Hill. Management issues associated with this lack of presence include vandalism, people undertaking prohibited activities and the difficulty in enforcing regulations such as the 'dog on lead' policy.

It is recommended that Council consider opportunities to increase the official presence within the reserve, including on evenings and weekends.

Opportunities could include voluntary patrols in partnership with community groups and other agencies (e.g. Parks Victoria), investigating Council staff resourcing or installing surveillance cameras.

Recommendations

Rec 54. Investigate a more regular official management presence within the reserve to facilitate greater compliance with the reserve's regulations

11.21 Dams and their Usage

As outlined previously, there are numerous dams located across Black Hill, some of which were constructed by Kyneton Shire in the 1960s, and some of which are artificial depressions resulting from the former gravel quarrying. Aerial photography illustrates that there are also several dams located near the reserve in the adjacent private properties.

Three of the dams are a permanent water source; they contain frogs and are fringed with indigenous wetland vegetation. These three dams are located at the southern end of the reserve, near the Circuit Track. These three dams all contain wetland and fringing vegetation.

There are a few dams located on the slopes of Black Hill, which contain water during the wetter seasons and after heavy rainfall. The Black Wallabies live amongst the granite outcrops along the ridge line; however they move downslope during summer, when the water sources on the slope dry out.

As outlined in Section 4.2.1, there are also several regionally significant wetland flora species that were recorded in the shallower artificial ephemeral depressions at the northern end of the reserve.

These are just some of the known uses of the dams/ephemeral artificial wetland depressions across the reserve. As all fauna species require access to water, the presence of these dams is critical to the presence of some fauna species within the reserve, especially the more cryptic or smaller species that would not venture across open paddocks to the dams in the adjacent properties. The dams would also support pest animals that live within the reserve.

It may be useful to install remote cameras around the permanent dams to record what species are utilising the dams and at what frequencies. This may also provide useful information regarding pest animal activity within the reserve.

Recommendations

Rec 55. Install remote cameras at the permanent dams to record fauna activity surrounding the dams

Rec 56. Retain all existing dams within the reserve

11.22 Recreational Activities at Black Hill

Black Hill is a passive recreational reserve, with an emphasis on walking around or across the reserve to view its geographical features. The majority of users are dog walkers or day trippers.

There have been incidents of other users entering the reserve for other recreation activities which are detrimental to the reserve, such as horse riders, motorbike riders and 4 wheel drivers. In addition, the reserve has been used by rock climbers and is currently subject to a request by an orienteering club. Some of these recreational activities are outlined below.

Orienteering

Recently Orienteering Victoria has recognised Black Hill as a potential event site. The following information has been paraphrased from information provided by a member of the Nillumbik Emus Orienteering Club (Niven 2016):

Until recently Black Hill was considered too small for an orienteering competition, but new technology and new event formats make Black Hill very appealing to experienced orienteers, due to the rocky outcrops combined with the complex hills and gullies and the mix of vegetation.

In orienteering people participate individually, and either jog or walk. It is conducted partly on and partly off tracks. Orienteering usually occurs on Sunday mornings, and the organisers bring their own toilets, use private land parking, install fence stiles and duckboards when necessary, conduct

rubbish clearance and do not affect the general public's normal use of an area. A typical day would involve 125 – 150 people, and they are unlikely to plan an event more than once every two years.

When the group uses Parks Vic or National Parks land they pay a fee, so it could be anticipated that a fee would also be required to utilise Black Hill. For a successful orienteering event, a very detailed map of a reserve/site is required, which Orienteering Victoria has now invested in, but various events such as the 2015 bushfire have delayed its first use for orienteering until at least 2017–2018.

When discussed with the Friends Group, they have requested that events avoid the wildflower season (spring), and for the moment the lack of leaf litter makes soil erosion a concern, hence delaying any possible event until at least 2017–18.

From an ecological perspective there are concerns with people trampling indigenous ground storey vegetation, spreading weeds and contributing to erosion, especially considering the fragile soils that exist on the slopes of Black Hill. From a risk management perspective, trees outside of the track maintenance areas may still be unstable and susceptible to falling, especially after heavy rain.

If future orienteering events were to be permitted at some point at Black Hill, they should be restricted to areas with less than 50% indigenous ground storey vegetation cover, and they should be undertaken in autumn when the ground is dry, and there is less likelihood of causing erosion. It is also recommended that the number of participants be limited to no more than 25 and that the organisers undertake a full risk assessment of the course prior to the event.

It is noted that orienteering is not permitted in other parks and reserves in Victoria (such as the Lerderderg and Wombat State Forest in recognition of the impact the activity can have on the natural values of these areas).

Rock Climbers

Currently rock climbers sometimes climb amongst the granite outcrops, mostly on weekends. Some of these rocks have pins installed. At one stage there were over 60 climbing routes marked at the reserve (Maltby, 1995). They are not considered to be a major management issue, as they do not leave rubbish behind them. It has been noted that the main damage appears to be removing lichen off some of the rocks.

From an ecological perspective, rock climbers are known to cause damage to vegetation, nesting birds and rocks, especially at the larger rock climbing sites such as Mount Arapiles. The degree of damage would be associated with the extent of usage of the site, number of climbers and whether they are restricted to certain rocks or climb across the reserve. Council should liaise with rock climbing clubs to raise awareness about the reserve's natural values amongst their members. It is also recommended that no new pins be allowed to be installed in the rocks.

Horse Riding

The occasional horse rider is observed at Black Hill Reserve. The main entrance used by horse riders is the secondary entrance.

From an ecological perspective, horses have the potential to damage native vegetation, increase the spread of weeds and pathogens and damage fragile habitat (for example the Brown Toadlet breeds in small crevices in the soil which can be destroyed by horses). If horses remain on the vehicular section of Circuit Track, there impacts are likely to be limited to the spread of pathogens and the introduction of pest plant seeds through their droppings. As the vehicular section of Circuit Track does not extend along the northern perimeter of the reserve, horses utilising this section of the track would be problematic for other track users (the track is narrow in this section) and for biodiversity, as pest plant seeds in their droppings could invade higher quality areas of bushland vegetation, and their hard hooves would impact the fragile soils off the track. It is recommended that horse riding be prohibited at the reserve and that the site's entrances be secured / modified accordingly to prevent access.

Mountain Bike Riding

An illegal mountain bike track has been constructed in the valley behind the pine plantation. It appears someone has put in considerable work to construct the track, and they may have gained vehicle access into the reserve to bring in materials, by smashing/cutting the padlock at the secondary entrance into the reserve.

It appears after detection by the Friends Group and Council, that use of the track has subsided, and the Friends Group plans to remove the jumps and 'clean up' the area.

Mountain bike riding does damage bushland, especially when tracks and jumps are created. Mountain bike riders sharing tracks is also dangerous for the other users. As mountain bike riders can go off track, they would cause damage to ground storey vegetation and the fragile soils of Black Hill. It is recommended that mountain bike riding be prohibited at Black Hill reserve.



Section of mountain bike track (Provided by W Terry)

Cross Country

Currently there is a cross country event that is held annually, and the participants only utilise the Circuit Track for the event. According to the Friends Group, there are no major management issues with this event occurring within the reserve.

Recommendations

Rec 57. Do not permit horse riding, mountain biking or motorbike riding at the reserve and secure / modify the reserve's access points to restrict access accordingly.

Rec 58. Liaise with relevant rock climbing clubs to raise awareness about the reserve's natural values amongst their members.

Rec 59. Do not permit additional rock climbing pins to be installed in the rocks.

Rec 60. Do not permit orienteering during the fire recovery phase. Review the appropriateness of orienteering in 2020. Orienteering should not occur in the Higher Quality bushland areas of the Reserve.

Rec 61. Undertake an ecological impact assessment for proposed recreation activities, if required, as a part of the investigation process and refer proposals to Council's environment unit for approval.

See Rec 62 (below) regarding installation of signs that clearly inform visitors about permitted and prohibited activities.

See Rec 54 regarding increasing surveillance of the reserve to facilitate greater compliance with the reserve's regulations.

11.23 Signage

At the main entrance to the reserve there are at least 15 different signs in at least four different styles. There are then very few signs beyond that or at the secondary entrance to the reserve.

The myriad of signs and the different styles means visitors may overlook important information. It is recommended that the number, styles and messages on the signs at the main entrance be reviewed to ensure that the important reserve information, such as 'Dogs on Leads only' and 'prohibited activities' are clear and that they occur at both reserve entrances.

Signage for other issues, such as the walking tracks could potentially be in a different style, so they are distinguishable from the important reserve messages.

Council has prepared sign templates for bushland reserve to create consistency, improve the presentation of signs in bushland areas, increase awareness of Council management and consolidate information regarding permitted and prohibited activities.

Opportunity also exists to review the directional signage to the reserve from the surrounding area to ensure visitors are able to find the reserve easily from different approaches.



Some of the signs at the main entrance to the reserve

Recommendations

Rec 62. Progressively implement Council's Bushland Reserves Signage Template to ensure new signage is consistent, effective and clearly advises visitors about the reserve's regulations including::

- *Dogs on lead*
- *No dumping of green waste*
- *No horse riding*
- *No mountain bike riding*
- *No motorbike riding*
- *No fire wood collection*
- *Take your rubbish home*
- *Pick up after your dog*

Rec 63. Review the directional signage to the reserve from different approaches and identify locations for new directional signs as required.

11.24 Managing Heritage Values

As outlined in Section 3 there are Aboriginal and European cultural heritage values associated with Black Hill.

Aboriginal Cultural Heritage values are managed under the Victorian Aboriginal Heritage Act 2006, which requires a Cultural Heritage Management Plan to be completed for any proposed high impact activities that may impact on potential values within a reserve. Other management actions that result in ground disturbance (such as some rabbit control works, as well as pathway construction etc) may also require a permit under the Act.

It is recommended that a study of the site's Aboriginal cultural heritage values be undertaken, to provide a more definitive history of the Aboriginal uses of Black Hill, and to reduce the need for any Cultural Heritage Management Plans and permits. An Aboriginal cultural heritage study should identify areas of potential significance or sensitivity and set out recommendations to mitigate any impacts to these values associated with proposed new uses/ activities, and routine management. Consultation with relevant Aboriginal groups will be required as a part of any Aboriginal heritage study.

With regard to European cultural heritage, there are no visible sites of significance, although cultural heritage values should always be considered if there are any management works plans that require earthworks.

Recommendations

Rec 64. Conduct a preliminary Aboriginal Cultural Heritage Study or "walk over" of the reserve that identifies possible areas / sites of significance in collaboration with relevant aboriginal groups. Consider commissioning more detailed studies if required in the future.

11.24.1 Green Waste and Firewood

Due to the 2015 bushfire, and the amount of burnt/fallen timber that currently occurs across Black Hill, it is difficult to know if illegal firewood collection is a problem within the reserve, or not. Whilst there is no official vehicle entry into the reserve, people can drive over the perimeter fences or enter via adjacent properties.

Logs on the ground provide habitat for ground-dwelling fauna, and firewood removal can have a detrimental effect on habitat and ground storey vegetation. Fallen logs also help stabilise the slopes of Black Hill.

A similar issue in reverse may be the dumping of green matter, which should not occur as green waste from gardens can introduce new weed seeds into a reserve, which can become problematic and invasive.

These issues are most likely to be problematic if the reserve continues to have a low official management presence, and if the management of the secondary entrance of Blackhill Road is not addressed.

Recommendations

See Rec 62 regarding installation of signs that clearly inform visitors about permitted and prohibited activities, including in relation to firewood collection and dumping of green waste

See Rec 54 regarding increasing surveillance at the reserve to facilitate greater compliance with the reserve's regulations.

11.25 Machinery Maintenance and Hygiene

Vehicle hygiene should always be considered within the general reserve management, as treating new weeds or soil pathogens is more difficult (and resource intensive) to control than avoiding their introduction.

If any works, management or maintenance vehicles are planned to enter the reserve, especially if earthworks are planned, then vehicle hygiene should always be considered. That is; ensuring that all machinery that used within the Reserve is cleaned (in an appropriate wash or brush down facility), before it enters the reserve, and that it is soil and weed free.

As there are no facilities for washing or brushing down on-site, any machinery needs to be cleaned before it enters the reserve.

Council is currently in the process of developing vehicle hygiene processes and procedures for relevant Council staff and contractors. These processes and procedures will be incorporated into relevant weed control and slashing tenders as required. The standard operating procedures and check lists developed should be provided to staff and contractors who bring machinery into the site.

Recommendations

Rec 65. *Ensure Council staff and contractors entering Black Hill Reserve are included in Council's vehicle hygiene program.*

11.26 Pine Plantation

The pine plantation was planted in the late 1960s/early 1970s, to provide a future income stream and to stabilise an eroded area of the reserve.

Due to the small size of the plantation and accessibility issues, it would now cost more to harvest the plantation than would be generated in income. In conjunction, approximately 80% of the plantation was burnt during the 2015 bushfire.

Currently there are some fallen pine trees, however most are still standing. The ground underneath the pines is mostly bare, but there a few regenerating shrubs and some exotic grasses. As the pines fall over, and more light enters the pine plantation, it is likely that more plants will germinate. Whilst pine needles have an alleopathic effect that prevents most plant growth, the majority of the needles were burnt in the bushfire, mostly eliminating this issue.

There is currently a conundrum regarding how to manage the plantation. Since the bushfire many logs within the plantation have fallen over, and it is likely all the burnt trees will fall in the next 10 or so years. After the burnt trees have fallen over, it is probable that the remaining trees will decline (there is evidence some are already declining) and also fall.

Whilst the pine plantation is located away from the Circuit Track, it is known that people have recently constructed a mountain bike track behind the pine plantation, so people are walking through the area.



The pine plantation

The main issue with the pine plantation is whether to leave the trees to naturally fall over in the next 5–20 years, or whether to intervene and remove the hazards. The latter option is resource intensive and would require a plan to be prepared for the area. As there are some remnant larger eucalypts and smaller trees/shrubs growing around the plantation, these also need to be considered in any future plans for the area.

Given the small area the plantation occupies (approximately 1 hectare), removing the pine trees is not considered a high priority when all costs and ecological benefits are taken into account compared to other environmental management imperatives for the reserve. Therefore, it is recommended that the pine trees be allowed to naturally decline unless additional funding becomes available.

For safety purposes it is recommended that signs be installed advising visitors to stay clear of the plantation due to the risk they present. If this is considered ineffective, Council could consider restricting access to the area and felling any high risk trees in highly trafficked locations.

To prevent further invasion of pines outside the existing plantation, it is recommended that pine saplings be removed as a priority.

Recommendations

Rec 66. Install signs warning people to keep out of the pine plantation due to potential falling hazards. If this proves ineffective, consider restricting access to the area.

Rec 67. If funding becomes available, prepare and implement a plan for the removal of the plantation and revegetation to incorporate the area into the rest of the reserve.

Rec 68. Remove any pine saplings in the vicinity of the plantation as a priority.

11.27 Introduction of Threatened Species into Black Hill

In 2015, the proposed introduction of threatened Brush-tailed Rock-wallabies from Mount Rothwell Biodiversity Interpretation Centre into Black Hill Reserve was discussed between the Centre and MRSC, as Black Hill contained suitable habitat for the species. The proposal would have entailed construction of predator-proof fencing at the reserve, on-going pest animal control programs (for foxes) and a daily management presence at the site. To accommodate this, an office and toilets were proposed.

Some community members raised concern that the program would result in the removal of public access to the reserve and could impact the movement of existing native wildlife. As a result, on 22 July 2015 Council resolved:

- 1. That Council notes the proposed Black Hill Reserve Brush-tailed Rock Wallaby Introduction Project put forward by Mt Rothwell Biodiversity Interpretation Centre.*
- 2. That should Council indicate support in principle for a project of this nature, encourage Mt Rothwell to investigate the opportunity to introduce this program in other reserves in the Macedon Ranges.*
- 3. That Council prepares an Environmental Management Plan for Black Hill Reserve with full community consultation, as previously proposed.*

From an ecological perspective the proposal would have addressed most of the management concerns at the reserve while still maintaining the current public access arrangements. On this basis, the proposal would have improved pest animal control, improved fencing and the associated unauthorised access concerns and would have increased knowledge of Black Hill and its' values to the broader community. It also would have provided an example of how a Council could work in cooperation with a private operator to manage habitat for a threatened species, which would provide other funding sources in the longer term. The presence of an on-site ranger would have greatly improved surveillance of the site and increased opportunities to take action on unauthorised activity.

The main community concerns were associated with how the predator-proof fencing would impede existing wildlife movements and dog walking. Some community members also raised concern that public access would be removed altogether.

It is noted that the proposal involved retaining public access as existing, including the ability to walk dogs within the reserve on the lead.

In terms of wildlife movements, the specifications for the fencing could have maintained movement opportunities by incorporating "wombat gates" such as those at the Royal Botanic Gardens Cranbourne and Warrandyte State Park (Coates 2013).

The consultation for the draft Environmental Management Plan indicated that the community still has questions about aspects of the proposal. As such, it is recommended that further engagement occur with the community as a part of preparation of Council's Biodiversity Strategy to help address some of the community's outstanding queries about the proposal. This could include tours to the Royal Botanic Gardens Cranbourne and Mt Rothwell.

Recommendations

Rec 69. Conduct additional community engagement about possible support for threatened species introduction programs with the aim of addressing some of the queries raised during the community consultation for the draft EMP.

11.28 Gates between the Reserve and Adjacent Properties

Near the north-west corner of the reserve there is an unlocked gate that provides access between the reserve and the adjacent property to the north. There is also a formed grassy vehicle track that was constructed by the Friends of Black Hill Reserve and runs from the Circuit Track to the gate. This track extends into the adjacent property and is maintained by the adjoining land owner at the request of the Langly-Barfold CFA Brigade for fire and emergency access.

There are also two other gates/access points along the western perimeter of the reserve into adjacent private properties. One of these points is open without a gate. It is apparent at all these points that vehicles from these properties do access the reserve at times.

There should be no private access into the reserve, unless for fire track maintenance purposes.

The location of these gates is depicted on Map 2.



Opening along western perimeter fence between the reserve and an adjacent property

Recommendations

Rec 70. Install locks/gates at each of the access points, to restrict access into the reserve. Provide a key to the north-west gate to the adjoining landowner to enable the existing fire track maintenance to continue.

Rec 71. Ensure locks can be opened by CFA crews, if required

11.29 Summary of Management Issues

As outlined in the Introduction to this Section of the EMP, the detailed discussion of the management issues associated with the ecological values of the reserve; has been utilised to define the management recommendations, principles and actions that will become the framework to guide the ecological management of the reserve within designated Management Zones.

The comprehensive management principles and actions for each Management Zone are provided in Section 9 of this EMP.