



Blackbutt Reserve  
**Vegetation Management Plan**



City of Newcastle  
September 2013

## Blackbutt Reserve - Vegetation Management Plan

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Published September 2013 by Newcastle City Council  
[www.newcastle.nsw.gov.au](http://www.newcastle.nsw.gov.au)

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**Front Cover:** Vegetation within Blackbutt Reserve is generally in excellent condition although it is subject to external pressure; recreational demand; and has been subjected to significant previous disturbance.

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# I Introduction

## I.1. Summary

This Vegetation Management Plan (VMP) applies to Blackbutt Reserve. The Reserve is bounded by Lookout Road in the west, Carnley Avenue to the south and New Lambton residences in the north and east.

This site is comprised of five catchments which drain roughly from west to east and make up a total area of around 165 hectares.

Blackbutt Reserve is predominantly vegetated and contains areas of excellent quality bushland.

The Bushland Inventory (2010) assessed Blackbutt Reserve as being an important asset to the City, with each of its sub-catchments rating within the top 20 of all reserves in the City (89 in total). Specifically:

- Coalmine Creek Catchment rated 4<sup>th</sup> out of the 89 Reserves.
- Rainforest Creek Catchment rated 5<sup>th</sup>;
- Black Duck Creek Catchment rated 6<sup>th</sup>;
- Echidna Creek Catchment rated 7<sup>th</sup>; and
- Bowerbird Catchment rated 17<sup>th</sup>.

Several of the best condition creek reaches assessed under the City of Newcastle's (CofN) Creek Assessment Program are also within the Reserve.

Although its size, shape and relative connectedness to the nearby Jesmond to Rankin Park Bushland complex make it a "high quality reservoir of biodiversity, it may still be too small and isolated to be sustainable without regular management" (CofN 2005).

Currently the vegetation at the site contains significant weed infestation, has an inappropriate fire regime and is subjected to various pressures resulting from proximity to urban development.

This VMP outlines Council's strategic approach to managing vegetation within Blackbutt Reserve to ensure that vegetation communities are protected and enhanced. This in turn will improve long term functionality and resilience of the vegetated areas; provide various ecosystem services; and provide habitat for fauna species.

This VMP is the result of review of several key documents (as outlined in Section 6 of this report), field work undertaken within the Bushland Inventory and site investigation undertaken by Land Resource Industries.

This document should be read in conjunction with Council's Bushland Technical Manual (CofN, 2012).

## I.2. Scope

This VMP outlines CofN's strategic and legislative requirements for managing vegetation in Blackbutt Reserve.

The VMP aims to maintain or improve the diversity and structure of vegetation within the Reserve to ensure land services are maximised and to promote long term resilience of the

vegetation communities. Strategic management of vegetation within the Reserve will improve functionality of the vegetation which in turn leads to improvements in the overall condition of land and water resources of the City while providing habitat for native species.

The VMP has been prepared based on site investigation; desk top review of previous studies and reports relating to the Reserve; and the field work of Clements and Associates in the Bushland Inventory which assessed and documented all CofN reserves in 2010.

This VMP provides sub-catchment specific vegetation information; a four year program for each of the Reserves sub-catchments; and specific recommendations for annual implementation plans within vegetation management zones proposed later in the report.

The Vegetation Management Zones suggested in this Plan group areas of similar condition and recovery potential where similar management actions are to be applied.

The recommended actions should be used by Reserve managers as the basis for their annual implementation plans which should be based on available resources; realistic targets achievable within each year; and year to year management aspirations for the site.

As per CofN's strategic planning framework, this plan requires review after four years.

### 1.3. Framework for Natural Asset Management

This document defines the way in which Council aims to manage vegetation within Blackbutt Reserve.

The Blackbutt Plan of Management (2012) is the overarching plan on which this Vegetation Management Plan is based. This VMP provides a 4 year delivery program and recommendations for annual Operational Plans as per Figure 1 below.



Figure 1 - Framework for Natural Asset Management

The Blackbutt PoM outlines the Reserve values; issues affecting the Reserve and strategies to deal with them. The relevant concepts from the PoM are presented in this document and will form the basis for vegetation management in the Reserve.

The land to which this VMP applies is the Rainforest; Black Duck; Coal Mine; Echidna; and Bowerbird Creek catchments. The specific lots to which the plan applies are outlined in the table below.

**Table 1 – Land to which this VMP applies**

<b>CLASSIFI- CATION NUMBER</b>	<b>PARK NAME/DESCRIPTION</b>	<b>LOT/Section/DP</b>	<b>Area (ha)</b>
C166	BLACKBUTT RESERVE	13//263567	0.64
		10//263568	0.23
		1//1148892	0.23
		1//594058	11.72
		1//594058	6.73
		1//1148892	0.94
		1//1148892	52.19
		11//263567	1.32
		181//599648	83.21
C178	RICHLEY RESERVE	19//555035	7.64
C183	LOOKOUT ROAD PARK NORTH	39//19631	0.61
		2/R/1949	0.14
		3/R/1949	0.15
		1/R/1949	0.12
		36/R/1949	0.15
		35/R/1949	0.15
Total Area (ha)			166.17

## 2 Goals, Values, Objectives and Strategies

### 2.1. Plan Goals

#### 2.1.1 Local Government Act

This plan is relevant mainly to the Natural Areas (as defined by the Local Government Act (1993)) in the Reserve.

For each category of Natural Area (Bushland, Watercourse, Wetland and Escarpment) present in the Reserve, the Local Government Act outlines core objectives. The Blackbutt Plan of Management considers the core objectives for each category and has consolidated these down to eight key objectives. The first three are relevant to vegetation management and have been adopted as the objectives of this VMP

Objectives of the Plan are to:

- Manage the Reserve in a manner that protects and enhances the values and quality of the Reserve
- Conserve biodiversity and maintain the ecosystem function of the reserve
- Provide for restoration and regeneration of natural areas within the reserve

#### 2.1.2 Goal of this VMP

This VMP aims to ensure the ongoing ecological viability of the Reserve by protecting the ecological biodiversity, landform and habitat values of the Reserve.

## 2.2. Values

The Blackbutt Reserve Plan of Management outlines values of the Reserve. Many of these directly reflect the value of the vegetation on the site and are reproduced here:

**Ecological** - The Reserve provides an important habitat for native plants and animals and contributes to our green corridors. It plays a vital role in conserving regional and local biodiversity.

**Nature** - The opportunity to experience something of the wild, as well as the picturesque characters of nature in an urban area, provide aesthetic, health and wellbeing benefits.

**Recreation** - The use of the Reserve for recreational pursuits in a unique natural setting.

**Education** - The Reserve offers significant learning opportunities through education and interaction.

**Scenic** - The prominent ridgelines are important features of the Reserve's topographical character. In their forested state they present a significant backdrop and skyline of natural form to a large 'viewshed' spread over Newcastle's suburban development.

**Accessibility** - An accessible place for all members of the community, in proximity to the city and with good connections both within and to surrounding areas.

**Historical** - Blackbutt demonstrates a living example, in part, of the original nature of Newcastle and the immense time scale that is represented.

## 2.3. Strategies

Performance measures or Strategies are outlined in the Blackbutt PoM. These are broken up for the whole of the reserve and for each sub-catchment.

The relevant Strategies applied to the whole reserve in this VMP are:

1. Control the spread of weed species, focussing on the intact core of the Reserve and in areas of threatened species and endangered ecological communities.
2. All fire management activities shall consider fuel loads and potential risk to property, in addition to ecology diversity and integrity.
3. To implement appropriate fuel reduction strategies in proximity to culturally significant sites
4. Delineate "natural" areas and "recreation" and urban areas to restrict incompatible uses and regenerate natural areas where appropriate.
5. Surplus grass area may be reclaimed by planting of indigenous vegetation to increase buffer zones and promote ecological sustainability and biodiversity.
6. Manage erosion and sedimentation within the Reserve from tracks, streams and drainage lines.
7. Management of stormwater impacts on the Reserve.
8. Protection and enhancement of the current condition of the watercourses within Blackbutt Reserve.
9. Protect the biodiversity and ecological value of wetlands
10. Protect the diversity of flora, fauna and ecological communities with particular emphasis on threatened species and endangered ecological communities.
11. Minimise the spread of disease that will impact on the conservation of the Reserve

12. Ensure appropriate environmental impact assessment is undertaken for all appropriate activities.
13. Prioritise the management of Habitat Trees
14. To establish and maintain Blackbutt Reserve as a key habitat location which is well connected
15. Encourage the use of local provenance (species for revegetation).
16. Landscape and Tree Planting
17. Reserve protected from activities that will degrade or reduce viability of the site.
18. Establish and Maintain an appropriate recreational track network to provide access to key destination points
19. Encourage neighbouring residents to become involved with the conservation and management of the reserve

The Blackbutt Plan of Management also proposes Management Actions for each of these strategies and these are expanded on in the catchment specific recommendations that make up the VMP.

### **3 Blackbutt Reserve – Site Description**

This section collates background information for the Reserve that is relevant for vegetation management within the site.

The Reserve contains a significant area of native vegetation, which provide various land services; habitat for threatened species; as well as providing social services and recreation opportunities. The forested ridge line forms a visual horizon from many areas of the City and thereby plays an important landmark and aesthetic role in Newcastle’s Cultural Diversity (Green Corridors Plan)

#### **3.1 Location**

Blackbutt Reserve is located in the south-central portion of the LGA. The reserve is surrounded by the suburbs of New Lambton Heights; New Lambton; and Kotara. Blackbutt is one of the most significant areas of bushland in the Newcastle LGA, however it is isolated from other reserves due to surrounding development and infrastructure.

Lookout Road forms the western boundary of the Reserve and divides it from another significant area of bushland to the west: the Jesmond to Rankin Park Bushland Complex.

For management purposes, the Reserve is divided into five individual sub-catchments and this division is retained for the purpose of this plan (Figure 2), however the Vegetation Management Units proposed may span the catchment boundaries.



Figure 2. Blackbutt Catchments (green outline); Creek-lines (Blue) and Major Tracks (Orange).

## 3.2 Reserve Scale

Blackbutt Reserve, is approximately 165ha in area and is predominantly comprised of Bushland. The Reserve sits at the headwaters of Throsby Creek Catchment which is about 3000ha in size.

Although on first glance the Reserve seems relatively small compared to its catchment setting, the 2004 Newcastle Stormwater Plan (SMP) notes that bushland comprises only 280 ha or about 9% of the total Throsby Creek catchment area. This places into context the importance of Blackbutt Reserve which contains approximately 60% of the catchments bushland when the SMP statistic is considered.

Management of vegetation in the reserve is also important in that Blackbutt Reserve is an iconic site in the local area which receives high visitation and usage. The City of Newcastle has an obligation to ensure the management of the site reflects the best standards of management. This is consistent with the Blackbutt Reserve Plan of Management which aims to position the Reserve as a leading example of environmental sustainability.

## 3.3 Land Use affecting the Reserve

The 2012 Newcastle Local Environment Plan zones the whole of Blackbutt Reserve as E3 (Environmental Management). This zoning permits a range of activities that occur within the reserve that can affect the existing vegetation. These are considered in subsequent sections of this VMP.

The predominant land use surrounding the Reserve is R2 Low Density Residential. Parts of the Reserve's western boundary are flanked by Lookout Road which is zoned as SP2 Infrastructure (Classified Road). Numerous issues arise from the neighbouring land uses that will be considered later in this Plan.

## 3.4 Vegetation Characteristics

LHCCREMS (2000) mapped several vegetation types in the Reserve as per Figure 3.

Within drier areas and ridgelines LHCCREMS maps:

- MUI5 – Coastal Foothills Spotted Gum – Ironbark Forest. The forest canopy is dominated by Spotted Gum (*Corymbia maculata*) in association with *Eucalyptus paniculata*. Other tree species also occur (eg white mahogany and turpentine). The mid stratum is open and comprised of species such as *Allocasuarina torulosa*, *Persoonia linarifolia*, *Breynia oblongifolia* as well as other small shrub species. Ground strata is dominated by grasses.
- MU30 – Coastal Plains Smooth Barked Apple Woodland. This community occurs on drier slopes and is dominated by Smooth Barked Apple (*Angophora costata*) and Red Bloodwood (*Corymbia gummifera*). Other canopy species can include Spotted Gum (*C. maculata*) and Broad Leaved White Mahogany (*E. umbra*). It has an open dry shrubby layer and ground stratum is dominated by grasses.

MUI5 and MU30 are predicted to support several threatened flora species, however, only *Tetratheca juncea* is documented as occurring at the site.

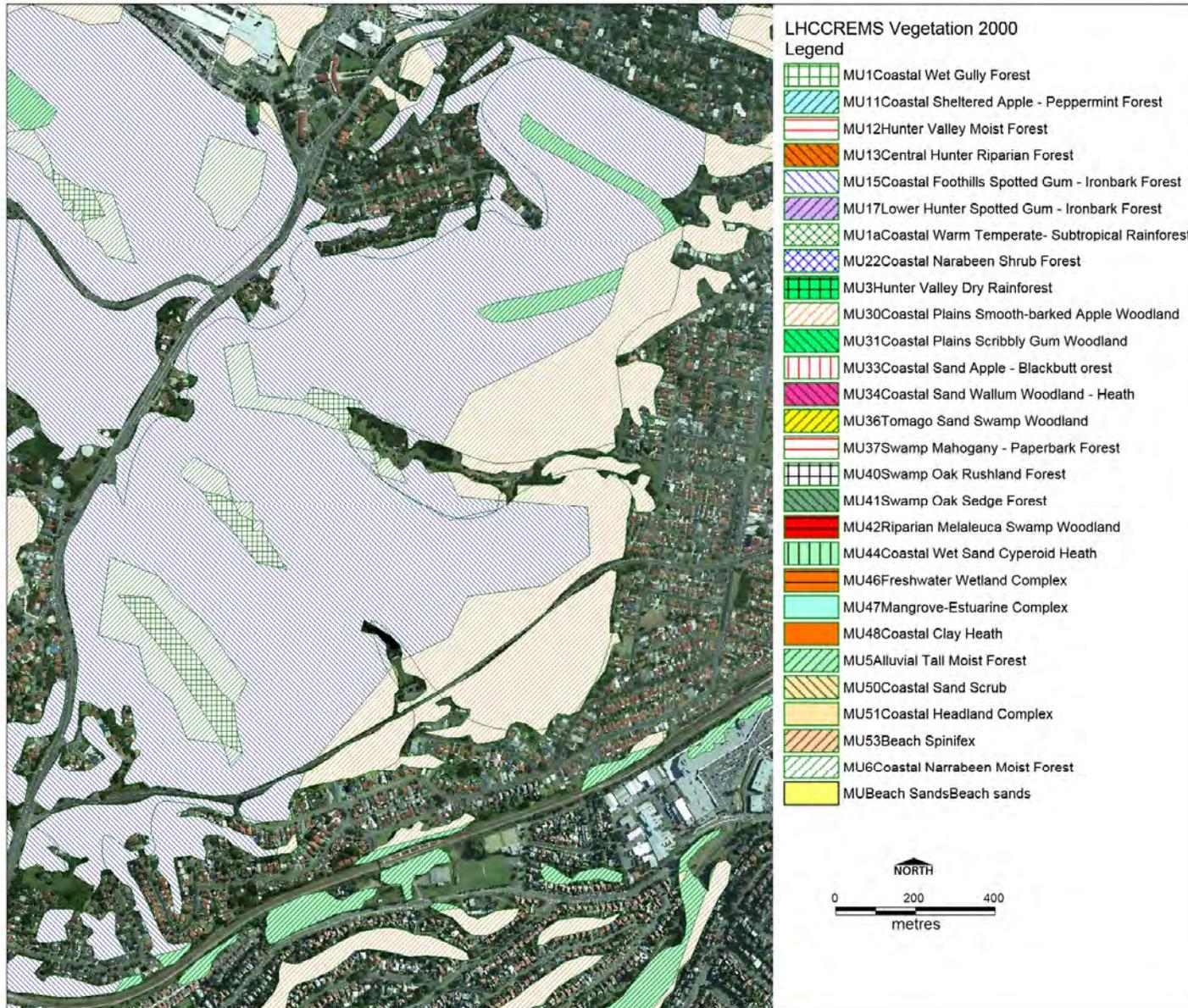


Figure 3: LHCCREMS vegetation mapping in the Reserve.

Within the sheltered gullies, LHCCREMS maps the following communities:

- MUI - Coastal Wet Gully Forest. This forest occurs in the most sheltered areas on the site and is characterised by Sydney Blue Gum (*E. saligna*) and Turpentine (*Syncarpia glomifera*) emergents over a rainforest mid strata. Other Eucalypt species are common and, within the Reserve, this forest can grade into the communities described as MU5 and MU6.
- MU5 – Alluvial Tall Moist Forest occurs in gullies within the Reserve. The mid stratum contains less rainforest species and is more open than MUI. Common canopy trees include Sydney Blue Gum (*E. saligna*) and Turpentine (*S. glomifera*) as well as Rough Barked Apple (*Angophora floribunda*); Spotted Gum (*Corymbia maculata*) and White Mahogany (*E. acmenoides*).

Mid stratum shrubs and small trees commonly occurring are Cheese Tree (*Glochidion ferdinandi*), Lilli Pilli (*Acmena smithii*), Prickly Leaved Paperbark (*Melaleuca stypheliodes*), Grey Myrtle (*Backhousia myrtifolia*) and Sandpaper Fig (*Ficus coronata*).

- MU6 - Coastal Narrabeen Moist Forest. Again, this community is characterised by a Eucalypt canopy over a mesic mid stratum. This community is quite similar to MU5, however, MU5 is restricted to alluvial flats where wetland species are able to occur (eg *Gahnia clarkeii*, *Melaleuca* sp etc).

Interestingly, total absence of fire since the late 1950's has meant that mesic mid-strata plants are locally dominating some areas of the reserve. This is especially evident within Rainforest Creek catchment which contains an area dominated by rainforest species. This rainforest stand is locally uncommon.

### 3.5 Significant Fauna assemblages and Habitat types

The Reserve contains several significant fauna species. Newcastle Council has records that show the following species as being recorded in the reserve:

- |                                    |                         |
|------------------------------------|-------------------------|
| • <i>Ninox connivens</i>           | Barking Owl             |
| • <i>Ninox strenua</i>             | Powerful Owl            |
| • <i>Daphoenositta chrysoptera</i> | Varied Sittella         |
| • <i>Ptilinopus regina</i>         | Rose-crowned Fruit-Dove |
| • <i>Pteropus poliocephalus</i>    | Grey-headed Flying-fox  |
| • <i>Phascolarctos cinereus</i>    | Koala                   |
| • <i>Ptilinopus superbus</i>       | Superb Fruit-Dove       |
| • <i>Ptilinopus magnificus</i>     | Wompoo Fruit-Dove       |
| • <i>Petaurus norfolcensis</i>     | Squirrel Glider         |

Numerous other nationally or state listed species occur in the Newcastle LGA and are predicted to utilise the habitat provided by the vegetation types within the Reserve. It is quite likely that the list above is not exhaustive and targeted surveys would reveal additional species. For example, the NPWS Wildlife Atlas shows that the following have been recorded as occurring in the nearby George McGregor Reserve and they could easily move to Blackbutt Reserve:

- Gang-gang cockatoo
- Regent honeyeater
- Masked owl
- Little bent-wing bat
- Eastern bent-wing bat

Further investigation and targeted surveys for use by various fauna species is recommended.

A 2011 survey by Forest Fauna Surveys indicates there are almost 400 habitat trees within Blackbutt Reserve including many with large hollows that are suitable for owls, other large birds and large reptiles.

### 3.6 Weeds affecting the Reserve

Weeds occur in all sub-catchments of the Reserve to various extents. There are still relatively large areas, however, where native vegetation is mostly weed free.

Noxious or significant environmental weeds, which should be given priority for treatment, are listed in Table 2 (noxious weeds also have classification listed). It should be noted that this list is not exhaustive as it is based on 20x20m quadrat monitoring in the Bushland Inventory and LRI site inspections. Many other weed species can potentially affect the Reserve.

**Table 2 – Significant Weeds of the Reserve**

PARK_NAME	Significant Weeds Present
Rainforest Catchment	<p><i>Araujia sericifera</i>  <i>Asparagus aethiopicus</i>  <i>Cirsium vulgare</i>  <i>Cinnamomum camphora</i>  <i>Hedychium gadnerianum</i>  <i>Jacaranda mimosifolia</i>  <i>Ochna serrulata</i>  <i>Lantana camara</i> (Class 5)  <i>Lilium formosanum</i> (Class4)  <i>Ligustrum lucidum</i> (Class4)  <i>Ligustrum sinense</i> (Class 4)  <i>Olea europaea</i> subsp. <i>cuspidata</i>  <i>Panicum maximum</i>  <i>Passiflora edulis</i>  <i>Tradescantia fluminensis</i></p>
Black Duck Creek Catchment	<p><i>Ageratina adenophora</i> (Class4)  <i>Araujia sericifera</i>  <i>Asparagus aethiopicus</i>  <i>Bidens pilosa</i>  <i>Cinnamomum camphora</i>  <i>Hedychium gadnerianum</i>  <i>Ochna serrulata</i>  <i>Lantana camara</i> (Class 5)  <i>Ligustrum lucidum</i> (Class4)  <i>Ligustrum sinense</i> (Class 4)  <i>Lonicera japonica</i>  <i>Passiflora edulis</i>  <i>Ipomea indica</i>  <i>Senna pendula</i> (Class 4)  <i>Setaria palmifolia</i>  <i>Solanum mauritianum</i>  <i>Solanum nigrum</i>  <i>Thunbergia alata</i>  <i>Tradescantia fluminensis</i></p> <p>Various garden escapes also occur around Main Ridge rec area and in the upper catchment near the residences.</p>

Coal Mine Creek Catchment	<i>Asparagus aethiopicus</i> <i>Asparagus virgatus</i> <i>Cinnamomum camphora</i> <i>Ehrharta erecta</i> <i>Ipomea indica</i> <i>Ochna serrulata</i> <i>Lantana camara</i> (Class 5) <i>Ligustrum lucidum</i> (Class4) <i>Ligustrum sinense</i> (Class 4) <i>Lilium formosanum</i> <i>Rhaphiolepis indica</i> <i>Ruellia squarrosa</i>
Echidna Creek Catchment	<i>Asparagus aethiopicus</i> <i>Cinnamomum camphora</i> <i>Cyperus eragrostis</i> <i>Hedychium gadnerianum</i> <i>Lantana camara</i> (Class 5) <i>Ligustrum lucidum</i> (Class4) <i>Ligustrum sinense</i> (Class 4) <i>Lonicera japonica</i> <i>Michelia figo</i> <i>Ochna serrulata</i>
Bowerbird Creek Catchment	<i>Asparagus aethiopicus</i> <i>Cinnamomum camphora</i> <i>Ehrharta erecta</i> <i>Hedychium gadnerianum</i> <i>Lantana camara</i> (Class 5) <i>Lilium formosanum</i> <i>Ligustrum lucidum</i> (Class4) <i>Ligustrum sinense</i> (Class 4) <i>Cardiospermum grandiflorum</i> <i>Ochna serrulata</i> <i>Rhaphiolepis indica</i> <i>Setaria palmifolia</i>

Numerous other weeds also occur in the Reserve and should be treated in priority areas as required to assist regeneration of native vegetation or where they are affecting revegetation (eg some grasses or annuals).

### 3.7 Pest Species

Pest animals that have been reported in or immediately surrounding the reserve are cats, foxes, carp and feral bees.

Feral bees are listed as a key threatening process due to their competition for tree hollows. As this VMP considers functionality of vegetation in the reserve, monitoring should be conducted from time to time to ensure feral bees are not occupying habitat trees in the Reserve.

Cat and Fox control within an urban environment is limited to trapping and should be considered. However, it is understood that previous efforts at trapping have not yielded good results.

Rabbits, dogs and pest bird species have not been reported as occurring in the Reserve, however targeted monitoring may be required to determine if they are having any effect on the Reserve.

### **3.8 Biosecurity**

Myrtle Rust has been reported around the Carnley Avenue Recreation Area and lower Rainforest Creek catchment, however this is understood not to have caused any dieback in vegetation. Monitoring and control if it is found again is required to ensure that this does not spread to other areas of the Reserve.

### **3.9 Corridors and connectivity**

Council's 2005 Green Corridors and Landscape Precincts Plan lists Blackbutt Reserve as one of four forested Key Habitat Localities within the City of Newcastle (the others being Glenrock State Conservation Area; Jesmond/Rankin Park Bushland Complex and Blue Gum Hills Regional Park). Other Key Habitat Localities within the Newcastle LGA are predominantly comprised of wetland vegetation communities rather than forest/woodland vegetation types.

The Plan notes that Blackbutt Reserve is within the Ridgeland Landscape Precinct which is characterised by forested habitats and that the reserves within are "isolated by surrounding urban development, fragmented by roads and other service easements, and are under pressure from ever-increasing recreational uses".

Further, the plan notes that systematic management of the reserves in this Precinct is required as they are probably too small and isolated to be sustainable. It suggests the creation of "buffer areas" around reserves in the Precinct and to educate residents surrounding the reserves to minimise impacts resulting from their isolation and their use.

Blackbutt Reserve has moderate connection to other habitat areas within the City, however these connections are generally dissected by roads; residential development and other built infrastructure. The Green Corridors Plan proposes a major corridor between Blackbutt and Glenrock Reserves. This utilises several smaller reserves as stepping stones between the two larger reserves with infill "buffer zone" planting to overcome this dissection to connect the Key Habitat localities.

The Jesmond to Rankin Park Complex is directly adjacent to Blackbutt Reserve however a major roadway (Lookout Road) divides the two reserves and there are several issues associated with the edge effects due to this road. Several major corridors are proposed by the Greening Plan that stem from the Jesmond to Rankin Park complex which are indirectly relevant to Blackbutt Reserve.

### **3.10 Water course**

Streams within the Reserve are predominantly steeper first and second order headwaters. Third order streams are present in lower sections of the Reserve in the Coalmine Creek and Echidna Creek catchments. Steeper headwaters are generally ephemeral, however, flows are mostly present within the second and third order sections.

Council's Creek Assessment Program indicates that several important creek reaches are present in the Reserve.

### **3.11 Hydrology**

Urban and road drainage are the major contributors to storm-water run-off onto the Reserve. Drainage from these sources contributes gross pollutants, nutrients, sediment and

weed contamination into the Reserve. Road and urban stormwater mainly influences the western and northern portions of Blackbutt Reserve and this has resulted in degraded and weed infested vegetation communities in these areas.

Unsealed tracks are present in the northern catchments of the Reserve and contribute some sediment to downstream wetlands and creek-lines.

### **3.12 Soils**

NSW Soils Landscape Mapping (Matthei, 1995) shows the Reserve lying within the Awaba Hills physiographic region. Soil Landscapes within the Reserve are predominantly comprised of Cedar Hills (ce); Killingworth (ki); and Gateshead (ga). These occur over Permian Coal Measures.

Cedar Hills Soil Landscape is a colluvial soil type. Slopes range from 15% to 40% and this zone is prone to mass movement.

The Killingworth Soil Landscape are erosional soil types and slopes range from 3% to greater than 20%.

The Gateshead Soil Landscape is characterised by low gradients (5-15%) with only localised steep slopes.

Killingworth and Cedar Hills Landscapes are highly prone to erosion.

### **3.13 Topography & Geology**

The Reserve lies within the headwaters of the Throsby Creek Catchment.

Topography ranges from steep slopes and ridges to moist gullies and low foothills. Gullies and ridges run roughly west to east in the reserve.

The Reserve lies within the Newcastle Coal Measures formed in the late Permian period. Formation is mapped as being in the Adamstown and Lambton Subgroups. Lithology is comprised of conglomerates, sandstone, siltstone, coal and tuff.

### **3.14 Aesthetic and Social:**

Council's Landscape Precincts Plan lists the Reserve as part of the Ridgeland's Landscape Precinct where the "forested ridgeline forms a visual horizon from many areas of the City, and thereby plays an important landmark and aesthetic role in Newcastle's cultural identity".

The Reserve (chiefly Richley Reserve and Carnley Ave Recreation Areas) is an important social gathering place and has facilities for picnics, play and social functions. The Carnley Ave recreation area also contains animal exhibits and provides for educational opportunities.

The reserve also provides many opportunities for other outdoor recreation in the forested areas.

## **4 Management Issues**

This section of the VMP draws on the relevant issue definitions from the PoM and considers the effects on vegetation within the Reserve. Definitions from the PoM are denoted by italics.

Usually priority is given to works that address management issues that are affecting good quality bushland in the Reserve. From these areas, works radiate out to more degraded areas.

There are exceptions to this rule when:

1. There is a legal requirement to work in other areas. Examples include instruction from a Fire Authority or requirement to control a Noxious Weed;
2. Works are required to protect or improve another high-value asset. For example creek-line and riparian works in high priority reaches; and
3. Social factors are considered. For example, it may be desirable to improve vegetation condition around high use areas in the reserve to improve the overall appeal of recreation areas and the entrance to the site. This also sets a good example of how vegetation should be managed in urban areas.

As a general rule this VMP recommends, as a high priority, any works that address issues that are affecting adjoining good condition bushland and maintaining areas in good condition. Priority for works is defined on a catchment by catchment basis within the Appendices.

The Blackbutt Plan of Management outlines issues that affect the reserve as a whole. Catchment specific issues are also described in the PoM. The issues relevant to vegetation management are reproduced here:

#### 4.1 Edge Contact Zones

*The reserve has acquired an extensive edge contact problem between external margins, park functions (picnic area, wildlife displays, tracks, roads and carparks) and the natural areas (bushland, wetland, watercourse and escarpment). Urban edges of roads and developed properties generate a number of harmful and incompatible aspects. One of the most important of these is the downslope and downstream passage of stormwater. It carries with it pollutants from roads, buildings and gardens.*

In the Reserve this is generally evident in the upper catchments (western most extremities) and throughout the Bowerbird Creek catchment. Vegetation in these areas is degraded and weed infested and impacted by the surrounding landuse.



Figure 4: Example weed infestation in edge contact zone in the upper Black Duck catchment.

## 4.2 Stormwater, erosion and sedimentation

*Stormwater drainage from surrounding roads and residential areas discharging concentrated flows and potential to cause erosion at discharge locations and convey road pollutants. Presence of highly erodible soils means that all earth works and track maintenance must be managed to achieve zero run off. Existing erosion and sedimentation from tracks, streams and drainage in the upper part of the catchment.*

Erosion and sedimentation within the Reserve result in fairly localised vegetation management issues and these are considered on a case by case basis in the Appendices.

## 4.3 Water quality/wetland

*Poor water quality due to high sediment and nutrient loads. Community feeding of the aquatic birds and associated high biochemical oxygen demand. Wetland birds also damage and remove aquatic vegetation. Heavy metals remaining in the wetland ponds following earlier mining activities within the Reserve. Potential for algal blooms. Management is required to minimise stagnation of water in low flow areas.*

This issue is not directly addressed by this VMP, however, creation of buffer zones and re-vegetation around the Reserve's wetlands, consistent with Dragonfly Environmental (2011), will assist with resolving this issue.

## 4.4 Conservation of threatened species

*Blackbutt Reserve is an important reserve for protected and threatened fauna species. The Reserve contains threatened species listed under Federal and State legislation.*

Vegetation protection and improvement is critical to conservation of threatened species in the Reserve (for example, improvement of vegetation structure; ensuring habitat features are protected; and ensuring that there will be successive generations of habitat trees in the Reserve).

## 4.5 Weed invasion

*Weed growth in the reserve has its origins in the urban environment around it. This situation is not subject to change and therefore the reserve and all the bushland areas associated with urban environments will always be affected by weed growth.*

Apart from surrounding land-uses affecting the reserve, as stated in the PoM, it is highly likely that previous disturbance within the reserve has also contributed to weed infestation problems. Weed control is the major consideration of this Vegetation Management Plan.



Figure 5: Lantana is the most significant weed in the Reserve.

#### 4.6 Service utilities

*Sewer lines, overhead power, water and stormwater services usually leave a trail of permanent damage where they cross the reserve. Without adequate measures being taken to properly reinstate broken surfaces and lost foliage, weeds and erosion proceed to take their toll. The damage to the affected area will not repair itself.*

This impact is relatively localised and at best reserve managers need to liaise with utility providers to ensure impacts on vegetation are minimised.

#### 4.7 Grassed surfaces

*Picnic areas and parkland activity naturally lead to surfaces being grassed for obvious reasons. Separation of grass and bushland by natural means is virtually impossible and ultimately the needs of tidiness encourage the spread of mowing, the further retreat of the bush edge and ultimately the increased potential for weeds to colonise and invade.*

Again this impact is localised and relevant only to recreation areas. This VMP acknowledges that there is a trade-off between recreational use and vegetation protection and that a balance, utilising various landscaping methods to define boundaries, is required. Ultimately, however, this VMP's main goal is to preserve bushland and mowing encroachment into native vegetation requires management.

#### 4.8 Climate change

*The types of climate change impacts particularly relevant to Blackbutt Reserve include increased damage to Council assets due to storm damage and increased frequency and intensity of bushfires. There is an increased likelihood of stormwater and drainage systems being*

*overwhelmed or damaged and increased damage to roads and footpaths. Increased incidence of pests and weeds due to altered climate regime, loss of remnant vegetation as a result of water and heat stress and increased erosion and silting of waterways due to increased rainfall intensity.*

By improving condition of the native vegetation communities within the reserve, their resilience, or ability to cope with any change caused by long term variation in climate is increased.

#### **4.9 Habitat trees**

*Habitat tree is the term used to describe mature to over-mature trees that contain hollows or cavities. The hollows provide micro and macro habitats for a range of vertebrate and invertebrate fauna species for use as sheltering, nesting and breeding sites. The formation of hollows in trees is influenced by the species of tree, age of the tree and interval between disturbance events such as wildfire.*

*Events such as the June 2007 storm resulted in the destruction of many standing habitat trees within Blackbutt Reserve. Whilst there has been a loss of habitat trees following this event, many trees had significant damage to their limbs and main trunks. The tree damage will in time result in formation and recruitment of new hollows through natural decay, termite activity, fire and physical means such as birds.*

These trees require protection via Council's internal systems prior to activities such as prescribed burns; maintenance or construction works. Their protection is considered as part of the VMP.

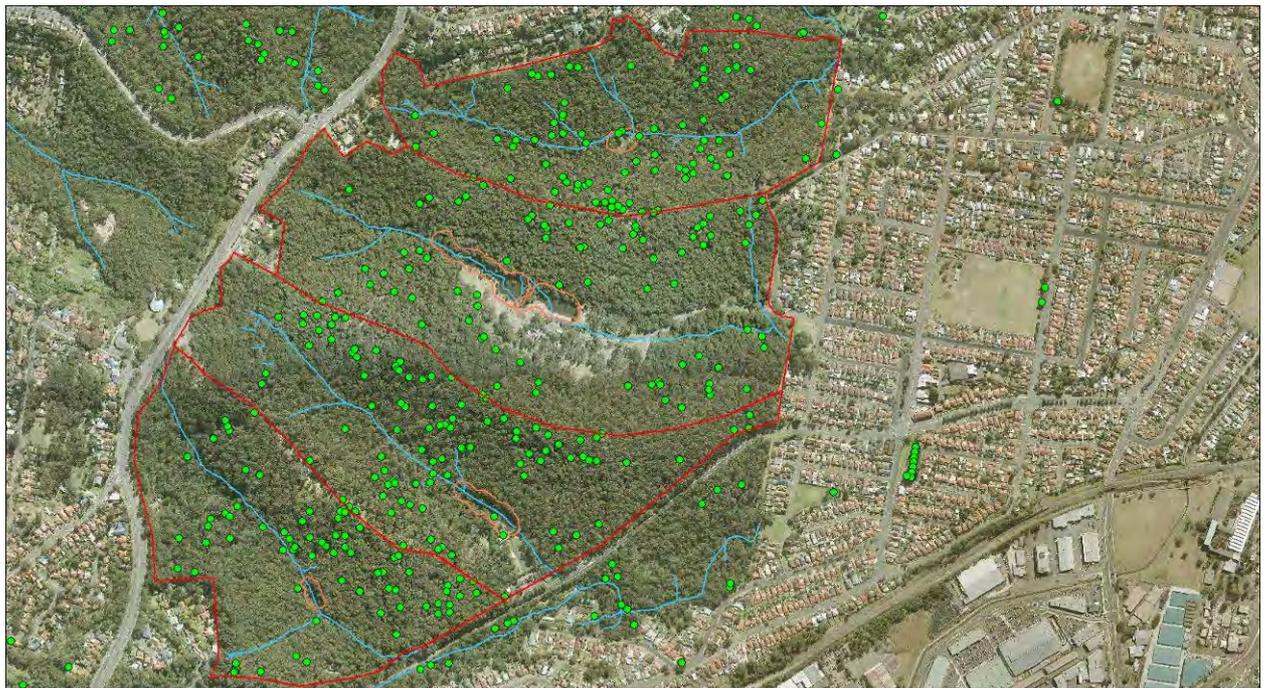


Figure 6 Habitat Trees in Blackbutt Reserve

#### **4.10 Bushfire Management and habitat tree conservation**

*Council is responsible for the management of fuel loads in proximity to urban and recreation infrastructure such as roads, residential areas and the animal enclosures. Management of fire fuel loads is required under the Rural Fires Act 1997 to ensure no loss or damage to human life and infrastructure.*

*The management of fuel loads will require careful management to avoid potential issues with threatened species. Many threatened species occur within Blackbutt Reserve. The Bushfire Management Plan for Blackbutt Reserve must accommodate the impact of fire and fuel reduction strategies on each threatened species and their habitat, and may require multiple strategies to ensure threatened species population persistence.*

Fire is also important to the drier vegetation communities on site and ecological burns are required from time to time.

#### **4.11 Corridors and key habitat**

*Blackbutt Reserve is a key habitat location. The Reserve is connected to a number of adjoining reserves through a number of corridors. The potential loss of Jesmond Bushland extent due to the state highway extension will provide additional challenges in managing Blackbutt Reserve for effective conservation outcomes.*

#### **4.12 Research and monitoring**

*There is minimal environmental research and monitoring undertaken in the reserve.*

As a high priority this VMP suggests targeted surveys within the Reserve to identify listed flora and fauna species. This will improve the information base on these species in the City and assist reserve managers to adequately protect and manage any species found.

#### **4.13 Recreational demand**

*The reserve is a popular destination for passive recreational pursuits such as picnics, BBQs and casual games. The capacity of the park to accept a continuing growth of recreational demand is a constraint and must have its limits.*

As with item 4.7, this VMP acknowledges that there is a trade-off between recreational use and vegetation protection. This VMP's main goal is to preserve bushland, therefore recreation needs to be controlled to minimise damage and expansion of cleared areas.

#### **4.14 Overabundance of Native Vines**

Locally there are areas within the Reserve that show signs of recovering from previous disturbance and exhibit dense lower strata of native vine species – predominantly *Cissus* and *Parsonsia* species. Fuel management activities (prescribed burns) may reduce the incidence of native vines in these areas, however there is a likelihood that they will return.

Native vines, although beyond the benchmarks prescribed by the NSW Government Biometric assessment methodology, are not considered a major issue in much of the Reserve as they are localised and provide for a richer variety of habitat in the Reserve. There are areas, however, where the vines are impeding natural regeneration and recruitment and where they will need to be managed. This is considered further in site specific recommendations in the appendices.

This issue is not covered in the Blackbutt PoM.



Figure 7: Dense occurrence of native vines near the animal exhibits.

## 5 VMP Implementation

The Blackbutt Plan of Management specifies Performance Targets and Management Actions for the Reserve, including those relevant to vegetation management. These form the basis of the Four Year Management Plan and the Annual Implementation Plan recommendations.

Site investigation and other sources of information have been used to fine tune the actions from the Blackbutt PoM into Annual Action Plan recommendations. Appendices 1 to 5 define management actions to deal with the issues outlined above in each sub-catchment.

### 5.1 Four Year Management Plans

Four Year Management Plans are used in Council's planning process to communicate what and how a plan will be delivered. Individual Four Year Management plans, covering each of the sub-catchments, are contained in Appendices 1 to 5.

### 5.2 Action Plans

Action Plans define an annual program of works to be undertaken so that VMP targets are met. The appendix considers each of the sub-catchments and breaks these into specific Vegetation Management Zones. Actions are then prescribed for each zone to achieve the VMP targets and objectives above. Reserve Managers are responsible for preparing annual implementation plans to deliver this VMP.

**The VMP suggests priority and timing for each of the recommendations; however delivery of these will be dependent on resources available to Council, realistic (achievable) targets and annual management aspirations for the site.**

As per the City of Newcastle's Bushland Technical Manual, Action Plans should:

- Set realistic targets for the 12 month period that are achievable within resources allocated to the site's management (cash and personnel);

- Ensure that qualified bush regenerators with good knowledge of local flora be engaged in any bush regeneration work resulting from the Plan (an exception to this may be promotional planting days in areas that are currently devoid of native vegetation);
- Adopt an adaptive management model (Plan – Do – Monitor – Plan, etc)
- Ensure bushland works commence in more intact areas and work to less intact area in the land parcels
- Leverage off other programs that can contribute to better vegetation condition within this reserve (eg buffer areas established as per Green Spaces Strategy; wider education programs).

Specifications that are contained in the Bushland Technical Manual should be used to develop and evaluate Action Plans.

## 5.3 Monitoring

### 5.3.1 Methodology for site monitoring and sampling criteria

To track overall condition of the site, as a minimum the Bushland Inventory 20x20m quadrats should be re-monitored every five to ten years. Methodology is outlined in the Bushland Asset Inventory Report (2010).

Additional monitoring criteria is specified in the Appendices.

Before and after monitoring, consistent with the Bushland Technical Manual should be implemented throughout areas that are subject to works proposed.

### 5.3.2 Monitoring timeframe

Monitoring is to be carried out prior to, during and after works. Re- monitoring of the Bushland Inventory quadrats will provide longer term objective monitoring.

Specific monitoring is required annually for sites where weed control or stabilisation works have been undertaken. This monitoring should observe any re-occurrence of weeds treated (or infestation by secondary weeds) and track growth of any vegetation established/natural regeneration.

## 5.4 Reporting

### 5.4.1 Asset Register - condition and function data

Action Plans will report to the Asset Register and will contribute data to condition and functionality measures. Data resulting from Action Plan works/monitoring (i.e. field sheets and scope of works report) allows an analysis of the raw data to compare to previous outcomes, and looks at trends for the Annual Management Plan.

### 5.4.2 Annual Management Plan

Annual data from Action Plan works will be aggregated and analysed for use in Council's Annual Reporting and State of the Environment reporting.

### 5.4.3 Strategic Planning

Data from the VMP and Action Plans will be used for Council's 4 & 10 year forward planning.

### 5.4.4 Action Plan Closure Report

- This report will provide data for reporting requirements above

- Project Processes Template Report is to be used (CofN reporting template)
- Daily reporting on an activity basis to be monitored by coordinator

## 5.5 Consultation

Extensive community and stakeholder consultation has occurred in relation to management of Blackbutt Reserve in the preparation of the Plan of Management. Items covered by this VMP received community attention during PoM preparation and further consultation with the wider community regarding management of vegetation is not required.

Consultation with neighbouring property owners is required where there are impacts resulting from the management of their land that affect the Reserve or in the instance where Council work may affect adjoining property.

## 5.6 Risk management

The Bushland Technical Manual should be consulted for risk management procedures.

## 5.7 Management guidelines

The Bushland Technical Manual contains standards written as specification clauses for *most* activities on *any* site. Clauses in the Bushland Technical Manual can be used to complete Project or Action plans.

The Bushland Technical Manual is available as a separate document and should be consulted in developing Annual Action Plans and for contracting works under these Plans.

## 6 Information Sources

- Anne Clements and Associates Pty Ltd (2010), Newcastle Public Bushland Asset Inventory Report. Report prepared for Newcastle City Council.
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- Newcastle Bush Fire Risk Management Committee (2012), Newcastle Bush Fire Risk Management Plan.
- Newcastle City Council (2003), Bushland Plan of Management.
- Newcastle City Council (2005), Green Corridors and Landscape Precincts Plan.
- Newcastle City Council (2006), Noxious Weed Declarations throughout the Newcastle City Council Area.
- NSW Environment and Heritage, Biometric Homepage, accessed at <http://www.environment.nsw.gov.au/projects/biometrictool.htm>, June 2013.
- Sivertsen, D.; Roff, A.; Somerville, M.; and Denholm, B. (2011) Hunter Native Vegetation Mapping. Geodatabase Guide. Report prepared for Office of Environment and Heritage.
- Winning, G (2000), Survey of *Tetratheca juncea* in Blackbutt Reserve and Rankin Park Bushland. Report prepared by HWR Ecoplan for Newcastle City Council.

## 7 Appendix

# Appendix A - Black Duck Creek Vegetation Management Plan

## A-1 Black Duck Creek Catchment Background Information

Black Duck Creek Catchment is the second largest catchment within the Reserve and occurs towards its southern end. Black Duck Creek catchment contains the Carnley Avenue Recreation Area which is the most visited area in the Reserve.

The figure below shows the approximate position of the catchment in the Reserve. This is the area that Appendix A considers and makes management recommendations for. Note that although this section deals with Black Duck Creek catchment, for ease of identifying Management Zones by Council staff and contractors, the catchment boundary has been adjusted slightly and tracks have been adopted as the boundary.



Figure A1: Black Duck Creek catchment shown by red hatching.

Black Duck Creek Catchment area of Blackbutt Reserve is generally in very good condition, with relatively few land management issues. However, the catchment does have a significant weed problem.

In the catchments upper extremities (downstream from Lookout Road and also immediately west of the Carnley Ave recreation area) weeds, especially lantana, are the major mid strata cover. Weeds occur elsewhere in the Reserve, chiefly to the south of the creek-line, however infestation is limited to scattered individuals rather than forming continuous infestations.

Outside of the severely weed infested areas, vegetation in the catchment is largely in excellent condition with over-storey regeneration; presence of plants of various age classes (including hollow bearing mature and over-mature trees); and exhibiting a good structure with the various strata coverage conforming to NSW Government Biometric Vegetation Benchmarks.

A small area in the central part of the catchment is extremely degraded and requires intensive weeding and planting.

In the catchment, formal tracks are sealed and there is minimal disturbance resulting from these. A number of informal tracks were located during field inspection; however these appeared to be in good condition, were generally well mulched (natural leaf litter) and not resulting in any significant impact on the Reserve. No significant areas of erosion were noted during site inspections.

The creek lines in Black Duck catchment are typical of first/second order streams in the region. Site inspection revealed that these contained sufficient rock, wood and vegetation to maintain them in a good condition. An instream, constructed wetland is located upstream of the Carnley Avenue Recreational Area. At the time of inspection water quality in this wetland appeared to be fair, however, there has been previous concern raised regarding water quality due to high use by waterbirds attracted to the site because of visitor feeding of these animals.

The recreational areas are a popular destination in the greater Newcastle area and contain various facilities as well as wildlife exhibits. The Carnley Avenue recreation area in particular receives high visitation, placing vegetation in its immediate surrounds under immense pressure, however this is currently managed well.

Table A1 contains a summary of catchment features (based on the Bushland Inventory 2010). A Four Year Management Plan, based on the Blackbutt Reserve Plan of Management, is contained within Table A2. Recommendations for Annual Action Plans as well as more detailed descriptions of the proposed Vegetation Management Zones are found in subsequent sections of this Appendix.

Table A1: Summary of features:

Asset ID number	Connectivity rating	Patch area rating	Perimeter : area ratio rating	Soil risk rating	Significant Species and/or Communities	Weed invasion	Disturbance rating	Fire regime	Presence of habitat trees	Intactness of canopy and shrub layer	% Native Species	Presence of vegetation of all ages	Area
BL0000051	high	high	good	high	present	low	low	not appropriate	present	good	high	yes	36.65ha

## A-2 Black Duck Creek Catchment Four Year Management Plan

Table A2: Black Duck Four Year Management Plan.

Item	Issue *	Performance Target *	Management Actions *	Means of Assessment *	Monitoring and Reporting	Priority and Timing
1	Blackbutt Reserve is a leader in environmental sustainability	Position Blackbutt Reserve as a leading example of environmental sustainability.	Blackbutt Reserve should be considered as a key location for the delivery of integrated environmental sustainability programs eg building design, energy and water conservation, waste management, bush regeneration, threatened species management.  Works under all other categories will achieve this target.	Blackbutt Reserve is a key location for the delivery of environmental sustainability programs.	As this plan relates to vegetation management only, monitoring and reporting will be as below.	High.
2	Edge contact zones with recreation areas and urban areas	Delineate natural areas and recreation areas and urban areas to restrict incompatible uses and regenerate natural areas where appropriate	Provide buffer zones between recreation and natural areas within the reserve using appropriate techniques such as leaf mulch and intensive planting.  Periodic assessment of edge contact zones with recreation areas to reduce the impact between incompatible activities.  Ensure that mowing does not creep into natural areas. Regenerate areas where mowing has encroached into natural areas where appropriate.	Monitor the condition of bushland sites located within Blackbutt Reserve against baseline.  Council maintenance staff provided with a copy of the category boundaries.  Electronic mapping of defined areas.	Annual rapid assessment of reserve to track management issues and any developing issues.  Site specific vegetation community mapping to develop baseline (this will map extents of vegetation community also).	High.  Delineate boundaries immediately (year 1 prior to commencement of all other works).

Item	Issue *	Performance Target *	Management Actions *	Means of Assessment *	Monitoring and Reporting	Priority and Timing
3	Cultural Heritage Management	Identify and appropriately conserve and manage items of cultural significance.  To implement appropriate fuel reduction strategies in proximity to culturally significant sites.	Undertake investigation within Blackbutt Reserve to ascertain if there are any culturally significant locations that are likely to be affected by council's fire reduction strategies.	All cultural sites identified and protected.	Produce Cultural study for the Reserve and implement protection and monitoring measures as necessary.	High.  Complete Heritage Study in Year 1.
4	Biosecurity	Minimise the spread of diseases that will impact on the conservation of the Reserve.	Council will identify, locate, document and contain/treat pests and diseases as they become known to minimise the impact on the future use and management of the Reserve.	Limit the spread of diseases that will impact on the conservation of the Reserve.	Annual rapid assessment of reserve to track management issues and any developing issues such as myrtle rust and phytophthora dieback.  Opportunistic observations. Targeted surveys if outbreak located in or near the Reserve.	High.  Life of Plan.
5	Bush regeneration	Control the spread of weed species, focussing on the intact core of the Reserve and areas of threatened species and EEC.  Weed projected foliage cover targets maintained below thresholds recommended in each vegetation management zone (as set out below).	Undertake bush regeneration and weed control to Council Standards.  Audit perimeter of Reserve to ascertain areas of encroachment, and illegal dumping and illegal access.  Liaise with neighbours to remove encroachments and minimise weed invasion on the urban fringe.	Monitor the condition of bushland sites located within Blackbutt Reserve against baseline	Annual rapid assessment of reserve to track management issues and any developing issues.  Ecology study – focus on locally significant, rare, threatened and endangered flora and fauna.  Site specific vegetation community and condition mapping to develop baseline.  Re-monitor Bushland Inventory 20x20 quadrats (establish additional quadrats where required)	High.  Commence high priority works immediately.  Life of Plan
6	Bushfire Management	All fire management activities shall consider fuel loads and potential risk to property in addition to ecological diversity and integrity.	Coordinate with NSW fire Brigade to prepare an annual works program and to implement actions in accordance with the Newcastle Bush Fire Risk Management Plan and Committee.  Ensure appropriate environmental assessment is undertaken when assessing proposals for new and existing hazard reduction burns and activities.  Ensure fire management techniques do not favour weed species. Prescription burns will be undertaken as required, subject to an assessment of vegetation type and fire interval thresholds.	All fuel reduction strategies undertaken at an appropriate time and in accordance with the recommended technique and location.	As required by the Newcastle Bush Fire Risk Management Committee and Council's internal bushfire management requirements.	High.  Commence high priority works immediately.  Life of Plan

Item	Issue *	Performance Target *	Management Actions *	Means of Assessment *	Monitoring and Reporting	Priority and Timing
7	Habitat trees	Prioritise the management of habitat trees.	Use the habitat tree mapping and assessment to assist with planning and decision making to avoid potential damage.	Habitat tree mapping is used to inform decision making.	Habitat Trees to be checked opportunistically to ensure there are no adverse impacts from reserve use/management and to monitor for feral species. Treatment programs implemented as required.	High.  Life of Plan.
8	Threatened Species Conservation	Protect the diversity of flora and fauna and ecological communities with particular emphasis on threatened species and endangered ecological communities.	<p>Continue to undertake assessments to ensure that high conservation natural areas, threatened species and habitat trees within Blackbutt Reserve are identified, protected and prioritised for restoration in accordance with legislative requirements.</p> <p>In areas supporting an endangered ecological community or threatened species, allow only activities consistent with any draft or adopted Recovery Plan or Priority Action Statement.</p> <p>Databases for threatened species are regularly updated with all available information. This information includes threatened species identified through reports and by Council staff and will be recorded through Council's Natural Resource Atlas and reported to OEH for inclusion on the National Parks and Wildlife Atlas.</p>	<p>All threatened species within Blackbutt Reserve are protected.</p> <p>Regular fauna surveys/observations.</p>	<p>Annual rapid assessment of reserve to track management issues and any developing issues.</p> <p>Ecology study – focus on locally significant, rare, threatened and endangered flora and fauna</p> <p>Site specific vegetation community mapping to develop baseline.</p> <p>Re-monitor Bushland Inventory 20x20 quadrats (establish additional quadrats where required)</p>	<p>High.</p> <p>Commence studies and baseline data collection immediately.</p> <p>Life of Plan</p>
9	Wetland	Protect the biodiversity and ecological values of wetlands.	<p>Wetland Audit (2011) for Blackbutt Reserve will be used to inform the management actions for all wetlands and surrounding wetland buffers.</p> <p>Increase aquatic plantings and use configurations that result in all water passing through them (can be floating or planted in substrate). Species list provided in Dragonfly Environmental (2011).</p> <p>Improve habitat for water plants. Plant a greater diversity of species and have these located in appropriate areas.</p>	Monitor the change in condition through condition assessment for all wetland rehabilitation sites.	<p>Annual rapid assessment of Black Duck wetland to track management issues and any developing issues.</p> <p>Establish 20x20 quadrats as baseline and re monitor post work.</p>	Medium.
10	Habitat restoration	Encourage the use of local provenance plant species.	Use local provenance native plants in Council landscape projects, including street trees, when appropriate.	Local provenance native plants are used in Council landscape projects.	Only local provenance plants used on Reserve for landscaping; bush-regeneration and rehabilitation projects. Planting schedules kept and actual works are audited.	Medium

Item	Issue *	Performance Target *	Management Actions *	Means of Assessment *	Monitoring and Reporting	Priority and Timing
11	Planning Assessment and Approvals	Ensure appropriate planning assessment is undertaken for activities within the reserve.	Ensure that environmental assessments are conducted for all relevant development/activities within the Reserve in accordance with Council's Environmental Assessment Manual (the EAM in prep.). The EAM applies to all Council staff, contractors and volunteers undertaking development on behalf of Council.	All appropriate development within the Reserve is assessed in accordance with Council's EAM.	Audit development/activities to ensure approved assessment and resulting mitigation measures are functioning appropriately.	High.  As required.
12	Erosion	Manage erosion and sedimentation within the Reserve from tracks, streams, and drainage lines.	Undertake stabilisation and rehabilitation of creek bed and banks on a priority basis.  Soft works as interface between end of pipe and natural areas  Investigate and implement remediation strategies that will reduce the negative impacts of stormwater on natural areas in the Reserve.	Reduction in impacts from stormwater and drainage on the condition of natural areas within the Reserve.	Annual rapid assessment of reserve to track management issues and any developing issues.	Low
13	Environmental capacity building and partnerships	Encouraging neighbouring residents to become involved with the conservation and management of the reserve.	Liaise with residents to raise awareness about damaging practices, such as using invasive garden plants, allowing domestic pets to roam free, dumping garden clippings and refuse into the reserve and stormwater runoff.  Develop a community education strategy highlighting the impact of weeds on native flora and fauna, focusing particularly on garden-derived species (target all adjoining and upstream landholders).	Local residents are involved with the conservation and management of the reserve either through individual actions or volunteering programs.	Register of residents/neighbours involved in conservation actions at the Reserve.  Consolidate and better manage current volunteers working under the City of Newcastle Landcare.  Structured program for volunteers working in Blackbutt Reserve.	Low

\* from 2012 Blackbutt Plan of Management.

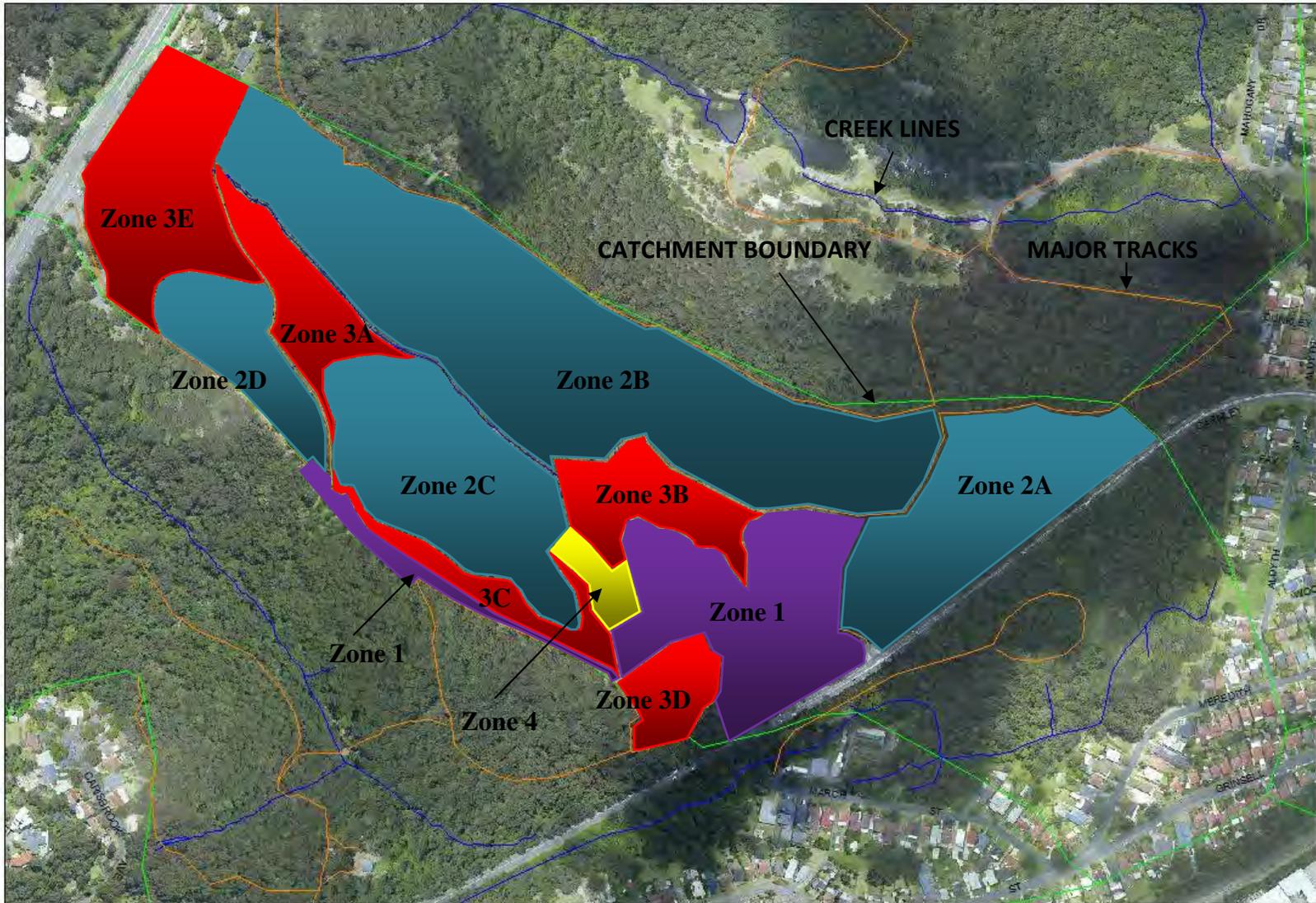


Figure A2. Proposed Vegetation Management Zones – Black Duck Catchment. Not to Scale.

### A-3 Site specific recommendations for construction of Annual Action Plans

This VMP establishes a baseline of natural resource assets in the Reserve and recommendations are primarily concerned with weed management as this is currently the major vegetation management issue affecting the site.

Table A3 outlines actions applicable to the whole reserve.

Table A3 – Actions to be applied to **Whole of Reserve**.

Item (All Zones)	Target	Action	KPI	Monitor	Timing	Priority
1	Blackbutt Reserve is a leader in environmental sustainability	Blackbutt Reserve should be considered as a key location for the delivery of integrated environmental sustainability programs eg building design, energy and water conservation, waste management, bush regeneration, threatened species management.  Implementation of vegetation management actions outlined in this plan will contribute to this target.	Catchment Crawl undertaken in Blackbutt Catchments	NA	Life of plan.	HIGH
2	Cultural Heritage Management	Undertake investigation within Blackbutt Reserve to ascertain if there are any culturally significant locations that are likely to be affected by Council's activities.  Map cultural heritage sites for use in activity planning and approvals.	Cultural study complete and information used in activity planning and assessments.	NA	Immediate – year 1	HIGH*
3	Biosecurity	Monitoring for outbreaks of Myrtle Rust and phytophthora and manage any occurrence within the Reserve. Identify and manage any new pests and diseases as they become known.	Identify and manage any plant pathogens that may impact on conservation within the Reserve.	Opportunistic observations and systematic surveys if a biosecurity risk is suspected.	Life of plan.	HIGH

Item (All Zones)	Target	Action	KPI	Monitor	Timing	Priority
4	Threatened Species Conservation	<p>Ecology study – focus on locally significant, rare, threatened and endangered flora and fauna</p> <p>Databases for threatened species are regularly updated with all available information. This information includes threatened species identified through reports and by Council staff and will be recorded through Council's Natural Resource Atlas and reported to OEH for inclusion on the National Parks and Wildlife Atlas.</p> <p>Map information for use in activity planning and assessment.</p>	Ecology study complete and information used in activity planning and assessments.	NA	Immediate – year 1	HIGH*
5	Planning Assessment and Approvals	Ensure appropriate planning assessment is undertaken for activities within the reserve.	Ensure that environmental assessments are conducted for all relevant development/ activities within the Reserve in accordance with Council's Environmental Assessment Manual (in prep.). The EAM applies to all Council staff, contractors and volunteers undertaking development on behalf of Council.	All appropriate development within the Reserve is assessed in accordance with Council's EAM.	Audit development/ activities to ensure approved assessment and resulting mitigation measures are functioning appropriately.	HIGH
6	Environmental capacity building and partnerships	<p>Liaise with residents to raise awareness about damaging practices, such as using invasive garden plants, allowing domestic pets to roam free, dumping garden clippings and refuse into the reserve and stormwater runoff.</p> <p>Develop a community education strategy highlighting the impact of weeds on native flora and fauna, focusing particularly on garden-derived species (target all adjoining and upstream landholders).</p>	Local residents are involved with the conservation and management of the reserve either through individual actions or volunteering programs.	Register of residents/neighbours involved in conservation actions at the Reserve.	As required	LOW

### A-3.1 Vegetation Management Zone I - Recreation and Adjoining Areas

Vegetation Management Zone I describes the recreational areas and immediately adjoining vegetation. This zone is highly modified and vegetation consists mainly of grassed areas; garden beds; and landscaping associated with the animal exhibits and other recreational facilities.

Areas of bushland included in this zone are along Carnley Ave and adjacent to Black Duck Creek. There are areas around/within the animal exhibits that have high weed cover but these areas are small and localised. The bushland area adjacent to the creek-line is highly impacted by Reserve visitors and consist largely of over-storey vegetation with ground and mid strata vegetation, mostly absent. The Main Ridge area requires some work to define the edge of the bushland/mown parkland. The constructed wetland and buffer zone (proposed by Dragonfly Environmental (2011)) are included in this zone as this area requires intensive planting/landscaping attention.

Generally this zone is well managed, utilising remnant tree, native landscape planting, mulching and other landscaping features to separate recreation from bushland areas.

Table A4. Actions for Zone I

Item (Zone)	Target	Action	KPI	Monitor	Timing	Priority
I. Zone I	Delineate natural areas and recreation areas and urban areas to restrict incompatible uses and regenerate natural areas where appropriate	<p>Clearly define the boundary between the recreational area and bushland area at Main Ridge picnic area. An area immediately down-slope of the emu enclosure (Carnley Ave) also requires better definition.</p> <p>Provide buffer zones between recreation and natural areas within the reserve using appropriate techniques such as leaf mulch and intensive planting.</p> <p>Areas that are continually accessed should be included as landscaping or recreation zones and managed accordingly. Within this zone it should be acknowledged that people will be accessing any “interesting” features within bushland (eg creekline in Carnley Rec Reserve downslope of the new playground) and possibly the best outcome would be to keep these areas weed free as well as providing mulch and sturdy planting (eg lomandra) in critical areas around the structural works.</p> <p>Successional planting of over-storey species is required in some areas.</p>	<p>Vegetation immediately surrounding recreation areas (including landscaped areas) be kept weed free and suitable ground cover (eg mulch) provided where visitor access is an issue.</p> <p>Over-storey species established in areas where there is no natural recruitment.</p> <p>Areas that are weed infested and that are being considered for future native plant establishment should be mown to reduce seed production (see FIGURE A2)</p> <p>Council maintenance staff provided with a copy of the category boundaries including no go zones in job start-up guides (eg pre task environment checklist or Safe Work Method Statement).</p>	<p>Rapid assessment of edge contact zones with recreation areas to track any developing issues.</p> <p>Periodic assessment of bushland and landscaping within this zone to ensure suitable buffer and groundcover provided.</p>	Resolve boundary issues immediately - Year 1	HIGH*

Item (Zone)	Target	Action	KPI	Monitor	Timing	Priority
2. Zone I	Control the spread of weed species, focussing on the intact core of the Reserve and areas of threatened species and EEC.	<p>Undertake bush regeneration and weed control to Council Standards.</p> <p>Weed control should focus on species outlined in s3.2.5 above. Appropriate method should be utilised for specific species, but generally cut and paint for larger plants and mechanical removal or spot spraying for smaller plants.</p> <p>In buffer areas immediately adjoining recreation areas, consideration should be given to dense groundcover planting or using mulch to provide ground cover, or both. This will minimise weeds and protect ground surface.</p> <p>Generally weed control will be of individual plants, however there are areas behind the animal displays that are severely weed infested and where vegetation structure is not representative of surrounding veg community. In these areas it is suggested that an intensive planting of suitable species be undertaken (this should include mid-storey shrubs and ground-covers).</p> <p>Successional planting of over-storey species is required in strategic areas where it will not impact on the built infrastructure.</p>	<p>Due to this zone being highly visible within the reserve, weed projected foliage cover should be maintained below 10%.</p> <p>Appropriate ground cover (mulch or vegetation) maintained throughout zone. If mulch is being utilised 50-100mm deep coverage to be maintained.</p>	Rapid assessment of reserve to track areas of weed encroachment as well as any contributing issues (eg, access; damage).	Year 1. Maintenance subsequent years.	HIGH
3. Zone I	Protect the biodiversity and ecological values of wetlands.	<p>Wetland Audit (2011) for Blackbutt Reserve will be used to inform the management actions for all wetlands and surrounding wetland buffers.</p> <p>Increase aquatic plantings and use configurations that result in all water passing through them (can be floating or planted in substrate).</p> <p>Improve habitat for water plants. Plant a greater diversity of species and have these located in appropriate areas.</p> <p>Improve wetland buffer vegetation via weed removal and intense planting on wetland edge.</p>	<p>Weed projected foliage cover should be maintained below 5% in wetland buffer areas.</p> <p>Establish native vegetation in buffer area so that long term ground cover pfc &gt; 60% is established.</p>	Monitor the change in condition through condition assessment for all wetland rehabilitation sites.	Year 2 and 3	MED

Item (Zone)	Target	Action	KPI	Monitor	Timing	Priority
4. Zone I	Protection and enhancement of the current condition of the watercourses within Blackbutt Reserve	<p>Rehabilitation of creek reaches to protect and enhance the highest priority NRM ranked creek reaches. <i>This has been completed within this zone.</i></p> <p>Rehabilitation and maintenance of the riparian zone to protect and enhance native vegetation assemblage. This action from the Blackbutt Plan of Management may not be achievable for the creek reach rehabilitated adjoining Carnley Ave recreation Area. Some additional revegetation here is desirable, however Reserve Managers will need to consider the effort required and risk of damage given high access to this site. Currently the rock works appear to be sufficient to hold the creek in place.</p>	Appropriate ground cover (mulch or vegetation) maintained throughout zone. If mulch is being utilised 50-100mm deep coverage to be maintained.	Monitor the change in condition through annual condition assessment for all watercourse rehabilitation sites with Blackbutt Reserve.	Year 3.	MED

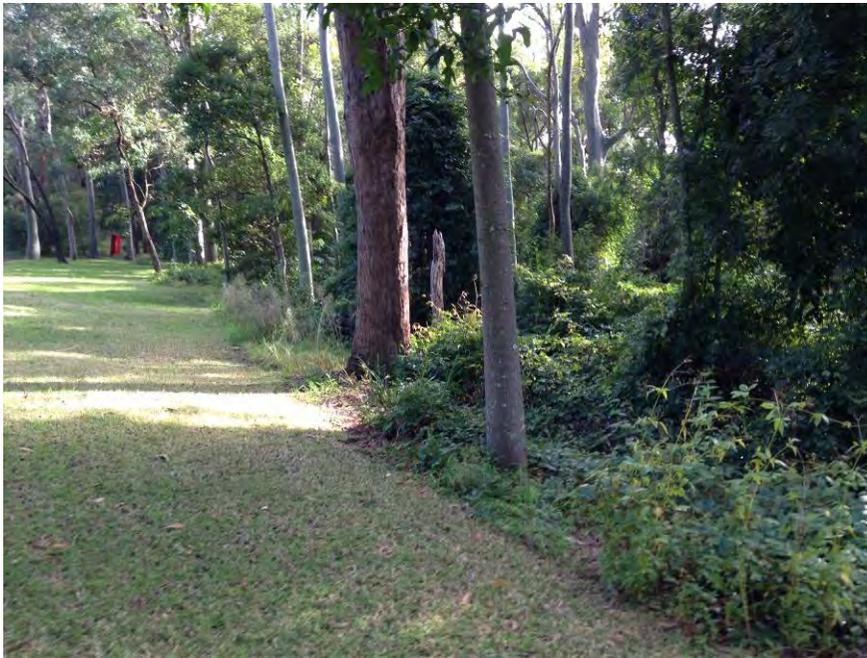


Figure A3. Example of area requiring definition of boundary + buffer.



Figure A4. This area requires slashing before the weeds set seed.

### A-3.2 Vegetation Management Zone 2 – Good Condition Bushland

Vegetation in the majority of the catchment could be considered to be in good condition. This zone has been mapped based on weeds being largely absent or occurring only as scattered individuals. Diversity in this zone is consistent with the vegetation types present. Structurally, all strata are present and there is a good age diversity of over-storey plants. Locally there are areas within this zone that exhibit an overabundance of native vine species, and although this is beyond the benchmarks prescribed by Biometric for the Spotted Gum- Ironbark forest, this is not considered a major issue. Treatment and replanting with suitable native mid storey species may be warranted immediately east of the emu enclosures.

**Management Zone 2A** shows some signs of disturbance and generally has a higher density of weeds than other good condition areas (disturbance is from Carnley Ave road reserve and there is an area that has subsidence holes; a small dam and other ground disturbance, presumably from previous mining). The major weeds in this area are individuals of lantana; ochona; and asparagus fern. This area has a fairly sparse groundcover, however there is sufficient natural mulch to protect the soil and this is not considered an issue. Weeds are worst in the southernmost area of this zone.



Figures A5 and A6: Vegetation within management zone 2A.

**Management Zone 2B** is in excellent condition and occurs along the northern ridge line of the catchment down to the main creek line.

The ridgeline vegetation is generally weed free with very scattered individuals of ochna, lantana and palm grass however projected foliage cover of these is estimated at less than 2% in this zone. Some areas are locally dominated by bracken fern or blady grass which can be a sign of previous disturbance and inappropriate fire regime.

The steep slope below the ridge vegetation, down to the creek-line contains a greater number of mesic understorey species with vines becoming more dominant in the mid to ground strata through much of the area. Major weeds are lantana; ochna and asparagus fern.

This zone, immediately north of Blueberry Ash Walk would benefit from a low intensity burn, however it is recommended that, within the life of this plan, only small patches be burned then monitored.



Figures A7 and A8 – Zone 2B ridgeline vegetation.

**Management Zone 2C** occurs south of the main creek-line almost to the Main Ridge picnic area where there it meets an area of degraded vegetation. Vegetation in 2C is generally in good condition however individuals and sometimes larger clumps of lantana are present, especially in the western most part of this zone. Other weeds such as wild tobacco and ochna are also present as individuals throughout this zone.

**Management Zone 2D** occurs in the south west of the Black Duck catchment. This area has had some degree of bush-regeneration which has resulted in the zone having a relatively low weed cover. Lantana is regrowing within this zone and follow-up treatment is recommended as a high priority.

Table A5: Actions to be applied to Vegetation Management Zone 2.

Item (Zone)	Target	Action	KPI	Monitor	Timing	Priority
1 – All Zone 2.	Protect the diversity of flora and fauna and ecological communities with particular emphasis on threatened species and endangered ecological communities.	<p>Continue to undertake assessments to ensure that high conservation natural areas, threatened species and habitat trees within Blackbutt Reserve are identified, protected and prioritised for restoration in accordance with legislative requirements.</p> <p>Databases for threatened species are regularly updated with all available information. This information includes threatened species identified through reports and by Council staff and will be recorded through Council's Natural Resource Atlas and reported to OEH for inclusion on the National Parks and Wildlife Atlas.</p>	<p>All native vegetation in this zone is protected and there is no reduction in extent of this Vegetation Zone.</p> <p>All threatened species within Blackbutt Reserve are protected.</p> <p>Threatened species and habitat trees mapped in a spatial database that is used in reserve decision making.</p>	<p>Annual rapid assessment of reserve to track management issues and any developing issues.</p> <p>Ecology study – focus on locally significant, rare, threatened and endangered flora and fauna</p> <p>Re-monitor Bushland Inventory 20x20 quadrats and establish additional quadrats throughout the reserve – alternatively a site specific vegetation community mapping project may be undertaken to develop baseline.</p>	Life of plan	HIGH.

Item (Zone)	Target	Action	KPI	Monitor	Timing	Priority
2 – All Zone 2. High priority Zone 2d	Control the spread of weed species, focussing on the intact core of the Reserve and areas of threatened species and EEC.	<p>Undertake bush regeneration and weed control to Council Standards.</p> <p>Bush regeneration (equivalent to secondary/maintenance weeding) is required in this management zone. Control of individuals of lantana; ochna; asparagus fern and palm grass plants throughout this area.</p> <p>Where possible plants to be removed by hand (smaller plants). Pulled plants may be piled and left to decompose on site. If larger plants are encountered cut and paint method should be employed and all seeds removed from site. Any control should aim to minimise native vegetation disturbance in this Zone.</p> <p>Primary control of weeds and ongoing maintenance in Zones 4; 3A; 3B and 3C which adjoin Vegetation Management Zone 2 is required to protect this “intact core” of the Reserve. These Zones are contributing seed stock to the good condition areas and high priority actions are discussed in subsequent sections.</p> <p>Bush regeneration teams should monitor for other weeds present, especially aggressive weeds such as vines which can rapidly spread in this zone. Any new weeds discovered should be reported and considered as part of targeted control.</p> <p>Vegetation Management Zone 2D is to be treated as highest priority as it will revert back to weed infested relatively quickly when compared to other areas without immediate maintenance (other areas in this zone are thought to be more resilient).</p>	<p>Control <b>all</b> individual occurrences of ochna, lantana, asparagus fern and palm grass within this management zone at least once during the life of this plan.</p> <p>Maintain exotic plant projected foliage cover below 5% at any time.</p>	<p>Monitor the condition of bushland within Blackbutt Reserve against baseline.</p> <p>Rapid assessment of reserve (especially along tracks/edges) to determine areas of weed encroachment as well as any contributing issues (eg dumping; access; damage).</p> <p>Site specific vegetation community mapping to develop a baseline. Re-monitoring every four to eight years.</p> <p>Re-monitor Bushland Inventory 20x20 quadrats every four to eight years.</p> <p>Before /after monitoring where bush regeneration works are undertaken.</p>	<p>Weed control 2d immediate, year 1, with follow up maintenance in subsequent years.</p> <p>Schedule teams to do “walk-throughs” for weed control in other areas of Zone 2 over life of plan.</p> <p>Annual Rapid assessments.</p>	HIGH*

Item (Zone)	Target	Action	KPI	Monitor	Timing	Priority
3 – All Zone 2.	All fire management activities shall consider fuel loads and potential risk to property in addition to ecological diversity and integrity.	<p>Coordinate with NSW fire Brigades to prepare an annual works program and to implement actions in accordance with the Newcastle Bush Fire Risk Management Plan and Committee.</p> <p>Ensure appropriate environmental assessment is undertaken when assessing proposals for new and existing hazard reduction burns and activities.</p> <p>Ensure fire management techniques do not favour weed species. Fire management activities should not damage any habitat trees or culturally significant sites.</p> <p>Prescription burns will be undertaken as required, subject to an assessment of vegetation type and fire interval thresholds.</p> <p>Consideration should be given to burning small areas within this zone for ecological purposes. Areas are also to be kept that are not burned intentionally. Experimental burns of parts of Zone 2B (north of Blueberry Ash Walk and south of the ridgeline) and 2c to determine the regrowth of native vine species vs other understorey species should be undertaken. If vines are not favoured, consideration should be given to burning larger areas of this zone by subsequent revisions of this plan.</p>	<p>All fuel reduction strategies undertaken at an appropriate time and in accordance with the recommended technique and location.</p> <p>Recommended fire interval thresholds for Zone 2 are 5 to 50 years for the spotted gum community and 25 to 60 years for the wet forests mapped as occurring in the Gully. Given the relatively small size of the reserve, only minor areas are to be subject to burning at any one time. It is recommended that significant no burn zones are maintained throughout the reserve, especially along the gully line.</p>	<p>Re-monitor Bushland Inventory 20x20 quadrats every four to eight years.</p> <p>Before /after monitoring where fire is used (especially in relation to regrowth of weeds and native vines such as cissus and parsonia which are able to rapidly colonise after disturbance).</p>	As required.	<p>HIGH for Risk Management and Protection</p> <p>MED for trial burns</p>
4 – Zone 2B and 2C	Protection and enhancement of the current condition of the watercourses within Blackbutt Reserve	Rehabilitation and maintenance of the riparian zone to protect and enhance native vegetation assemblage. (This zone requires weed control as per item 2 above. Generally planting will not be required as there is sufficient natural regeneration. Therefore, no specific vegetation management action relating to this Target).	As above.	Monitor the change in condition through annual condition assessment for all watercourse rehabilitation sites with Blackbutt Reserve (Creek Assessment Program)	NA	NA

### A-3.3 Vegetation Management Zone 3 – Weed Infested Areas

This Vegetation Management Zone occurs chiefly in the upper catchment west of the Main Ridge walking trail. It also occurs as a thin strip immediately downstream of the Main Ridge recreation area and in a more significant patch to the west of Carnley Ave Recreation Area. This zone is characterised by dense weed infestation, chiefly lantana, under a mostly intact over-storey. Other weeds such as ochna; asparagus fern; wild tobacco and several garden escapes also occur in this area.

Zones 3A; 3B and 3C are among the highest priority weed management activities proposed by this VMP for the reserve (in that order and along with maintenance weeding of Zone 2D). Zone 3C has had bush regeneration activities in the recent past consisting of primary weeding, however, this is beginning to become reinfested and overall this zone lacks good lower-mid storey structure.

To the west of the walking trail, Zone 3E is quite variable in that a number of the raised ridges are locally in very good condition with low weed disturbance, but lower areas and the “contact zones” with Lookout Road, the parking area at the top of the catchment and the residences are extremely weed infested.



Figure A9. Bush regeneration and lantana regrowth in Zone 3C.

Figure A10. Lantana in Vegetation Management Zone 3E.

Table A6: Actions to be applied to Vegetation Management Zone 3.

Item (Zone)	Target	Action	KPI	Monitor	Timing	Priority
1- All Zone 3	Protect the diversity of flora and fauna and ecological communities with particular emphasis on threatened species and endangered ecological communities.	<p>Continue to undertake assessments to ensure that high conservation natural areas, threatened species and habitat trees within Blackbutt Reserve are identified, protected and prioritised for restoration in accordance with legislative requirements.</p> <p>Databases for threatened species are regularly updated with all available information. This information includes threatened species identified through reports and by Council staff and will be recorded through Council's Natural Resource Atlas and reported to OEH for inclusion on the National Parks and Wildlife Atlas.</p> <p>As far as practical native vegetation in this zone is to be protected, however as this forms the majority of the boundary with the recreation areas as well as the boundary of the reserve with residences and Lookout Road, some clearing will be required, however over-storey species are to be avoided where possible. Clearing (subject to appropriate environmental assessment) may be required for access (eg along fence-lines); augmentation of recreational areas; and for asset protection.</p>	All threatened species within Blackbutt Reserve are protected.	<p>Annual rapid assessment of reserve to track management issues and any developing issues.</p> <p>Re-monitor Bushland Inventory 20x20 quadrats and establish additional quadrats throughout the reserve – alternatively a site specific vegetation community mapping project may be undertaken to develop baseline.</p>	Life of plan	HIGH

Item (Zone)	Target	Action	KPI	Monitor	Timing	Priority
2 - Zone 3A; 3B; and 3C	Control the spread of weed species, focussing on the intact core of the Reserve and areas of threatened species and EEC.	<p>Undertake bush regeneration and weed control to Council Standards.</p> <p>Primary weeding of these zones is required, however disturbance should be kept at a minimum and cut and paint used where larger plants are encountered (work has commenced on zone 3c, however this zone requires additional weed control as it is becoming re-infested).</p> <p>Local planting of mid strata shrubs and trees in Zone 3c may be required as this area is highly disturbed and regrowth consists mainly of lantana and native vines. The vines may need control while plantings are establishing.</p>	<p>Primary weeding in zones 3A and 3B</p> <p>Maintain exotic plant projected foliage cover below 10% for these zones.</p>	<p>Monitor the condition of bushland within Blackbutt Reserve against baseline.</p> <p>Rapid assessment of reserve (especially along tracks/edges) to determine areas of weed encroachment as well as any contributing issues (eg dumping; access; disturbance).</p> <p>Site specific vegetation community mapping to develop a baseline. Re-monitoring every four to eight years.</p> <p>Re-monitor Bushland Inventory 20x20 quadrats every four to eight years.</p> <p>Before /after monitoring where bush regeneration works are undertaken.</p>	<p>Year 1 – Zone 3a and 3c</p> <p>Year 2 – Zone 3B</p> <p>Maintenance subsequent years</p>	HIGH*

Item (Zone)	Target	Action	KPI	Monitor	Timing	Priority
3- Zone 3D	Control the spread of weed species, focussing on the intact core of the Reserve and areas of threatened species and EEC.	Undertake bush regeneration and weed control to Council Standards.  Primary weeding of this zones is required, however disturbance should be kept at a minimum and cut and paint used where larger plants are encountered (work has commenced on zone 3c, however this zone requires additional weed control as it is becoming re-infested).	Primary weeding in this zone.  Maintain exotic plant projected foliage 10% at any time.	Monitor the condition of bushland within Blackbutt Reserve against baseline.  Rapid assessment of reserve (especially along tracks/edges) to determine areas of weed encroachment as well as any contributing issues (eg; access; damage).  Site specific vegetation community mapping to develop a baseline. Re-monitoring every four to eight years.  Re-monitor Bushland Inventory 20x20 quadrats every four to eight years.  Before /after monitoring where bush regeneration works are undertaken.	Year 3  Maintenance subsequent years	MED

Item (Zone)	Target	Action	KPI	Monitor	Timing	Priority
4- Zone 3E	Control the spread of weed species, focussing on the intact core of the Reserve and areas of threatened species and EEC.	<p>Undertake bush regeneration and weed control to Council Standards.</p> <p>Zone should be broken into manageable sub-zones and works completed over a period of time (dictated by Council Resources available to complete works here).</p> <p>Audit perimeter of Reserve to ascertain areas of encroachment, and illegal dumping and illegal access.</p> <p>Primary weeding in this area is required. Brush-cutters may be required in places to reduce lantana biomass.</p> <p>A dense planting of mid-strata trees and shrubs is recommended for the contact zone with lookout road.</p> <p>Appropriate Asset Protection Zone needs to be established to the south of the residences and planting outside of the APZ with fire retardant mid strata trees and shrubs. A vehicular track along the fence-line would be desirable for access for emergency vehicles and for management purposes.</p>	<p>Primary weeding in this zone.</p> <p>Maintain exotic plant projected foliage 10% at any time.</p>	<p>Monitor the condition of bushland within Blackbutt Reserve against baseline.</p> <p>Rapid assessment of reserve (especially along tracks/edges) to determine areas of weed encroachment as well as any contributing issues (eg dumping; access; damage).</p> <p>Site specific vegetation community mapping to develop a baseline. Re-monitoring every four to eight years.</p> <p>Re-monitor Bushland Inventory 20x20 quadrats every four to eight years.</p> <p>Before /after monitoring where bush regeneration works are undertaken.</p>	<p>After item 2 in this table is complete.</p> <p>Maintenance subsequent years.</p>	MED
5 – Zone 3A and 3B	Protection and enhancement of the current condition of the watercourses within Blackbutt Reserve	Rehabilitation and maintenance of the riparian zone to protect and enhance native vegetation assemblage. (This zone requires weed control as per the above items. Generally planting will not be required as there is sufficient natural regeneration. Therefore, no specific vegetation management action relating to this Target).	As above.	Monitor the change in condition through annual condition assessment for all watercourse rehabilitation sites with Blackbutt Reserve (Creek Assessment Program)	NA	NA

### A-3.4 Vegetation Management Zone 4 – Intense Work Area

This Vegetation Management Zone occurs immediately west of the main animal exhibits. This zone was significantly damaged due to strong winds associated with an East Coast Low in June 2007. Limited natural regeneration has occurred due to the zone being characterised by dense areas of lantana and native vine species. The zone requires weed and vine removal to allow canopy species to regrow. The highest priority for this zone is to restore canopy cover and control weeds which can readily spread to adjacent good condition bushland. Successional lower strata planting can be considered by subsequent versions of this VMP if required.

Table A7: Actions to be applied to Vegetation Management Zone 4.

Item (Zone)	Target	Action	KPI	Monitor	Timing	Priority
I- Zone 4	Control the spread of weed species, focussing on the intact core of the Reserve and areas of threatened species and EEC.	<p>Undertake bush regeneration and weed control to Council Standards.</p> <p>Primary weeding in this area is required. Brush-cutters may be required in areas to allow access to plants and to reduce biomass. Care will need to be taken not to disturb establishing canopy species.</p> <p>Control of native vines is also required in this zone to give establishing trees a head start.</p> <p>Dense planting of over-storey trees and tall mid strata shrubs is recommended for this zone.</p> <p>This area will require a high commitment to maintenance over a period of 6 to 8 years to ensure plantings are not overrun by lantana and native vine species.</p>	<p>Primary weeding in this zone.</p> <p>Establish canopy and dense native species mid-storey.</p> <p>Maintain exotic plant and native vine projected foliage cover below 10% at any time.</p>	<p>Monitor the condition of bushland within Blackbutt Reserve against baseline.</p> <p>Periodic inspection of Zone to determine whether additional action/weeding is required.</p> <p>Before /after monitoring where bush regeneration works are undertaken.</p>	<p>Year 2.</p> <p>Maintenance subsequent years.</p>	HIGH



*Thank you to Brad West, Bushland Services Coordinator, and Felicity Charlton, Asset Project Officer (Newcastle City Council); for assisting with information, data, maps and comments that were used to finalise this report.*