



City of Melville
Wireless Hill Park
Strategic Management Plan

2017-2022

Jan 2018

Executive Summary

The *Wireless Hill Park Strategic Management Plan 2017-2022* updates and replaces the *Wireless Hill Reserve Management Plan 2008*. The scope of this plan is the 37.54 hectares of bushland in Wireless Hill Park.

Wireless Hill Park is listed as a regionally significant bushland by the Government of Western Australia (as Bush Forever Site 336) and forms part of regional greenway and regional bushland/wetland linkage.

Of the 49 assets targeted for monitoring and management, the 22 assets of regional, state and/or national significance were:

- 1 ecological community
 - *Banksia Woodlands of the Swan Coastal Plain* are a Threatened Ecological Community listed as Endangered under the Environment Protection and Biodiversity Conservation Act 1999
- 2 heritage sites
 - Scarred Tree is a registered Aboriginal Site
 - Heritage Trails are listed on the WA Heritage Register
- 2 reference sites
 - two 10 m x 10 m permanently marked quadrats used to develop a regional classification of vegetation of the Southern Swan Coastal Plain
- 4 flora species
 - *Jacksonia sericea* is listed by the WA Department of Parks and Wildlife as requiring monitoring/management, as a Priority 4 species
 - *Conospermum triplinervium* (now extinct onsite), *Astroloma macrocalyx* and *Melaleuca systema* were listed as regionally significant by the Government of Western Australia in assessing Bush Forever Sites
- 2 reptiles
 - *Lerista lineata*, *Lined Skink* is listed by the WA Department of Parks and Wildlife as requiring monitoring/management, as a Priority 4 species
 - *Lucasium alboguttatum*, White-spotted Ground Gecko is at the southern end of its distribution in the Perth region and was listed as regionally significant by the Government of Western Australia in assessing Bush Forever Sites
- 9 birds
 - *Calyptorhynchus banksii naso*, Red-tailed Black-Cockatoo and *Calyptorhynchus latirostris*, Carnaby's Black-Cockatoo are listed as Matters of National Environmental Significance under the Environment Protection and Biodiversity Conservation Act 1999 as threatened species
 - *Merops ornatus*, Rainbow Bee-eater is listed as a Matter of National Environmental Significance under the Environment Protection and Biodiversity Conservation Act 1999 as a migratory species
 - *Acanthiza apicalis*, Inland Thornbill and *Daphoenositta chrysoptera*, Varied Sittella, *Acanthiza chrysorrhoa*, Yellow-rumped Thornbill and *Smicromnis brevirostris*, Weebill and *Anthochaera lunullata*, Western Wattlebird and *Turnix varia*, Painted Button-quail were listed as regionally significant by the Government of Western Australia in assessing Bush Forever Sites



The vegetation is significantly modified. Wireless Hill Park has amongst the lowest recorded density of very large trees of any bushland area in the City of Melville as a result of the clearing of trees and shrubs across the site to facilitate the construction of a wireless communications station. This clearing commenced in 1912 and was followed by annual burning to impede regrowth of the vegetation until the station was decommissioned in 1967. However the majority of the park retains very high cover of native vegetation. The vegetation contains more than 50% of the *Banksia* trees recorded across 35 reserves surveyed in the City of Melville, and is nationally significant:

- *Banksia Woodlands of the Swan Coastal Plain* are listed as a Matter of National Environmental Significance under the Environment Protection and Biodiversity Conservation Act 1999.

The 219 native plant species recorded onsite include:

- 1 species, *Conospermum triplinervium*, that became extinct onsite between 1999 and 2016.
- A number of species at risk of local extinction, with 33 species previously being documented as restricted or in low abundance onsite. Only 1 *Astroloma macrocalyx*, 4 *Banksia ilicifolia*, 7 *Banksia grandis* (including plantings) and 10 *Melaleuca systena* plants were present in 2016
- A number of species that naturally occur on the Swan Coastal Plain, but could possibly be introduced as plantings (*Melaleuca preissiana*, *Olearia axillaris*, *Rhagodia baccata*) or should be treated as weeds (*Agonis flexuosa*, *Callitris preissii* and *Calothamnus quadrifidus*)

A total of 59 native animal species (1 bat, 14 reptile, 38 bird and 6 invertebrate species) have been confirmed onsite but it is expected that as many as 104 vertebrate species may be present. The assemblage is expected to be highly diverse for an urban reserve, underpinning the reserve's importance for fauna in the City of Melville. The fauna inventory includes:

- 4 bushland dependent birds that may have become extinct onsite (*Acanthiza apicalis*, Inland Thornbill and *Acanthiza chrysorrhoa*, Yellow-rumped Thornbill and *Daphoenositta chrysoptera*, Varied Sittella and *Ninox novaeseelandiae*, Southern Boobook Owl)
- 10 bushland dependent reptiles and amphibians that may have become extinct onsite

Of the 44 threats considered for targeted management, the very high impact threats confirmed/assumed to be directly affecting Wireless Hill Park 2008-2017 were:

- 5 weed species/groups
 - *Schinus terebinthifolius*, Brazilian Pepper
 - *Asparagus asparagoides*, Bridal Creeper
 - *Lachenalia reflexa*, Soldiers
 - very large live non-native tree weeds
 - perennial clumping grasses
- 1 feral animal species
 - *Felis catus*, cats
- 1 pathogen
 - *Phytophthora cinnamomi*, Dieback
- 2 weather events
 - High Temperatures
 - Low Rainfall



A discussion is provided on changes in assets and threats since the last management plan in 2008. A comprehensive audit of key performance indicators, and many leading and lagging indicators, was not possible as quantitative data collection has not been previously standardised by the City of Melville for bushland management. Since 2008:

- 17 threats were prevented
- 2 threats were eliminated
- 14 threats were unchanged or decreased
- 5 threats increased
- 6 threats could not be assessed for changes
- 31 assets were maintained
- 2 assets were not maintained
- 7 assets could not be assessed for changes

Applying the principles established in the City of Melville's *Natural Areas Asset Management Plan*, this strategic reserve plan establishes 59 objectives for threats in order to meet the 42 goals for assets for the period 2017-2022. These are to be implemented through operational reserve plans, guidelines and procedures, and the outcomes and effectiveness of management reviewed using quantitative data.

The major priorities for management should be:

- Increasing numbers of selected native plant species (*Conospermum triplinervium*, *Banksia grandis* and *Banksia ilicifolia*)
- Eliminating selected weed species (Brazilian Pepper, Bridal Creeper, Two-leaf Cape Tulip, Black Flag, Bugle Lily and Pelargonium)
- Reducing the number of large live weed trees and selected trees and shrubs
- Containing the pathogen *Phytophthora cinnamomi*, Dieback



Recommended Reference

The recommended reference for this document is:

Waters, A (2017) *Wireless Hill Park Strategic Management Plan 2017-2022*, Woodgis Environmental Assessment and Management for the City of Melville, Perth.

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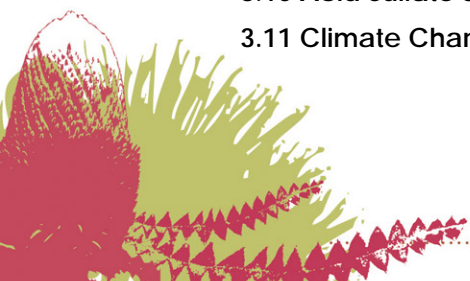
Acronyms and Definitions

ANZECC	Australian and New Zealand Environment and Conservation Council
DBH	Diameter at Breast Height
DEC	(WA) Department of Environment and Conservation
DEP	(WA) Department of Environmental Protection
DPaW	(WA) Department of Parks and Wildlife
EPBC Act	Environment Protection and Biodiversity Conservation Act
FCT	Floristic Community Type
ha	hectares
Melville	City (rather than suburb) unless specifically stated otherwise
NAAMP	Natural Areas Asset Management Plan
PEC	Priority Ecological Community (as defined and listed by DPaW)
WAPC	Western Australian Planning Commission



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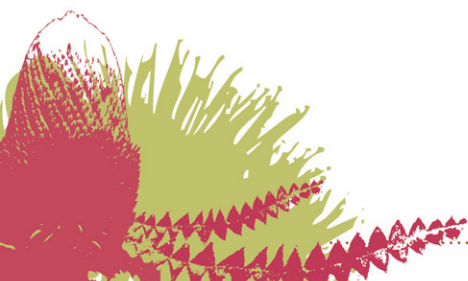


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1 Introduction

1.1 Background

The *Wireless Hill Park Strategic Management Plan 2017-2022* updates and replaces the *Wireless Hill Reserve Management Plan 2008* (City of Melville, 2008).

In accordance with the City of Melville's *Natural Areas Asset Management Plan* (NAAMP) framework, the Strategic Reserve Plan forms part of the integrated set of documents shown in Figure 1.

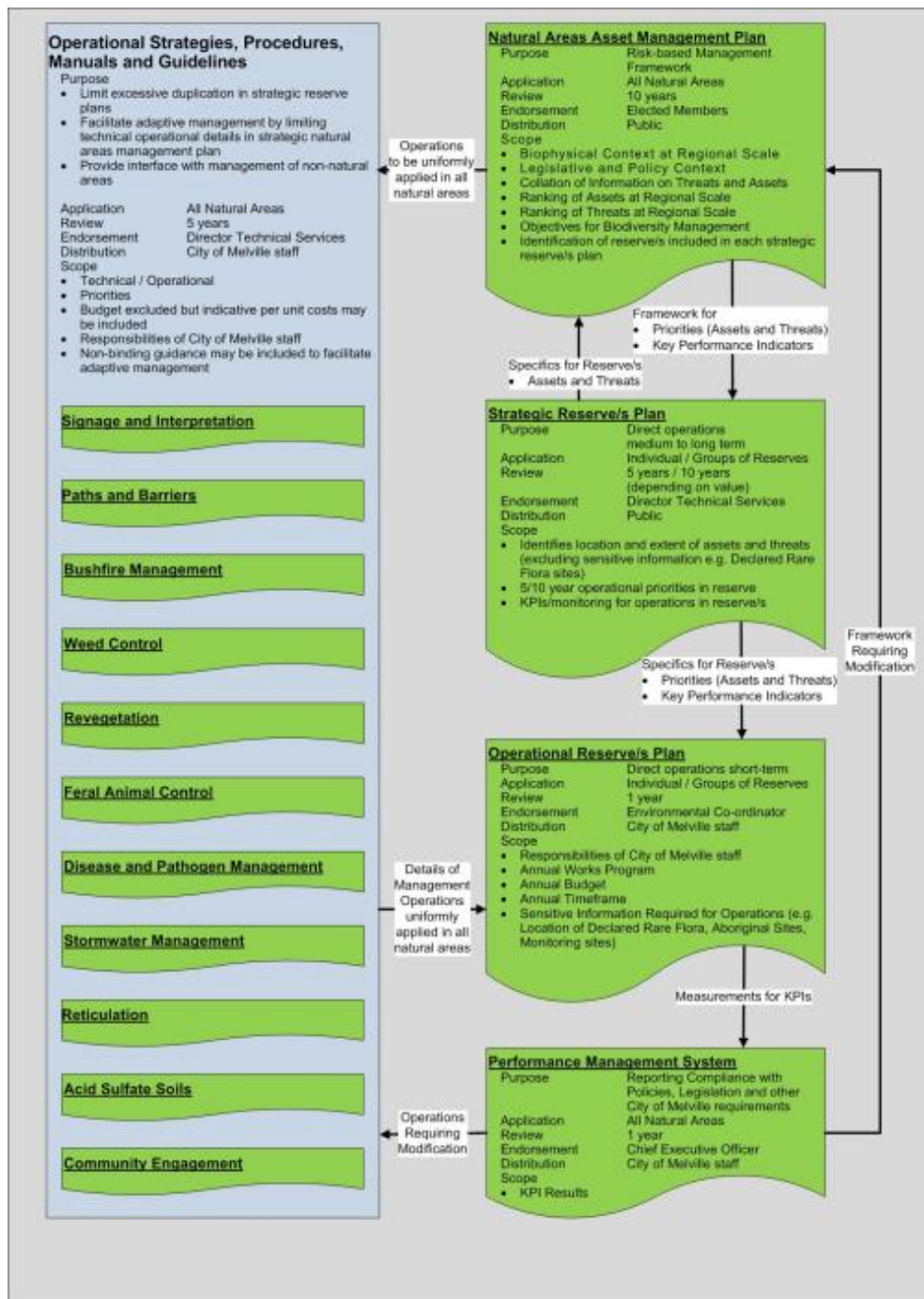
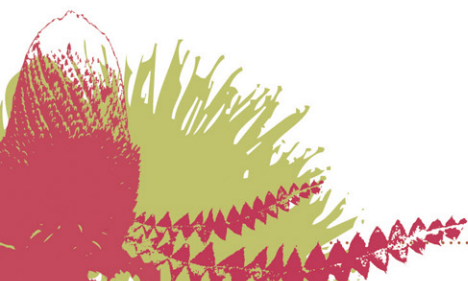


Figure 1 Context of Strategic Reserve Plans in relation to other documents



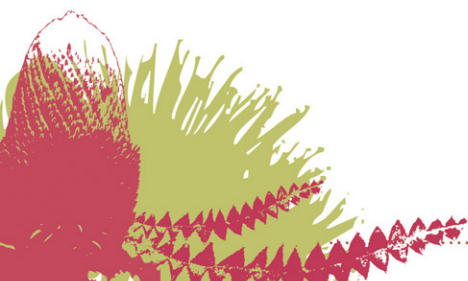
The Strategic Reserve Plan is structured with the major headings of assets and threats in accordance with the NAAMP framework, whereby assets are maintained or enhanced by the management of threats (using the strategies and guidelines) as summarised in **Figure 2**.

Priorities for Protection from Threats								Threats impacting on assets and therefore subject to Management	Techniques for Management of Threats										
BIODIVERSITY ASSETS									THREATS	STRATEGIES AND GUIDELINES									
Bush Forever Reserves	Ecological Community Sites	Wetland Sites	Heritage Sites	Community Interest Sites	Reference Sites	Native Flora Species	Native Fauna Species		Sign, Path and Barrier Guidelines	Bushfire Strategy	Weed Control Strategy & Guidelines	Revegetation Strategy & Guidelines	Feral Animal Strategy and Guidelines	Diseases and Pathogen Guidelines	Stormwater Management Strategy	Reticulation Guidelines	Acid Sulfate Soils Guidelines	Community Engagement	
X	X		X	X	X	X		Physical Disturbance	X	X	X	X	X	X	X	X	X	X	
X	X		X	X		X	X	Fire		X	X	X				X		X	
X	X	X	X	X		X	X	Weeds		X	X	X				X		X	
X	X					X	X	Habitat Loss				X	X					X	
X	X					X	X	Feral Animals				X	X					X	
X	X	X	X	X	X	X	X	Diseases & Pathogens	X					X				X	
X	X	X	X		X	X	X	Stormwater							X			X	
						X		Reticulation								X			
X	X	X	X			X	X	Acid Sulfate Soils									X		
X	X	X	X			X		Climate Change			X	X							

Figure 2 Documents used to Maintain/Enhance Assets by Managing Threats
 Red = Strategy intended to Prevent, Eliminate, Contain or Manage impacts from threat
 Orange = Strategy or Guideline to Manage secondary impacts from threats

Guidelines and procedures were to largely pre-empt strategic reserve plans, to ensure efficiency and consistency in benchmarking and monitoring expected outcomes. The City of Melville has begun to develop the guidelines and procedures required but they do not yet fully apply the framework for ranking/prioritising assets and threats, nor document all management and monitoring techniques.

Historically management plans have focused on developing flora and fauna inventories to identify reserves of greatest significance within the City of Melville. Under the NAAMP framework, the focus is moving to risk assessment and prioritisation of management objectives within reserves, and it is envisaged that future plans will focus to a greater degree on reviewing the outcomes and effectiveness of management strategies and guidelines.



The NAAMP provides a framework for:

- consistently prioritising assets and threats;
- a format for plans; and
- community involvement in managing specific reserves:
 - the community can assist during the preparation of strategic reserve plans in:
 - the identification and benchmarking of assets and threats; and
 - quantifying objectives for threats and goals for assets (e.g. specific number of very high value plants of a species to be established onsite).
 - the community can assist during the life of strategic plans in:
 - the identification and delineation of additional assets (including revegetation sites) and threats;
 - the monitoring of assets and threats; and
 - on-grounds works in the context of specific and measurable goals.



1.2 Objectives

Under the framework of the NAAMP, the objectives of this and all City of Melville Strategic Reserve Plan/s are to:

- document:
 - the extent and/or abundance and condition of assets;
 - the present and potential level and extent of impacts of threats;
 - any changes evident in the assets and threats over time;
 - reserve-specific risk-based management priorities;
 - management strategies relevant to the specific reserve;
- discuss:
 - reserve specific application of strategies and make reserve specific recommendations regarding the implementation of strategies.

1.3 Scope

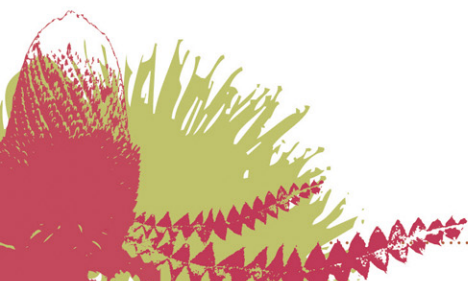
The scope of this report is the 37.54 hectares of bushland in Wireless Hill Park (Reserve 33422, and Lots 50, 100, 223, 14758, 14759 and 14760, and part lot 52).

The park is located in the suburb of Ardross in the north of the City of Melville, as shown in Figure 3.



Figure 3 Location of Wireless Hill Park

The bushland in Wireless Hill Park was rated highly in terms of its overall value in the NAAMP. Of the four ratings, Wireless Hill Park was in the highest tier.



2 Assets

2.1 Overview

The City of Melville has committed to a strategic goal to ‘contribute to the maintenance and enhancement of biodiversity for the preservation of our natural flora and fauna’.

The NAAMP documents the regional context for climate, soils, landforms, flora and fauna; and establishes a framework by which biodiversity is:

- defined as assets at three scales:
 - **Reserves** (usually defined by cadastral boundaries);
 - **Sites** (management units such as a vegetation type that may encompass either a part or the entirety of a reserve); or
 - **Species** (a group of organisms capable of interbreeding freely with each other but not with members of other species).
- prioritised for either maintenance and enhancement (or confirmation if its status onsite is uncertain, or monitoring if a reserve is not critical habitat) in terms of:
 - **Values** (assessed with reference to local regional, state, national and international significance) as shown in **Figure 4**.

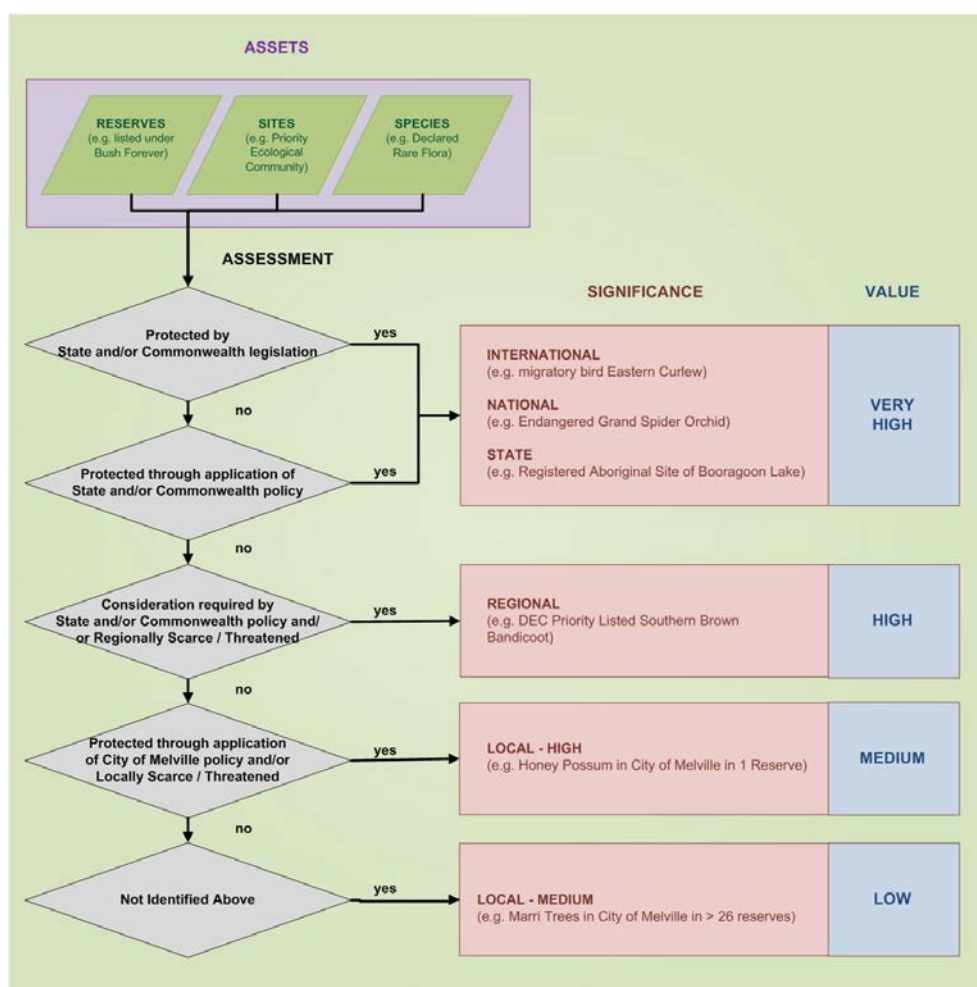
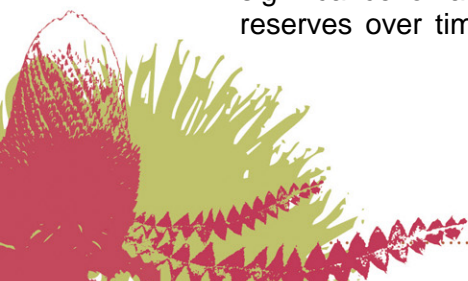


Figure 4 Assessment of Assets in Natural Areas

The values of assets are reviewed periodically as they will occasionally change (e.g. the significance of an occurrence of a species may be downgraded if it is recorded in more reserves over time with additional targeted surveys). A change in the value of an asset is



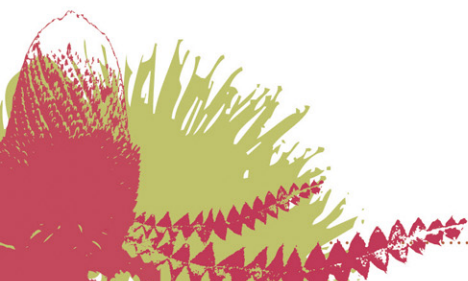
applicable to that asset in all natural areas in the City of Melville, including in reserves with current endorsed strategic reserve management plans.

To provide foci for management and monitoring, a strategic risk assessment was undertaken in the 2013 NAAMP (Waters A. , 2013) to identify assets with elevated susceptibility to threats.

Assets are used as indices where they are significant and/or vulnerable to loss or degradation without targeted action. Vulnerable assets were determined on the basis of the characteristics summarised in [Table 1](#).

Table 1 Groups of Assets generally most susceptible to Threats

Threats	Sites	Assets	
		Fauna Species	Flora Species
Physical Disturbance	All sites	Ground dwelling and/or burrowing reptiles	All shrubs, and herbaceous species
Fire	All sites	All ground dwelling species (non-burrowing, non-climbing and non-flying species)	Trees and shrubs that are killed by fire and regenerate only from seed stored on the plant
Weeds	All sites	Ground dwelling and/or burrowing reptiles	All shrubs, and herbaceous species
Habitat Loss	Ecological Community listed as Threatened or Priority by DPaW Present in few reserves	Listed as Threatened or Priority by DPaW Present in few reserves or few individuals in a reserve Cannot persist in urban or 'small' bushland areas Hollow dependent species	Listed as Threatened or Priority by DPaW Present in few reserves or few individuals in a reserve
Feral Animals Cats and foxes Rabbits Bees	- Revegetation sites -	All species - Hollow dependent species	- - All herbaceous species
Diseases & Pathogens	All sites	No species	Wide range of species
Stormwater	All wetlands	All wetland dependent species	All wetland dependent species
Reticulation	All sites	Reptiles that are either ground dwelling and/or burrowing	All shrubs, and herbaceous species
Acid Sulfate Soils		All wetland dependent species	All wetland dependent species
Climate Change	All wetlands	All wetland dependent species	Long-lived shallow rooted and associated with saturated soils



2.2 Reserve Assets

2.2.1 Bush Forever

Bush Forever Sites are properties listed as containing regionally significant bushland by the Government of Western Australia (2000). Bush Forever is not subject to ongoing revision and therefore the Bush Forever status of reserves is expected to remain unchanged for the foreseeable future. However under the NAAMP, Bush Forever status is considered in terms of:

- prioritising management resources between reserves, and
- managing sites and species within reserves to ensure reserves continue to meet the Bush Forever criteria for which they were listed.

Bush Forever Site 336 (Wireless Hill Park, Ardross) covers the majority of Wireless Hill Park, as shown in [Figure 5](#).

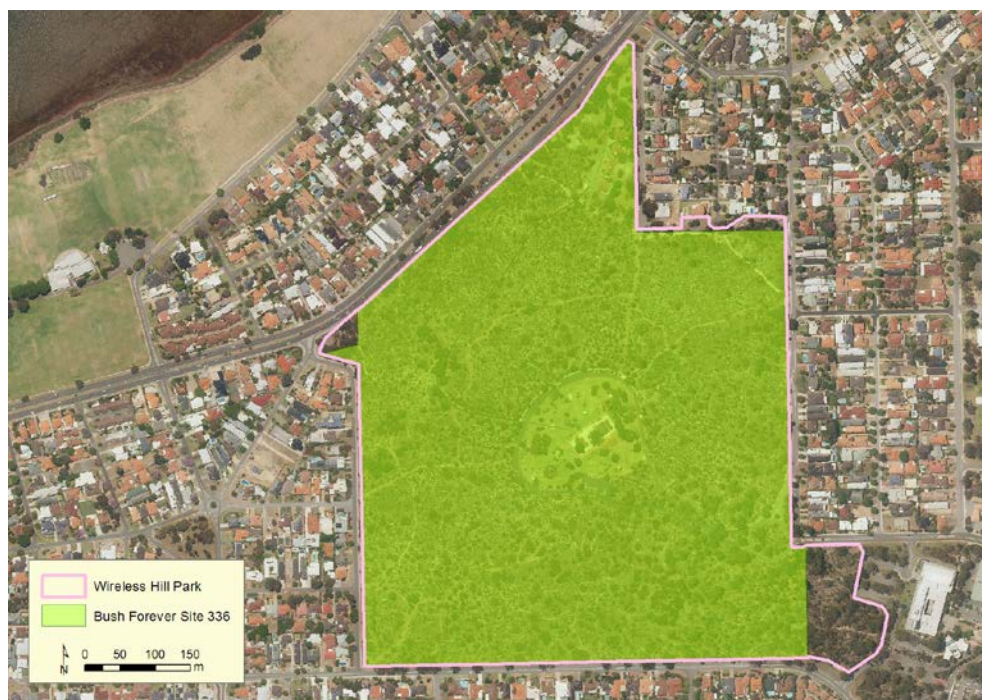


Figure 5 Bush Forever Site 336

Bush Forever Site 336 met four (out of a possible seven) criteria for listing, and the Bush Forever Site's characterisation applies to all the bushland covered in this strategic reserve management plan.

Bush Forever Volume 2: directory of Bush Forever Sites (Government of Western Australia, 2000), gives some indication of the justifications for Bush Forever Listings but with some degree of interpretation possible. The Bush Forever values of Site 336, for the purposes of the management of sites and species onsite, are:

- **Representation of ecological communities (Areas that as a suite represent the range of ecological communities and the places in which these communities merge):**
 - The site is representative of one Floristic Community Type (FCT 28 *Spearwood Banksia attenuata* or *Banksia attenuata* – *Eucalyptus* woodlands), and the transition between the Karrakatta - Central and South vegetation complex and the Bassendean - Central and South vegetation complex.
 - The Strategic Reserves Management Plan recognises these values in differentiating between, and managing, flora and vegetation at a fine-scale.

- **Rarity (Areas containing rare or threatened communities or species, or species of restricted distribution)**
 - The species recorded on the site and listed as significant in the Bush Forever assessment were:
 - one gecko: *Lucasium alboguttatum*, White Spotted Ground Gecko (previously named *Diplodactylus alboguttatus*)
 - three plants: *Jacksonia sericea* (P3), *Conospermum triplinervium* and *Astroloma macrocalyx*.
 - Whilst not listed in the Bush Forever assessment in 2000, the following significant species have been documented onsite:
 - Two birds: *Calyptorhynchus latirostris*, Carnaby's Black-Cockatoo and *Calyptorhynchus banksii naso*, Forest Red-tailed Black-Cockatoo. They are both migratory birds that are listed as a threatened species.
 - Threatened Ecological Communities were not evaluated for the site at the time of the Bush Forever assessment in 2000. As of 16 September 2016, the status of the vegetation onsite was elevated to a listed Threatened Ecological Community. All Banksia Woodlands of the Swan Coastal Plain were declared a Threatened Ecological Community, a Matter of National Environmental Significance (MNES) under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), where occurrences were either:
 - entirely in 'Pristine' condition,
 - 'Excellent' condition for patches greater than 0.5 ha, or
 - 'Very Good' condition for patches over 1 ha, or
 - 'Good' condition for patches over 2 ha.
 - the Strategic Reserve Plan recognises and manages these values as significant species and sites
- **Scientific or evolutionary importance (Areas containing evidence of evolutionary processes either as fossilised material or as relict species and areas containing unusual or important geomorphological or geological sites; Areas of recognised scientific and educational interest as reference sites or as examples of the important environmental processes at work)**
 - Two flora quadrats were established onsite in 1994 as part of a survey of the Swan Coastal Plain undertaken by CALM to develop a regional vegetation classification (Floristic Community Types based on groups of co-occurring plants) (Gibson, Keighery, Keighery, Burbridge, & Lyons, 1995).
 - The Strategic Reserve Management Plan would recognise these quadrats as significant sites if they could be relocated.
- **Criteria not relevant to determination of regional significance, but which may be applied when evaluating areas having similar values (Attributes which taken alone do not establish regional significance, but which can add to the value of bushland and enhance its contribution to Bush Forever)**
 - This criterion likely refers to the site's National Trust of Australia (WA) Classification, the site forming part of a significant potential bushland/wetland linkage, and 'some existing protection' of the site as a City of Melville reserve.
 - The Strategic Reserve Management Plan is consistent with these values in managing the bushland onsite for biodiversity and heritage values.



2.2.2 Ecological Linkages

Ecological linkages can increase the effective size of flora populations, and increase available habitat for individual animals, and help maintain genetic diversity for animals and plants by providing connections between groups of animals and plants in isolated bushland remnants.

The management of linkages is outside the scope of strategic reserve plans and is dealt with through processes such as:

- land use planning processes;
- the *City of Melville's Green Plan* (Alan Tingay and Associates, 1998);
- the *City of Melville Streetscape Strategy*; and
- the *City of Melville Public Open Space Strategy*.

Under the NAAMP, linkages are considered in terms of:

- prioritising management resources between reserves, and
- determining whether species can persist onsite in the long term.

The Government of Western Australia (2000) included Wireless Hill Park in three linkages (Figure 6):

- Regional Greenway 24, Swan River; and Regional Greenway 82, Piney Lakes - Wireless Hill - Swan River (Alan Tingay and Associates, 1998); and
- Regional bushland/wetland linkage 50 (Government of Western Australia, 2000).



Figure 6 Linkages Containing Wireless Hill Park

Whilst Wireless Hill Park forms part of a significant bushland/wetland linkage, the bushland has been moderately isolated from other terrestrial bushland remnants for approximately 40 years. The connectivity between 1953 and 2014 is shown in Figure 7 to Figure 14. The current extent and connectivity of remnant bushland in the vicinity remained relatively unchanged after 1995.

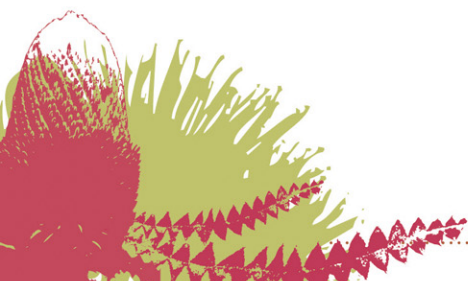




Figure 7 Wireless Hill Park 1953



Figure 11 Wireless Hill Park 1981

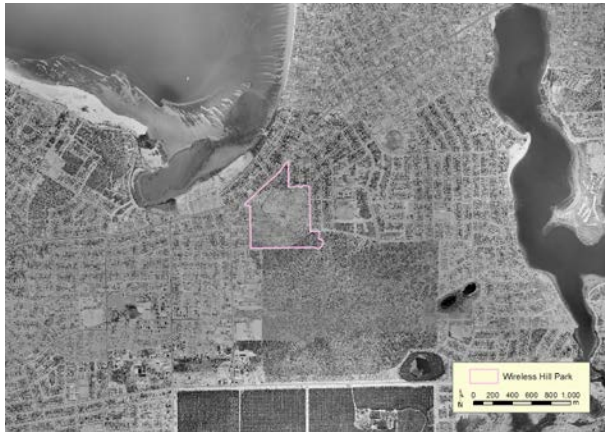


Figure 8 Wireless Hill Park 1965



Figure 12 Wireless Hill Park 1985



Figure 9 Wireless Hill Park 1974



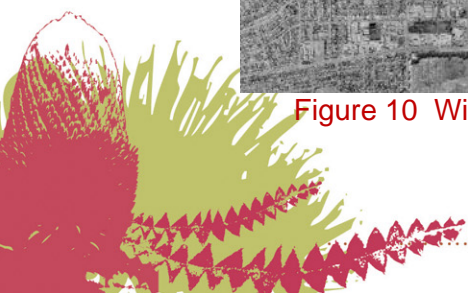
Figure 13 Wireless Hill Park 1995



Figure 10 Wireless Hill Park 1979



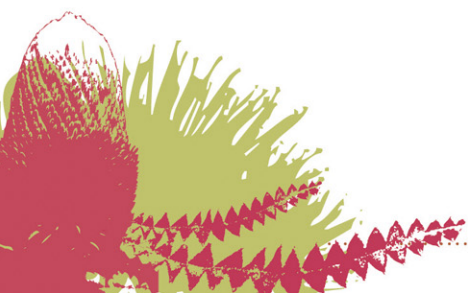
Figure 14 Wireless Hill Park 2014



The total native cover in this area has implications for the long term persistence of some flora and fauna species discussed in [Section 2.4](#) and [Section 4](#). There is approximately 5% native vegetation in a circle extending 2 km out from the centre of Wireless Hill Park ([Figure 15](#)).



[Figure 15](#) Remnant Vegetation within 2 km of Wireless Hill Park



2.3 Site Assets

2.3.1 Ecological Communities

The vegetation was characterised in *Bush Forever. Volume 2: Directory of Bush Forever Sites* (Government of Western Australia, 2000) as a vegetation association (up to three consistent dominant/indicative species per layer, in up to three layers) of:

Corymbia calophylla Woodland over

Eucalyptus marginata, *Banksia attenuata* and *Banksia menziesii* Low Woodland over

Xanthorrhoea preissii, *Macrozamia fraseri* and *Stirlingia latifolia* Open Heath to Shrubland

The vegetation can be also mapped as single vegetation subassociation (up to five consistent dominant/indicative species per layer, in up to five layers), with:

- the dominant trees and shrubs listed in the above description being consistently present across most of the site (Figure 16 to Figure 19), as well as other conspicuous species such as the shrubs *Adenanthos cygnorum*, *Hibbertia hypericoides* and *Gompholobium tomentosum*; the orchids *Caladenia arenicola* and *Diuris longifolia/magnifica*, the grass *Amphipogon turbinatus* and the herb *Lyginia barbata*; and
- 32% (70 species) of the 219 native species present are widespread/common across the park, and 37% (80 species) are scattered across the park (Table 50 in Appendix 1).



Figure 16 All *Banksia attenuata* Trees



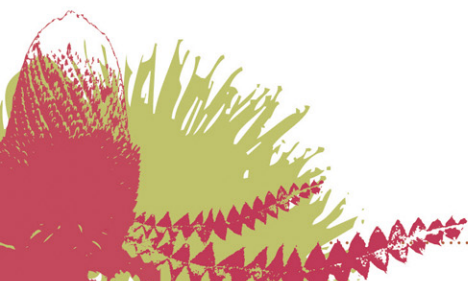
Figure 18 All *Banksia menziesii* Trees



Figure 17 Very Large *Corymbia calophylla* Trees



Figure 19 Very Large *Eucalyptus marginata* Trees



The vegetation is a Threatened Ecological Community of national conservation significance. *Banksia Woodlands of the Swan Coastal Plain* that is listed as a Matter of National Environmental Significance, and Endangered, under the Environment Protection and Biodiversity Conservation Act 1999 where occurrences are either: entirely in 'Pristine' condition; 'Excellent' condition for patches greater than 0.5 ha; or 'Very Good' condition for patches over 1 ha; or 'Good' condition for patches over 2 ha.

Vegetation maps presented in previous management plans for Wireless Hill Park have been inconsistent, as shown in **Figure 20** and **Figure 21**.

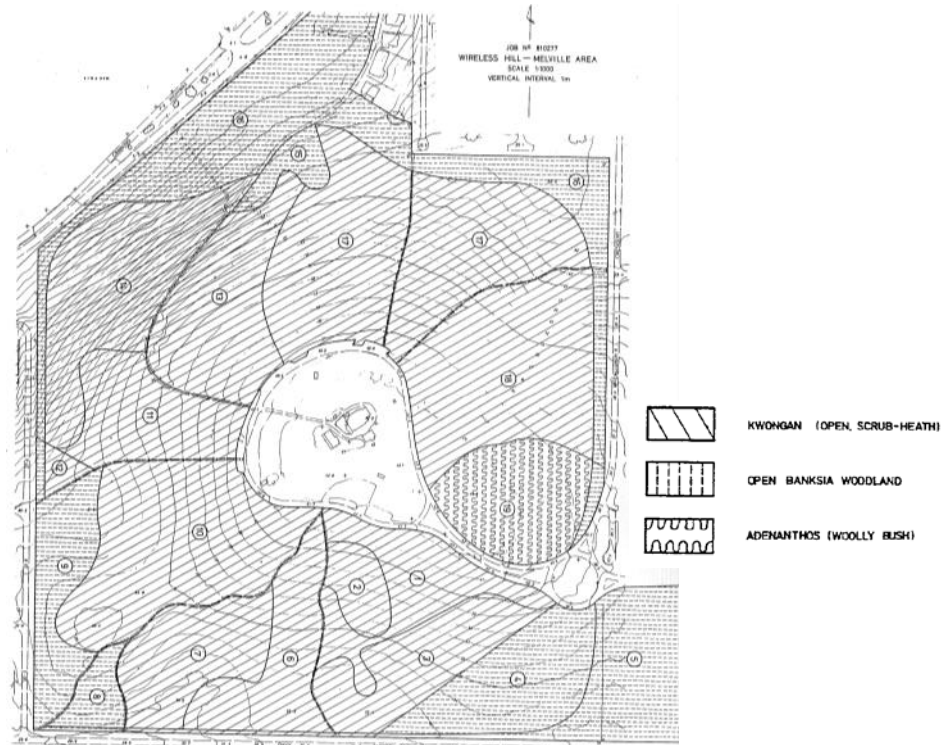


Figure 20 Vegetation Map in 1984 Management Plan

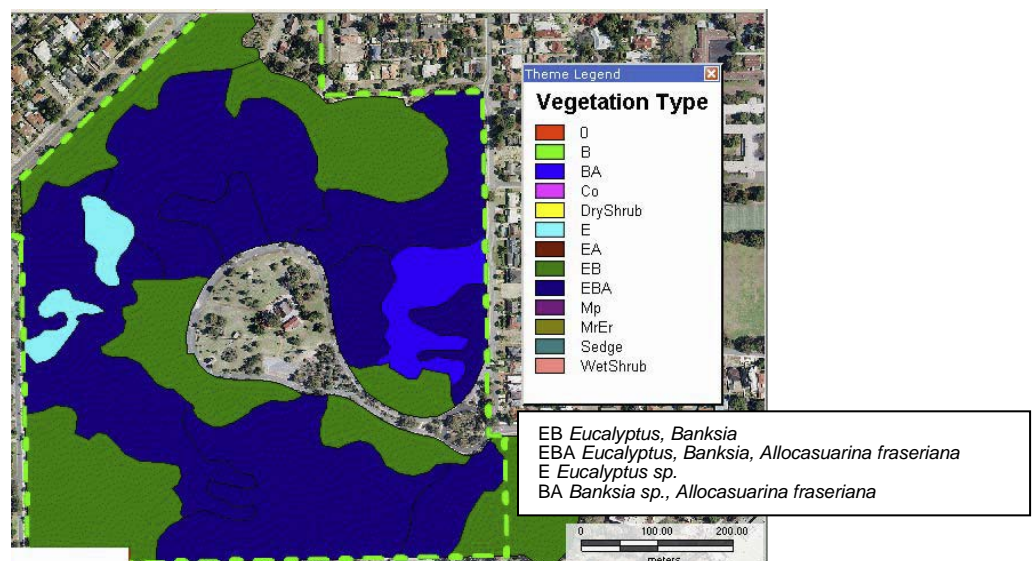
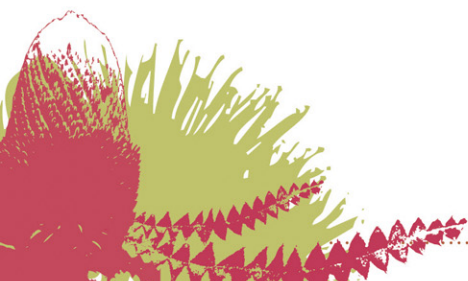


Figure 21 Vegetation Map in 2008 Management Plan



The inconsistencies in interpretation of vegetation patterns have arisen because:

- Much of the vegetation has regrown after historic selective clearing of trees and shrubs;
- The previous maps were based on only dominant species (trees and tall shrubs) and their structure (height and density, which changes as regrowth progresses), rather than floristic composition (the presence/absence of all plant species);
- There are gradual changes in floristic composition;
- Species that tend to co-occur do not have distributions that exactly match;
- Many species are scattered, or in low abundance, and their presence in any particular part of the park is not necessarily evident without systematic searches;
- Dieback and altered fire regimes have modified the vegetation;
- Plantings have been established across much of the site; and
- Datasets have not been consistently retained and utilised (e.g. precise locations of quadrats established in 2002 were not documented in the *Wireless Hill Park Vegetation Survey and Recommendations for Future Monitoring Programmes* (White, 2002)), and the loss of datasets such as the master copy of the *1985 Wireless Hill Park Management Plan* (Smith, 1985), which contained lists of plant species in each management zone in Appendix VI.

A systematic floristic survey would need to be undertaken to fully elucidate the plant patterns within Wireless Hill Park. This has been undertaken:

- Comprehensively for orchids across the park in *Baseline Orchid Surveys – Wireless Hill Park* (Waters A. , 2012); and
- In a partial systematic survey (that was outside the scope of, but undertaken within, the 2016 survey) of selected other species.



Whilst many species are distributed across the entire park, in the south of Wireless Hill Park there appears to be a change in floristics associated with the lower-lying terrain reflected in:

- the absence of *Jacksonia sericea* (Figure 22); and
- the presence of *Caladenia discoidea* (Figure 23), *Pterostylis recurva* (Figure 24) and *Pyrorchis nigricans* (Figure 25).



Figure 22 *Jacksonia sericea* Distribution



Figure 24 *Pterostylis recurva* Distribution

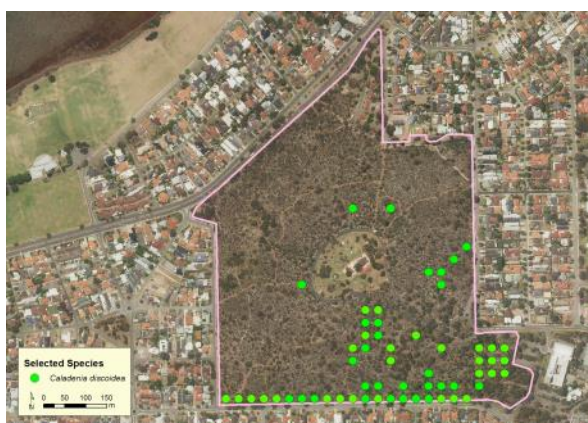


Figure 23 *Caladenia discoidea* Distribution



Figure 25 *Pyrorchis nigricans* Distribution

The following are examples of species concentrated on the exposed northern and western slopes:

- *Acacia pulchella* (Figure 26), which can be favoured by disturbance;
- *Banksia sessilis* (Figure 27), which can be also favoured by disturbance;
- *Caladenia longicauda* (Figure 28);
- *Eucalyptus gomphocephala* (Figure 29), which appear to be remnant trees although this species was noted as being absent from the park in the 1985 *Wireless Hill Park Management Plan* (Smith, 1985);
- *Grevillea vestita* (Figure 30);
- *Melaleuca systena* (Figure 31);
- *Phyllanthus calycinus* (Figure 32); and
- *Pimelea rosea* (Figure 33).

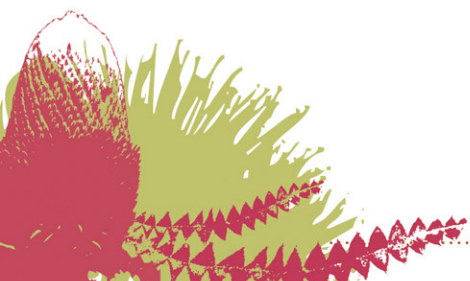




Figure 26 *Acacia pulchella* Distribution



Figure 30 *Grevillea vestita* Distribution



Figure 27 *Banksia sessilis* Distribution



Figure 31 *Melaleuca systena* Distribution

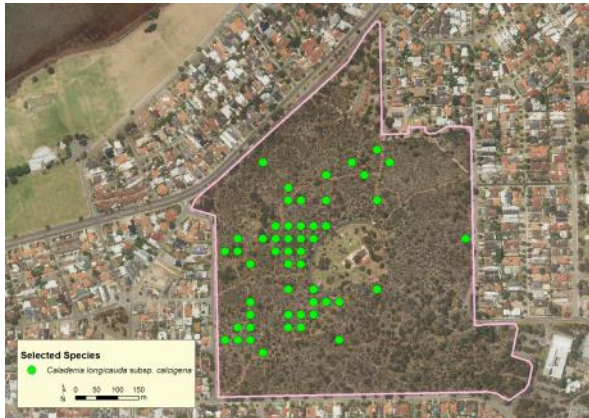


Figure 28 *Caladenia longicauda* subsp. *calligens* Distribution



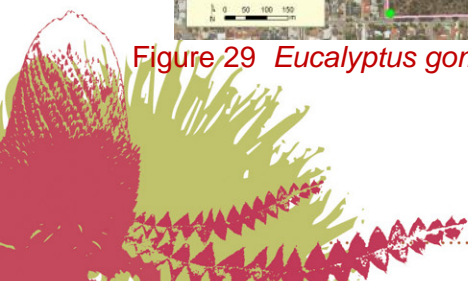
Figure 32 *Phyllanthus calycinus* Distribution



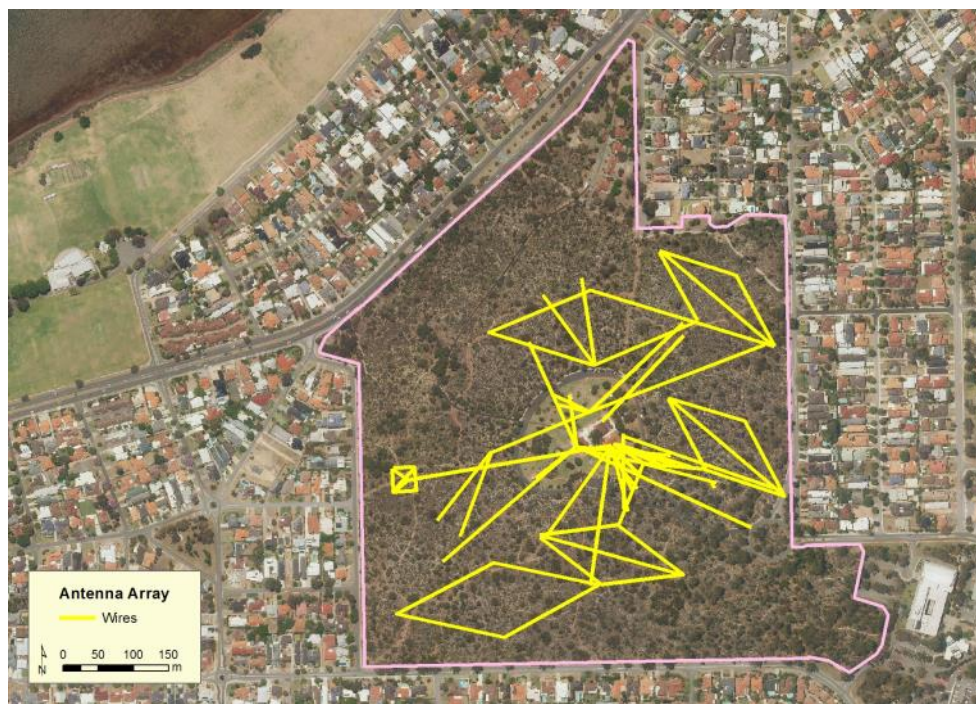
Figure 29 *Eucalyptus gomphocephala* Distribution



Figure 33 *Pimelea rosea* Distribution

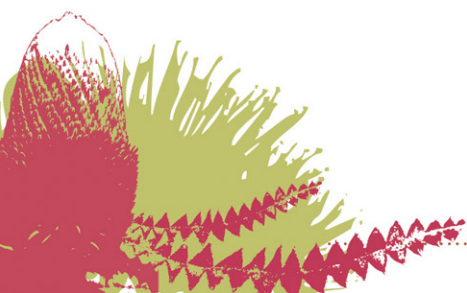


The vegetation onsite was significantly modified by the clearing of trees and shrubs across much of Wireless Hill Park to facilitate the construction of a wireless communications station. This commenced in 1912, and was followed annual burning to impede vegetation regrowth until the station was decommissioned in 1967. The extent of the array of wires associated with the communications station is shown in [Figure 34](#).



[Figure 34](#) Antenna Array across Wireless Hill

The clearing of trees and shrubs, with the retention of low plants, across much of the park is evident in photos in [Figure 35](#) and [Figure 36](#).





State Library of Western Australia

Figure 35 Clearing of Overstorey and Midstorey around Base of Antenna in 1935

Source: State Library of WA, Stuart Gore Collection, 219047PD: Looking down, 1935



State Library of Western Australia



Figure 36 Clearing of Overstorey and Midstorey across Wireless Hill Park in 1935

Source: State Library of WA, Stuart Gore Collection, 219036PD: View towards the river, 1935

The areas that were unequivocally cleared at some point in aerial photos between 1953 and 2014 are shown in **Figure 37**.

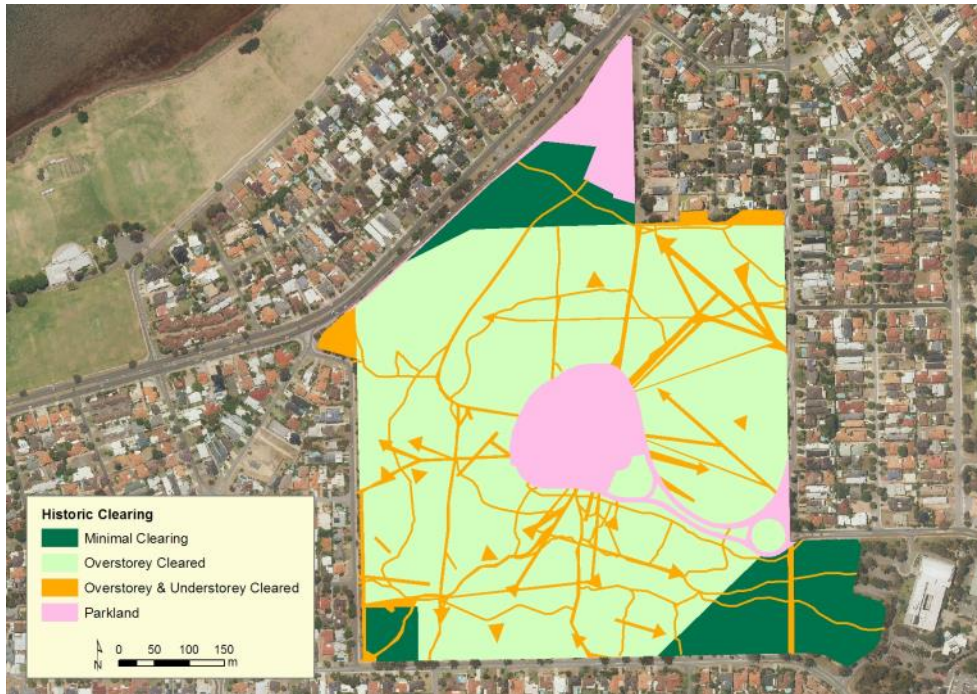


Figure 37 Historical Clearing Evident in Aerial Photography 1953 Onwards

Additional modifications to the vegetation would have occurred. Annual burning of the site was undertaken while the communications facility was operational (Smith, 1985).



The communications facility was used continuously from 1912 until it was decommissioned in 1967, and the reserve was vested with the City of Melville in 1969. **Figure 38** to **Figure 43** show vegetation regrowth since 1953.



Figure 38 Vegetation in 1953



Figure 41 Vegetation in 1985



Figure 39 Vegetation in 1965



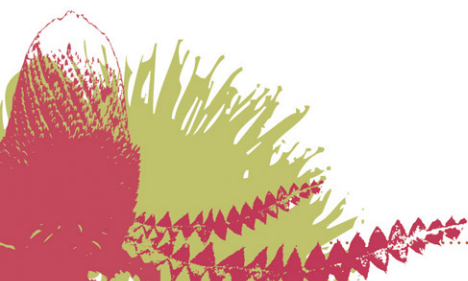
Figure 42 Vegetation in 1995



Figure 40 Vegetation in 1974



Figure 43 Vegetation in 2014



The extent of the vegetation association is listed in [Table 2](#).

Table 2 Extent of Vegetation Association

Association	Dominant / Typical / Indicative species	Area (ha)
<i>Banksia attenuata</i> / <i>Banksia menziesii</i> woodland	<i>Allocasuarina fraseriana</i> <i>Banksia attenuata</i> <i>Banksia menziesii</i> <i>Corymbia calophylla</i> <i>Eucalyptus marginata</i>	37.54

The native plant species in each vegetation unit are listed in [Table 50](#) in [Appendix 1](#).

Assets are prioritised on the basis of their highest level of significance. The significance of vegetation associations can be determined in terms of several classifications:

- **Vegetation Complexes** are a regional classification for the Swan Coastal Plain, Darling Scarp and Darling Plateau defined in terms of plants reoccurring on specific soils and landforms by Heddle *et al.* (1980) and mapped by DPaW. Plant communities may occur in more than one complex but the relative proportions of plant communities vary between complexes (Government of Western Australia, 2000)
- **Floristic Community Types** (FCTs) are a regional classification for the Swan Coastal Plain and Darling Scarp defined in terms of groups of co-occurring plants by Gibson *et al.* (1995) and the DEP (1996). FCTs are distributed in more of a mosaic than vegetation complexes but the classifications are equivalent in dividing the region into a roughly equal number of classes. The Floristic Community Type was determined by the Department of Conservation and Land Management (Gibson, Keighery, Keighery, Burbridge, & Lyons, 1995) at two 10 m x 10 m quadrats in Wireless Hill Park. Quadrat 'wire01', in the south east of the park, and Quadrat 'wire02', in the south west of the park, were both classified as Floristic Community Type 28 'Spearwood *Banksia attenuata* or *Banksia attenuata* – *Eucalyptus* woodlands'.
- **Vegetation Types** are a local classification in the City of Melville defined in terms of dominant overstorey species and mapped by Ecoscape (2006). The general descriptions of vegetation types were applied to vegetation associations to avoid issues with minor discrepancies in interpretation of boundaries.

The significance of the vegetation in Wireless Hill Park, using different classifications, is shown in [Table 3](#).

Table 3 Significance of Ecological Community in Wireless Hill Park

Vegetation Association	Vegetation Complex	Floristic Community Types	Vegetation Types
<i>Banksia attenuata</i> / <i>Banksia menziesii</i> woodland	Bassendean – Central and South Karrakatta – Central and South High Significance Both Vegetation Complexes with 10-30% uncleared	FCT 28 'Spearwood <i>Banksia attenuata</i> or <i>Banksia attenuata</i> – <i>Eucalyptus</i> woodlands'. Very High Significance Threatened Ecological Community	Banksia and <i>Allocasuarina</i> species on upland areas / <i>Eucalyptus</i> and <i>Banksia</i> species on upland areas Low Significance Multiple occurrences in Melville



The areas of high native plant cover (bushland areas with <25% non-woody weeds, <25% bare ground and >15 m from very large live weed trees) in 2016 is shown in **Figure 44**.

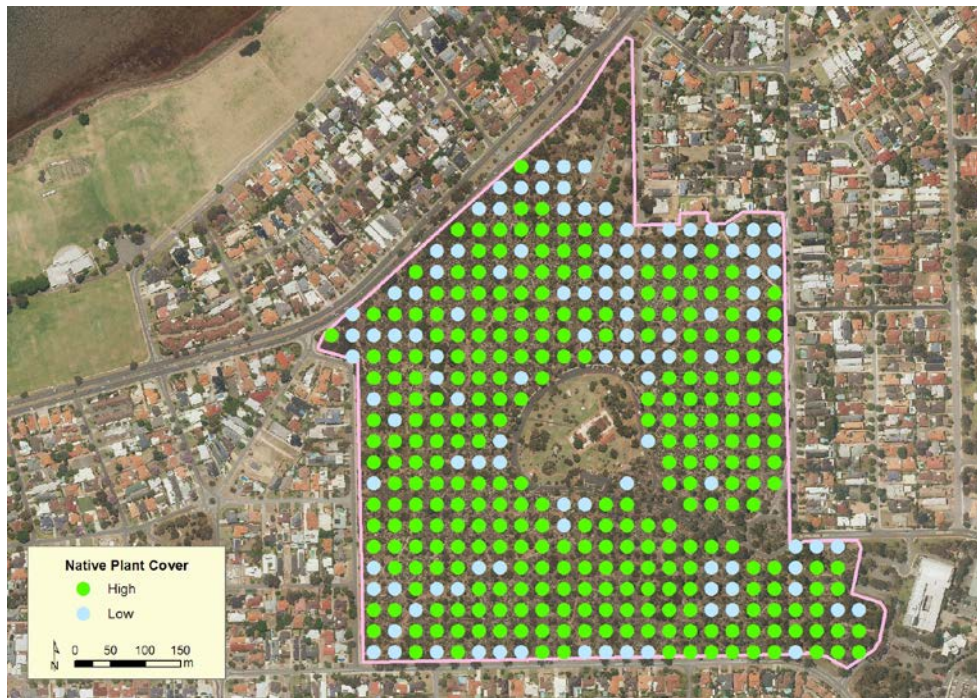
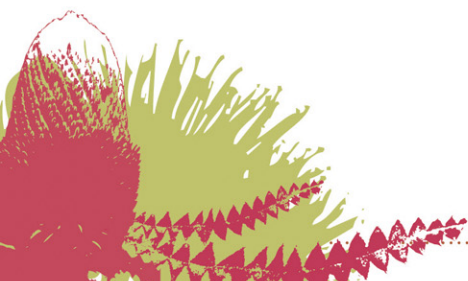


Figure 44 Areas of High Native Plant Cover 2016

The ecological communities for which objectives apply are listed in **Table 4**.

Table 4 Ecological Community Indices

Values	Ecological Community Sites	High Native Plant Cover 2008	High Native Plant Cover 2016	Assets 2008-2017
Very High Significance Threatened Ecological Community	FCT 28 'Spearwood <i>Banksia attenuata</i> or <i>Banksia attenuata</i> – <i>Eucalyptus</i> woodlands'.	No Data	72%	Not Assessable



2.3.2 Fauna Habitat

Very large trees are important habitat sites for a number of resident and migratory birds and bats onsite:

- many birds rely on tree hollows (Birdlife Australia, 2013);
- roost sites (in tree hollows and under flaking/rough bark) are a critical habitat requirement for bats (Hosken, 1996); and
- The size of trees is one of the critical factors in determining the likelihood of hollow formation in trees (Gibbons & Lindenmayer, 2002).

The locations of the very large dead trees and live native trees (trunk diameter at breast height greater than 50 cm) are shown in **Figure 45**.

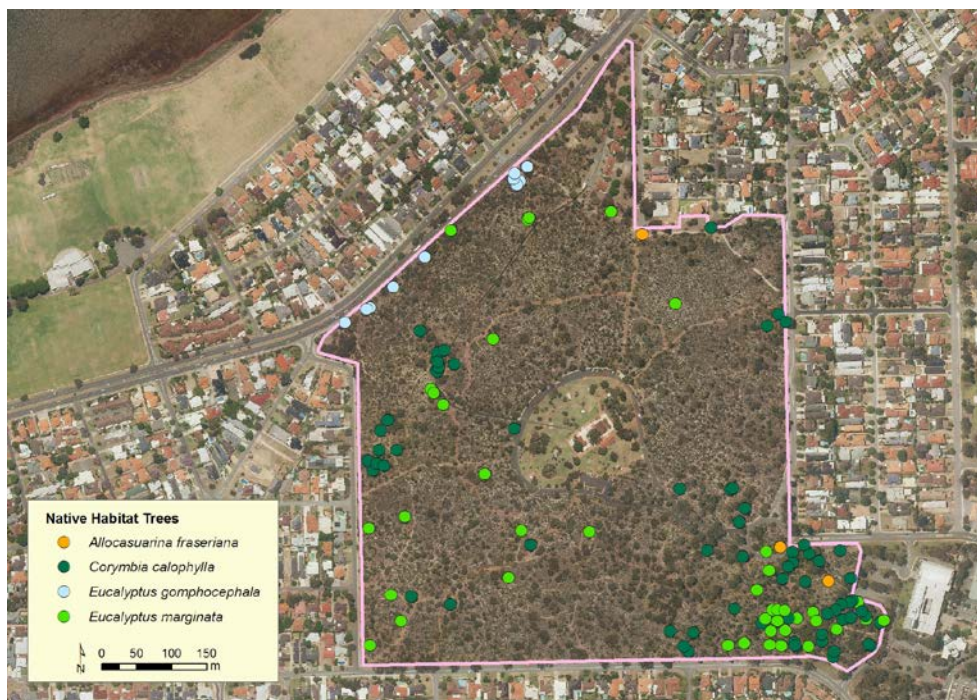


Figure 45 Distribution of Native Habitat Trees in 2016

The numbers of very large trees by species are listed in **Table 5**.

Wireless Hill has amongst the lowest recorded density of very large trees of any bushland areas in the City of Melville, as shown in **Table 6**.

Table 5 Numbers of Very Large Native Trees by Species

Species		Alive	Dead
<i>Allocasuarina fraseriana</i>	Sheoak	3	
<i>Corymbia calophylla</i>	Marri	65	3
<i>Eucalyptus gomphocephala</i>	Tuart	10	
<i>Eucalyptus marginata</i>	Jarra	34	7
Total		112	10

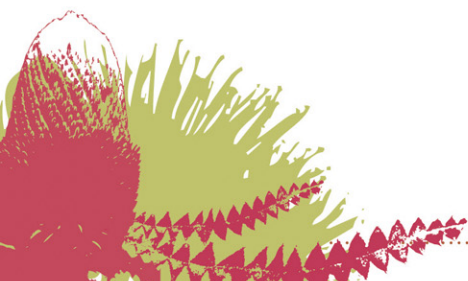


Table 6 Numbers of Very Large Trees per Hectare in Melville Reserves

Species	Estuarine Reserves+ (4 reserves)	North-West Reserves (3 reserves)	Bullcreek Reserves (7 reserves)	South-Eastern (infested) Reserves (8 reserves)#	Eastern Reserves (3 reserves)	Central (2 reserves)	Central (modified) (2 reserves)	Heathcote Reserve (1 reserve)	Wireless Reserve (1 reserve)	Quenda (1 reserve)	Piney Lakes Reserve (1 reserve)
Live Native	19	17	12	8	6	6	5	4	3	2	1
Dead	3	2	0	1	<1	<1	0	0	<1	0	0
Total	22	19	13	9	6	6	5	4	3	2	1

The fauna habitat for which objectives apply are listed in **Table 7**, which reflects that the number of very large trees was not previously benchmarked for the Wireless Hill Park bushland, and that there was no evidence of significant changes 2014-2016.

Table 7 Fauna Habitat Sites Indices

Values	Habitat Sites	Trees / Hectare 2008	Trees / Hectare 2016	Assets 2014-2017
Medium Very Large Trees	Live Native Tree	No Data	3	Maintained (assumed unchanged)
	Dead Tree		<1	

2.3.3 Wetlands

Wetlands are defined in Schedule 5 of the *Environmental Protection Act 1986* as areas 'of seasonally, intermittently or permanently waterlogged or inundated land, whether natural or otherwise, and includes a lake, swamp, marsh, spring, dampland, tidal flat or estuary' and wetlands can be categorised in accordance with **Table 8**.

Table 8 Wetland Types

WATER LONGEVITY	LANDFORM				
	BASIN	CHANNEL	FLAT	SLOPE	HIGHLAND
Permanent Inundation	Lake	River	-	-	-
Seasonal Inundation	Sumpland	Creek	Floodplain	-	-
Intermittent Inundation	Playa	Wadi	Barlkarra	-	-
Seasonal Waterlogging	Dampland	Trough	Palusplain	Paluslope	Palusmont

Source: Government of Western Australia (2000)

Wireless Hill Park contains no wetlands identified in the DPaW's *Geomorphic Wetlands Swan Coastal Plain* dataset, based on the regional scale mapping of Hill *et al.* (1996).

There are no wetland indices in the Wireless Hill Park.



2.3.4 Heritage

Wireless Hill Park is not included on the current National Heritage List, although it was included in the Register of the National Estate that the National Heritage List replaced.

The description of the history of the park in the Register of the National Estate (Department of the Environment and Energy, 2017) was:

Perth Wireless Station at Wireless Hill Park was one of the first official radio stations approved for construction in Australia and the fifth to come into operation. Development of the site commenced in 1912 and on 30 September the Australian Post Master General's Department commissioned the station. The buildings were constructed by the PWD of Western Australia under the direction of Hillson Beasley. The complex comprised a group of cottages at the north end of the site and three operations buildings at the south end of the site on the crest of a ridge together with the mast and a number of sundry structures. The cottages are believed to have initially accommodated the construction staff and later, the operational staff of the facility. From 1912, the wireless operators transmitted from the Operators Building. The station was used continuously between 1912-67 as the main coastal radio communications centre for the State. In the 1920s, it became a feeder station for international radiograms. In addition, a short wave experimental broadcasting station run by Amalgamated Wireless Australia (AWA) shared the facilities with the commercial radio station 6PR from 1931 and the police radio network. From 1942, the AWA experimental operation was removed and the remaining operators were all shifted into the Engine House which became the Main Transmitter Hall. Some wireless operators moved to Bassendean with the setting up of a receiving station there. From 1943 the Wireless Hill station was used as an alternative for international shortwave radio messages. In 1946, these operators returned to Applecross; the former Operators Room became offices. In 1962, the former 120m high mast was replaced with a 423m mast which remained until 1967. The facility was decommissioned in 1967 and the mast was dismantled. The site and improvements passed to the City of Melville for community purposes.

The City of Melville Local Government Inventory states that Wireless Hill Park (comprising brick and tile radio operations buildings, brick and tile staff accommodation buildings, concrete tower bases, culturally modified landscape settings and urban bushland) has cultural heritage significance for the following reasons:

- radio telecommunications provided one of the important links between Australia and the rest of the world at a time when these links were significant to a relatively small community in one of the most remote cities in the world;
- the radio communications station has played a part in the development of commercial radio broadcasting and experimental shortwave radio as well as functioning as a communications vehicle for state government instrumentalities and marine safety;
- it once contained all the elements of a working radio communications station from the nascent development to eventual phasing out; the place retains sufficient 1912 fabric to remain a fine example of an early radio communications station;
- the place was one of five main radio telecommunication stations in Australia participating in international, national, state-wide and regional radio communications and broadcasting;



- the mast is remembered as a highly visible and prominent landmark both by day and with its lighting at night, until decommissioned; today, the park forms the basis of a highly valued area of urban bushland.

The City of Melville Local Government Inventory also noted that:

The Aboriginal name for Wireless Hill is 'Yagan's Lookout' and has always been a significant place for communication by the Beeliam Nyoongars. Fires were used for communication, one example was signalling the movement of fish along the Swan River. Wireless Hill was a food gathering area, as well as gathering medicinal plants by the women.

A number of heritage sites/portions of the heritage sites are associated with buildings and parkland areas that are outside the scope of this management plan. The bushland itself contains heritage sites listed on:

- the WA Aboriginal Sites Register
 - Place 18725 Melville Scarred Tree (the location of which is not shown in this plan but is in the south east of the park)
- the WA Heritage Register
 - Heritage Place No. 17795 Heritage Trails - Wireless Hill (Constructed from 1969)
- the City of Melville's Municipal Heritage Inventory
 - the Heritage Trail component of Place 'AR01' - Wireless Hill Park, Museum, Four Houses, Heritage Trails, Moreton Bay Fig Tree and Eucalyptus Tree

The walking trails shown in **Figure 46** were constructed along old firebreaks (Smith, 1985), as well as the macadamised roadway from the former Operations building down to the former staff houses, in the case of the 'Station Walk'.

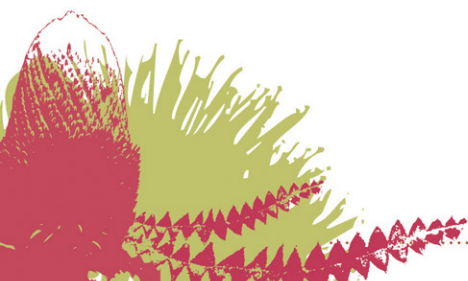
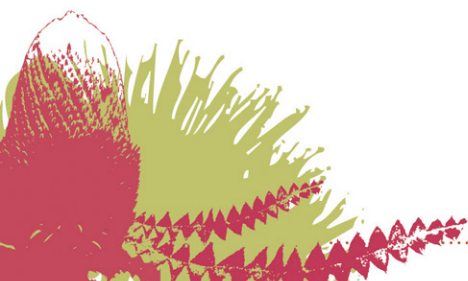




Figure 46 Wireless Hill Park Heritage Trails Map



The heritage site indices are listed in [Table 9](#).

Table 9 Heritage Sites Indices

Values	Habitat Sites	2008	2017	Assets 2008-2017
Very High Site on WA Aboriginal Sites Register	Place 18725 Melville Scarred Tree	Not Assessed	Not Assessed	Assumed Maintained
Very High Site on WA Heritage Register	Heritage Place No. 17795 Heritage Trails - Wireless Hill <ul style="list-style-type: none"> • Station Walk • Yagan's Genuunny • Wildflower Walk 	1,520 m	1,520 m	Maintained

2.3.5 Community Interest

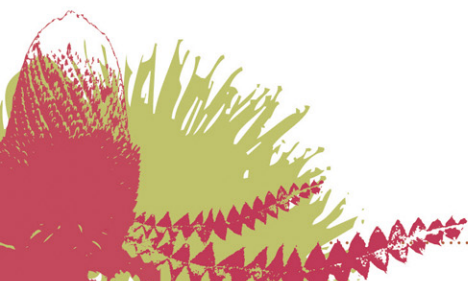
Revegetation sites can be a focus for community interest as these are visible manifestations of natural area management, and the public is often directly involved in their proposal or implementation.

The Friends of Wireless Hill are a local community group who actively contribute to on-ground works including revegetation, weeding activities and public education. The group works in partnership with the City of Melville to improve the park.

Community interest sites are listed in [Table 10](#) and shown in [Figure 47](#).

Table 10 Community Interest Sites 2016

Community Interest Sites	Total
Bat Boxes	5
Restoration Sites	12.92 ha
Closed Tracks	1,760 m ²



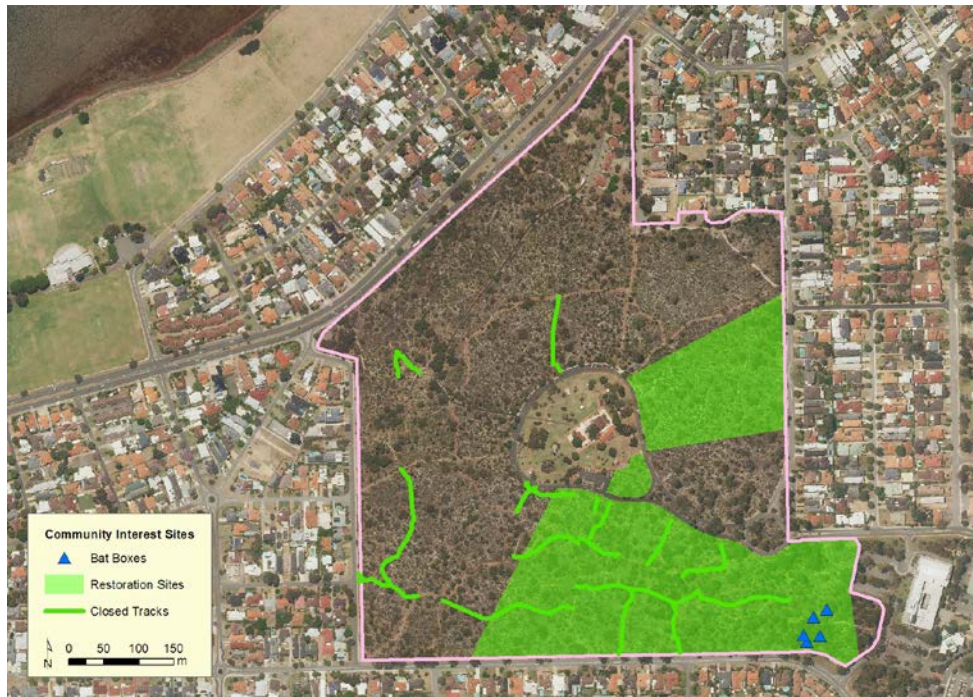


Figure 47 Community Interest Sites

Revegetation sites are areas in which plantings have been undertaken and are currently being intensively managed and have not been assessed against the completion criteria, at which point they stop being treated as revegetation sites. No plantings/closed tracks in **Figure 47** have been assessed against criteria in **Table 11**.

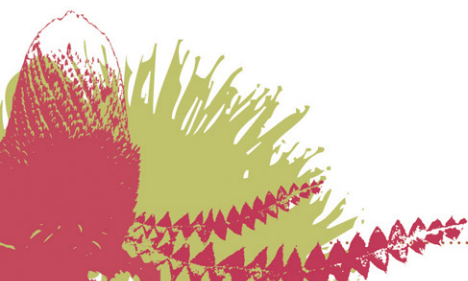
Table 11 Revegetation Objectives

Revegetation Category	Objectives
Establishment of individual plants or artificial hollows	<ul style="list-style-type: none"> Plants > 5 years old Hollows used by target species A minimum number of plants or artificial hollows
Rehabilitation Reinstating self-sustaining and functional ecosystems based on local species, but not aspiring to fully replace all of the original components of an ecosystem.	<ul style="list-style-type: none"> Plants > 5 years old Gaps between native plants < 1 m x 1 m Weed cover < 25% and bare ground < 25% in any 100 m² area (in which a rectangle with a minimum side of 2 m can fit) A number of shrubs/trees (the number varying between sites) Diversity criteria generally not set
Restoration of vegetation Reinstating the composition, structure, function and dynamics of pre-existing indigenous ecosystems	<ul style="list-style-type: none"> Diversity and density measurements benchmarked against reference site

The community interest sites for which objectives apply are listed in **Table 12**.

Table 12 Community Interest Site Indices

Values	Community Interest Sites	Completion Criteria Met 2008-2017	Assets 2008-2017
Medium Revegetation Sites	Bat Boxes	No data	2 Not Assessable
	Restoration Sites		
	Closed racks		



Generally, additional planting areas are explicitly defined in operational plans, rather than strategic reserve plans which indicate broad priorities (within and between ecological communities, and between species) and document the effectiveness of revegetation (changes in weed and native plant cover, and bare ground). This framework facilitates the identification and delineation of additional revegetation sites with community input during the life of the strategic plans, prioritising sites using:

- the values of assets (with a focus on ecological communities and native species);
- objectives relating to the extent of ecological communities to be enhanced; and
- threats identified in the strategic plans.



2.3.6 Reference

Reference sites provide opportunities for long-term monitoring and research. The reference sites that have been established in the Wireless Hill Park are shown in **Figure 48**.

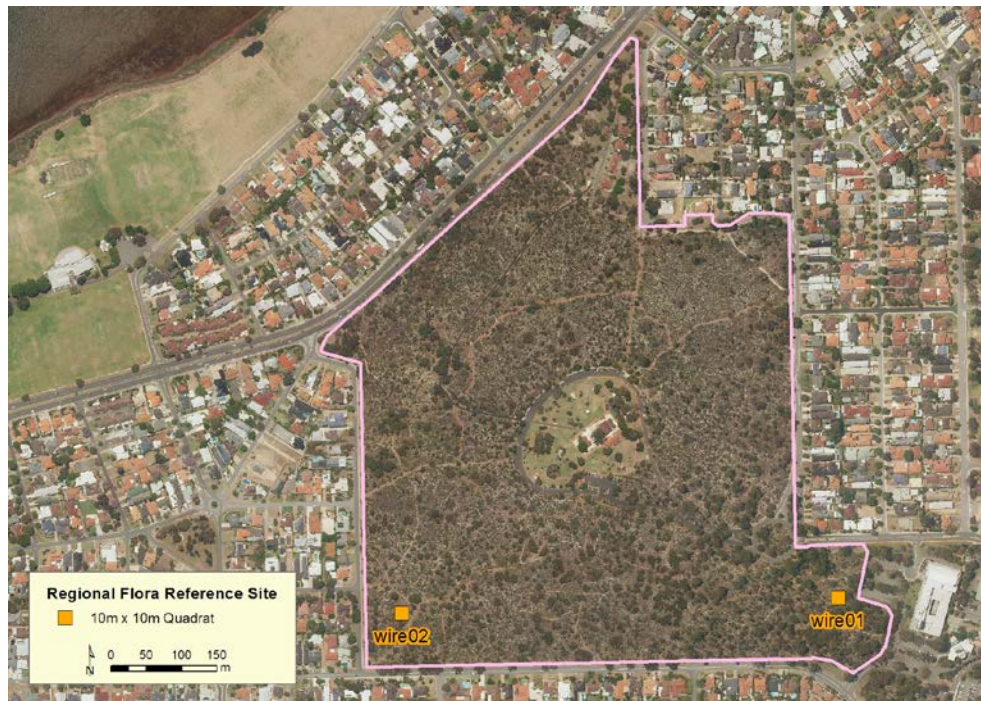


Figure 48 Reference Sites

The WA Department of Conservation and Land Management (CALM) established two quadrats in Wireless Hill Park (“wire01’, in the south east of the park, and ‘wire02’, in the south west of the park) as part of the data gathering for the regional classification of vegetation types in *A Floristic Survey of the Southern Swan Coastal Plain* (Gibson, Keighery, Keighery, Burbridge, & Lyons, 1995).

There were inaccuracies in the order of 100 metres associated with the locations of quadrats established by CALM in 1994 and there are more than 20 starpickets and fence droppers appearing to mark various monitoring sites across the park. The precise location of the quadrats need to be confirmed.

DPaW’s Bush Forever records (TEB-BF-148-01) include a photo labelled ‘wire01’ (**Figure 49**) that can be used in relocating starpickets that are associated with this site.





Figure 49 Quadrat 'wire01'

The reference sites for which objectives apply are listed in Table 13.

Table 13 Reference Site Indices

Values	Reference Sites	Number of Sites 1994	Number of Sites 2008-2017	Assets 2008-2017
High Regional Flora Reference Site	100 m ² quadrat	2 sites	No Data	Not Assessable
Medium Local Flora Reference Site	Requires Confirmation		No Data	Not Assessable



2.4 Species

2.4.1 Native Flora

A total of 219 native plant species have been recorded in the park, which is:

- estimated to represent more than 90% of the native flora species present; and
- approximately 50% of the species recorded in the natural area reserves in the City of Melville.

The flora inventory is included in [Table 50](#) in [Appendix 1](#) and some mapping undertaken for 52 species (approximately 25% of species). Wireless Hill Park supports more than 50% of the Banksia trees recorded across 35 reserves surveyed in the City of Melville ([Table 53](#) in [Appendix 1](#)).

Plant species in Wireless Hill Park are to be managed as meta-populations (disjunct but nearby stands functioning as a single population due to occasional interbreeding through dispersal of seed or pollen) not as a series of independent populations:

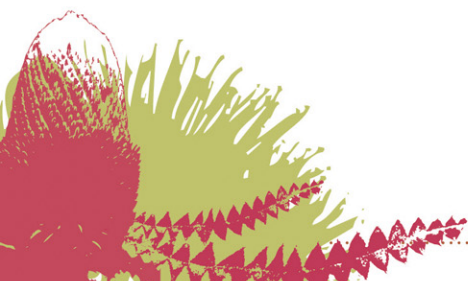
- nearby populations (within scales of 5-20 km) can contribute to each other's vigour through interbreeding, for some species (Young, Broadhurst, Byrne, Coastes, & Yates, 2005);
- consolidation of meta-populations in individual reserves should contribute to the overall viability of the species across all the reserves; and
- a plant species is to be managed as a single asset across all the reserves, with presence of subpopulations in each reserve monitored.

The indices for plants are listed in [Table 14](#).

Table 14 Plant Indices

Values	Plants	Status 2008	Status 2016	Assets 2008-2017
Very High DPaW listed Priority 4 shrub	<i>Jacksonia sericea</i>	No Data	55% of park	1 Maintained
High 'significant populations' in Bush Forever area	<i>Conospermum triplinervium</i>		0 (extinct)	1 Not Maintained
	<i>Astroloma macrocalyx</i>		1 plant	
High 'species associated with the Spearwood dunes (sands and Tamala limestone) the occurrence of which is extended inland along the river'	<i>Melaleuca systena</i>		10 plants	2 Maintained
Low Present in many Melville reserves, but in low abundance or decline	<i>Banksia attenuata</i>	2,218 plants	4 Maintained	
	<i>Banksia grandis</i>	7 plants		
	<i>Banksia ilicifolia</i>	4 plants		
	<i>Banksia menziesii</i>	1,529 plants		

Maps and further comments for very high and high value species are provided in [Appendix 1](#).



Plants at Risk of Local Extinction

There appear to be a significant number of species restricted in extent/abundance in Wireless Hill Park:

- 33 species were categorised as having few plants or clumps in the park in *Wildflowers in Wireless Hill Park* (McGrath, 1999) and/or *Plants at Wireless Hill* (Creed, 2012) ([Table 15](#));
- Some species have not been consistently recorded in surveys since 1984, possibly due to low abundance (e.g. *Acanthocarpus preissii*, which is a distinctive coastal species that was unlikely to have been planted as it was not available from nurseries when it was recorded onsite in 1984);
- 4 orchid species were confirmed at <5% of monitoring points (*Pheladenia deformis*, *Pterostylis barbata*, *Thelymitra campanulata* and *Thelymitra crinita*) in *Baseline Orchid Surveys – Wireless Hill Park* (Waters A. , 2012); and
- An examination of species listed as occasional or scattered (outside the scope of, but conducted within, the 2016 survey) indicated that such species can also be highly fragmented and/or in low abundance ([Figure 50](#)).

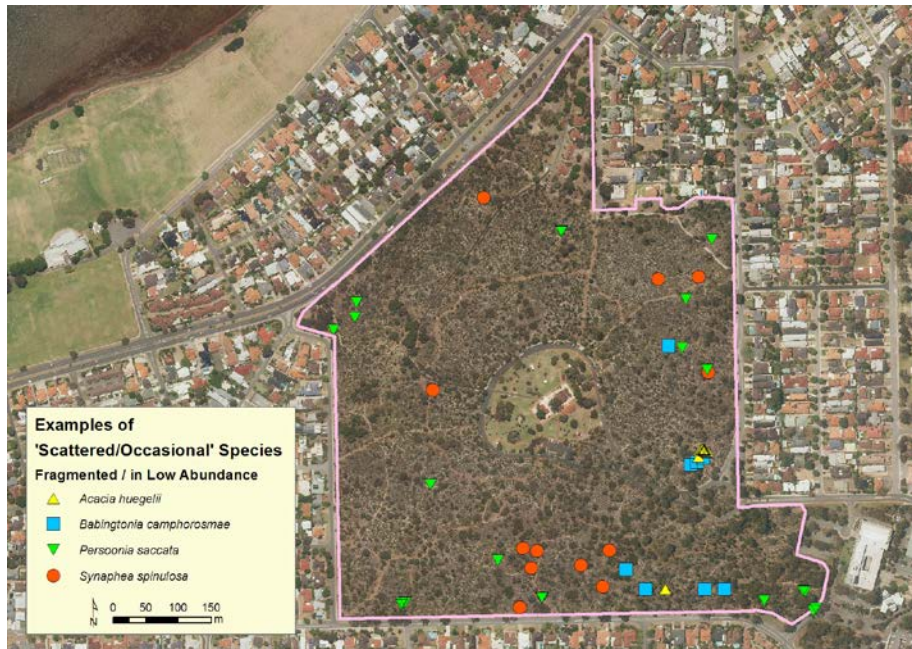


Figure 50 Examples of Flora potentially Fragmented / in Low Abundance

The 33 species previously documented as being restricted or in low abundance in Wireless Hill Park are listed in [Table 15](#).

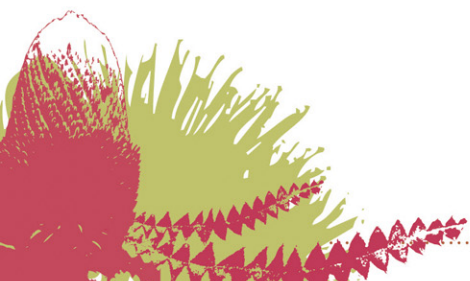
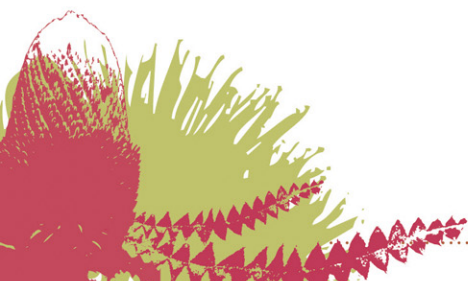


Table 15 Species with Restricted Distributions / in Low Abundance

Species	Figure	Comments Plants at Wireless Hill (McGrath, 1999)	Comments Wildflowers in Wireless Hill Park (Creed, 2012)
<i>Acacia applanata</i>	Figure 52	-	Rare in bush
<i>Astroloma ciliatum</i>		2 plants <ul style="list-style-type: none"> • near the Davy St. boundary, not far west of the slab path • just to the south of the southwest concrete path, among trees 	-
<i>Astroloma macrocalyx</i>	Figure 52	1 plant <ul style="list-style-type: none"> • just north of ring road (different plant mapped in 2016) 	-
<i>Banksia grandis</i>	Figure 52	Southeast – other than plantings	-
<i>Banksia ilicifolia</i>	Figure 52	Not numerous, nearly all in northern half	-
<i>Billardiera fraseri</i>	Figure 52	-	Base of marri in Median Strip
<i>Chordifex sinuosus</i>		-	Not common
<i>Conostylis juncea</i>	Figure 52	No comments – but noted present	Few on Wildflower Walk on northern path
<i>Conospermum triplinervium</i>	Extinct	1 area <ul style="list-style-type: none"> • southern area, east of slab track 	
<i>Cyanicula gemmata</i>		1 plant <ul style="list-style-type: none"> • northeast 	-
<i>Eucalyptus gomphocephala</i>	Figure 52	-	-
<i>Hypocalymma angustifolium</i>		-	One plant adjacent to Barnard St
<i>Johnsonia pubescens</i>		2 areas <ul style="list-style-type: none"> • southeast corner • near Munsey St 	-
<i>Juncus subsecundus</i>		-	Not common
<i>Lechenaultia floribunda</i>	Figure 52	2-3 areas <ul style="list-style-type: none"> • east side of path from centre of Davy St • north side of path east of McCallum Cr 	Few plants upper southeast
<i>Lobelia gibbosa</i>	Figure 52	Northern park including uphill side of old entrance	Single plant at edge of road
<i>Lomandra caespitosa</i>	Figure 52	-	Rare in western part of bushland
<i>Lomandra hermaphrodita</i>		Only a few clumps recorded, but could be others	-
<i>Lomandra integra</i>	Figure 52	-	Few on Wildflower Walk
<i>Melaleuca trichophylla</i>	Figure 52	-	Several plants together, western part of park,
<i>Nuytsia floribunda</i>	Figure 52	Mainly near centre	A few trees
<i>Olearia elaeophila</i>		1 plant <ul style="list-style-type: none"> • just south of southwest path 	-
<i>Pheladenia deformis</i>	Figure 51	Scattered	Rare, on northern slope
<i>Pithocarpa cordata</i>		2 plants <ul style="list-style-type: none"> • on rise near heritage trail • southeast 	-
<i>Prasophyllum parvifolium</i>		1 plant <ul style="list-style-type: none"> • in deep Sheoak litter on east side near McCallum Cr 	-
<i>Pterostylis barbata</i>	Figure 51	-	-
<i>Pterostylis recurva</i>		1 plant <ul style="list-style-type: none"> • East of slab path and south of Almondbury St 	Scattered throughout bushland, especially under <i>Allocasuarina</i>
<i>Regelia inops</i>	Figure 52	1 plant <ul style="list-style-type: none"> • slightly east of centre 	Odd plants west of grassed area
<i>Scholtzia involucreta</i>	Figure 52	1 area <ul style="list-style-type: none"> • either side of heritage trail 	-
<i>Stylidium repens</i>	Figure 52	-	Median strip at park entry
<i>Thelymitra campanulata</i>	Figure 51	-	-
<i>Thelymitra crinita</i>	Figure 51	-	-
<i>Verticordia densiflora</i> var. <i>densiflora</i>	Figure 52	3 areas <ul style="list-style-type: none"> • south of path to McCallum Cr • between entrance and main carpark • west of centre and south of old entrance road 	Groups in upper bushland



The distributions of restricted / low abundance orchids are shown in **Figure 51**.

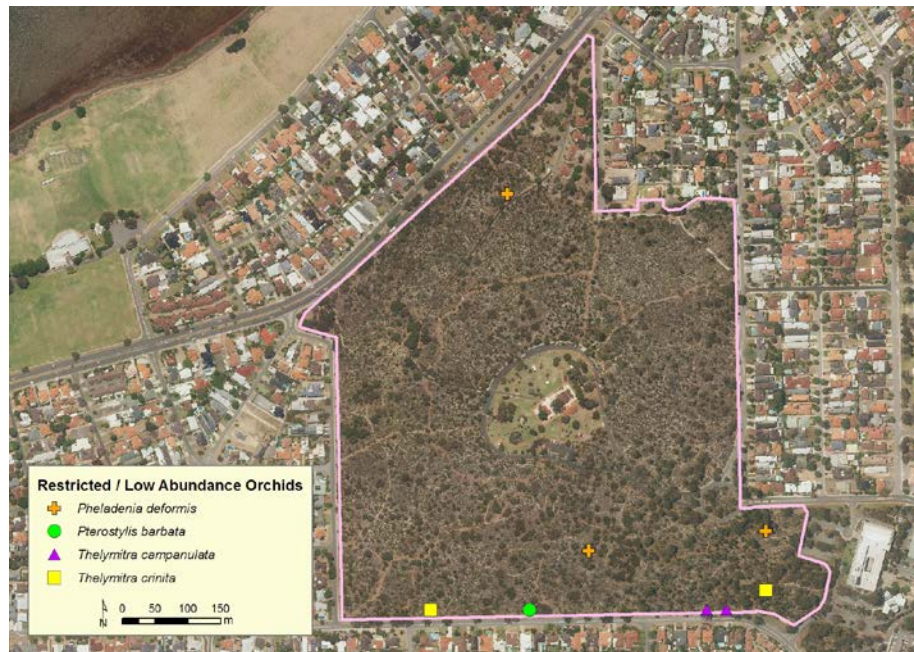


Figure 51 Orchids in Low Abundance

The distributions of other restricted / low abundance native species are shown in **Figure 52**.

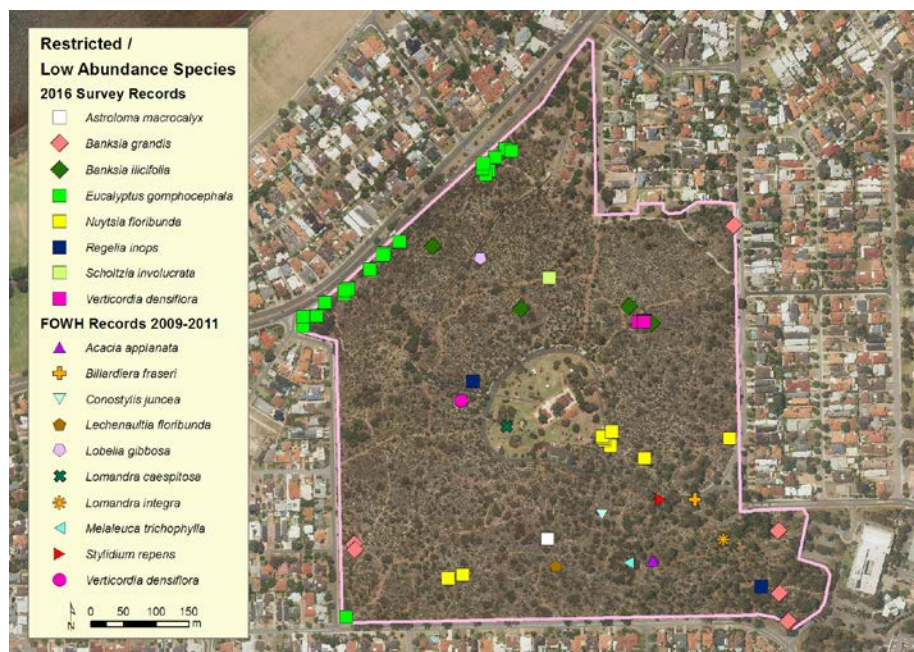
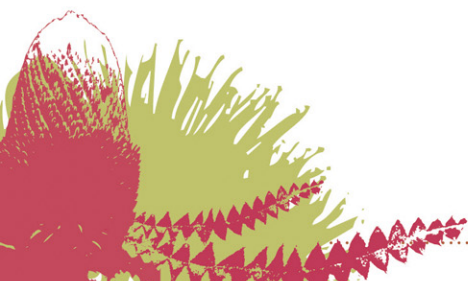


Figure 52 Other Flora Species in Low Abundance

Plants Extinct or Not Confirmed Onsite

Conospermum triplinervium went extinct between 1999 and 2016.



Native Species to be Managed as Weeds

A number of species native to Western Australia have been planted, some of which do not naturally occur onsite. Detailed planting records were not available and a comprehensive audit of plantings was not conducted, but it is noted that introducing different forms of species, as well as non-local species, can also result in negative impacts in terms of hybridization and competition, especially for significant isolated populations of native species targeted for monitoring and management.

The 1985 Management Plan appears to suggest a number of Swan Coastal Plain plants were introduced to the park. In the 1970s a number of species were planted in the park including *Anigozanthos manglesii*, Kangaroo Paws, *Anigozanthos humilis*, Catspaws and *Waitzia suaveolens*, Everlastings (Smith, 1985). Plantings were mainly in the south-east, and these species were widespread across the southern portion of the park by 1985 (Smith, 1985).

Banksia sessilis var. *cygnorum* is the naturally occurring variety of this shrub in the City of Melville, but other varieties have been planted in a number of City of Melville bushland reserves. Plantings were not individually examined in Wireless Hill Park, but other varieties of this species (which can be differentiated on the basis of leaf size and shape) should be excluded from the park.



The species that naturally occur on the Swan Coastal Plain, but could possibly be introduced as plantings into Wireless Hill Park are listed in **Table 16** and their distributions shown in **Figure 53**.

Table 16 Swan Coastal Plain Plants possibly introduced

Species	Comments
<i>Melaleuca preissiana</i>	<p>Should neither be planted nor treated as a weed until further investigations are completed</p> <ul style="list-style-type: none"> • Not in/around the Booragoon area in 1978 (Bridgewater & Wheeler, 1980). • One 4 metre high tree observed on traffic island in 2016 • Not recorded in Wireless Hill Park prior to 2016 • Grows predominately in winter-wet depressions (Powell, 2009)
<i>Olearia axillaris</i>	<p>Should neither be planted nor treated as a weed until further investigations are completed</p> <ul style="list-style-type: none"> • One shrub observed in 2016 • Not recorded in Wireless Hill Park prior to 2016 • Widespread and common coastal species used in revegetation (Dixon, 2011) • Does not usually occur on Karrakatta or Bassendean soils (Powell & Emberson, 1996) • Scattered in Kings Park (Barrett & Pin Tay, 2005)
<i>Rhagodia baccata</i>	<p>Should neither be planted nor treated as a weed until further investigations are completed</p> <ul style="list-style-type: none"> • One shrub observed in 2016 • Not recorded in Wireless Hill Park prior to 2016 • Widespread and common coastal species used in revegetation (Dixon, 2011) • Can occur on Karrakatta soils but does not usually occur on Bassendean soils (Powell & Emberson, 1996) • Does not occur naturally in Kings Park (Barrett & Pin Tay, 2005)

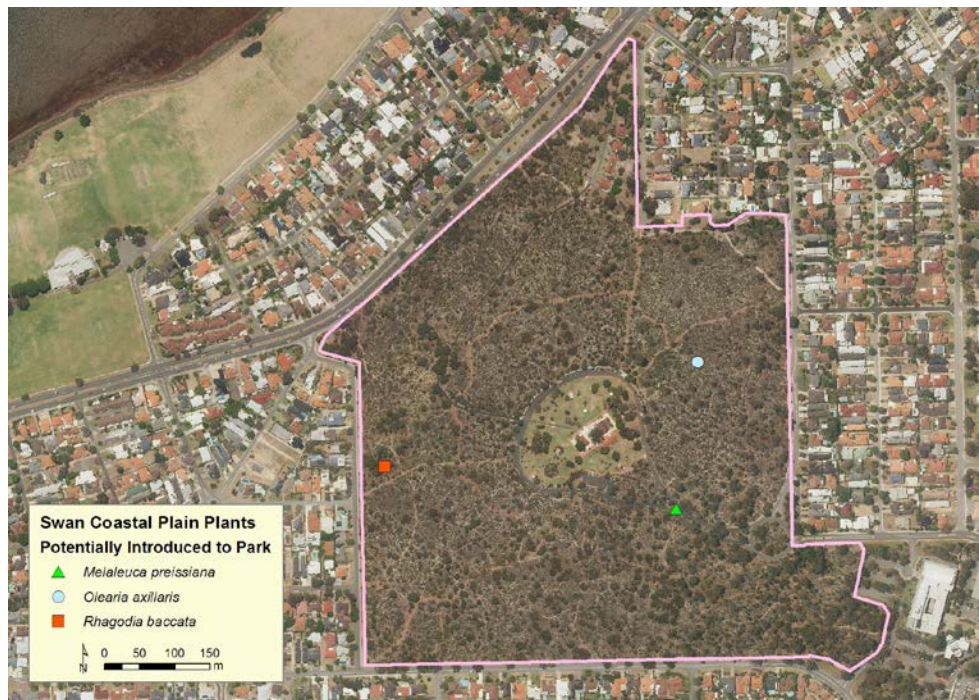
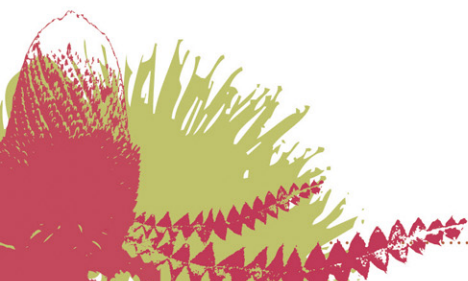


Figure 53 Distributions of Potential Plantings



The species listed in Table 17 and shown in Figure 54, which naturally occur on the Swan Coastal Plain, are considered weeds in Wireless Hill Park.

Table 17 Swan Coastal Plain Plants that should be treated as Weeds

Species	Generally absent from Bassendean dune soils ¹	Generally absent from Karrakatta soils ¹	Comments
<i>Agonis flexuosa</i>	✓	✓	<ul style="list-style-type: none"> Occurs around the periphery of Wireless Hill Park Was not recorded in/around Booragoon in 1978 (Bridgewater & Wheeler, 1980) Does not usually occur on Karrakatta or Bassendean soils (Powell & Emberson, 1996) In the Perth Region has a natural distribution restricted to calcareous dunes (Dixon, 2011). Naturally occurred along the Swan Estuary downstream from Freshwater Bay (Powell, 2009) with Blackwall Reach possibly being one of the most easterly occurrences (Government of Western Australia, 2000). Has the ability to completely alter the structure of communities it invades, and it is currently being removed from Kings Park (Keighery, 2013).
<i>Callitris preissii</i>	✓	✓	<ul style="list-style-type: none"> At one time this plant was fairly common around the Swan River (Main & Serventy, 1957). A weed in tuart woodland in Kings Park, but native to river escarpment in Kings Park (Keighery, 2013). The main population remaining on the Swan River is now at Peppermint Grove (Powell, 2009). Does not usually occur on Karrakatta or Bassendean soils (Powell & Emberson, 1996) It has germinated from mulch in other Melville reserves
<i>Calothamnus quadrifidus</i>	✓		<ul style="list-style-type: none"> Can occur on Karrakatta soils (Powell & Emberson, 1996) Associated with limestone in Kings Park and Bold Park (Barrett & Pin Tay, 2005) <i>Calothamnus</i> species have the capacity to completely alter the structure of communities that they invade and there is significant risk of hybridization between local and introduced forms of this species (Keighery, 2013).

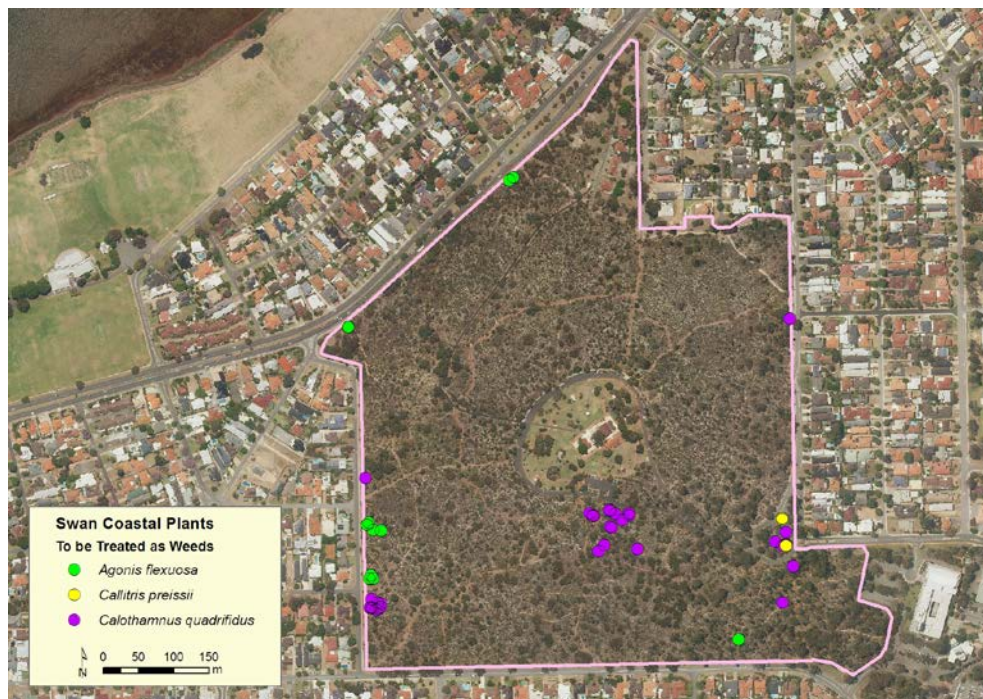
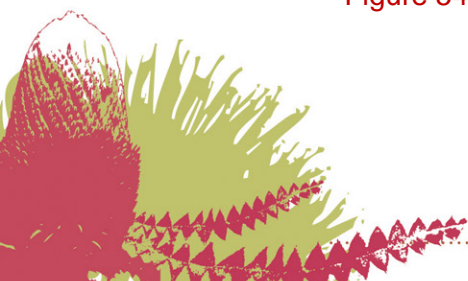


Figure 54 Swan Coastal Plain Plants that should be treated as Weeds





2.4.2 Native Fauna

The 59 native animal species (1 bat, 14 reptile, 38 bird and 6 invertebrate species) recorded in in Wireless Hill Park are listed in [Appendix 3](#).

Whilst 48 vertebrates have been confirmed in Wireless Hill Park, it is expected that as many as 104 vertebrate species may be present. The assemblage is expected to be highly diverse for an urban reserve, underpinning the reserve's importance for fauna in the City of Melville (Bamford, Shepherd, Browne-Cooper, & Chuk, 2017).

Mammals

The one native mammal species (a bat) confirmed in Wireless Hill Park is listed in [Table 58](#) in [Appendix 3](#).

The terrestrial mammal assemblage is expected to be poor and has little chance of natural recovery regardless of management measures due to lack of connection with other reserves. Better ground connectivity is not possible as the reserve is surrounded by established housing and a network of roads (Bamford, Shepherd, Browne-Cooper, & Chuk, 2017). However, the site is probably large enough to maintain small populations of Brush-tailed Possums and the Quenda (Southern Brown Bandicoot), and translocations of these two species into the reserve could be considered (Bamford, Shepherd, Browne-Cooper, & Chuk, 2017).

Only one species of bat was recorded on Wireless Hill Park but two or three species could be expected and all are likely to use the Grass Trees, bat boxes and other suitable cover across the reserve for roosting (Bamford, Shepherd, Browne-Cooper, & Chuk, 2017).

The persistence onsite of suitable feeding and breeding habitat, rather than individual bats, is the focus of management of the bats listed in [Table 18](#).

Table 18 Mammal Species to be Monitored

Species Values	Mammals	Status	2017 Survey
Low Bushland dependent species recorded in more than 2 Melville reserves	<i>Chalinolobus gouldii</i> Gould's Wattled Bat	Resident – Large Home Range Not Breeding Onsite	Present

Calls of the Gould's Wattled Bat were recorded by (Bamford, Shepherd, Browne-Cooper, & Chuk (2017) at 20:15 hrs on 12 May 2017 which suggested this bat (or bats) may not be roosting nearby as they are known to emerge before sunset. The calls were obtained over an area of burnt vegetation and airborne insects were noticeable during the late afternoon and prey items were therefore present.

Gould's Wattled Bats are expected to be partially dependent upon Wireless Hill Park as they have large home ranges and can regularly forage 5 to 10 km from roosts (Churchill, 2008). It feeds on insects (Strahan, 1998) and is an edge space aerial forager (Webala, 2010), foraging along gaps in vegetation and just below tree canopies (Churchill, 2008), usually in the open beside stands of vegetation (Bullen & McKenzie, 2008). Gould's Wattled Bats have a strong preference for roosting in large live trees (although they will also utilise dead trees and buildings where preferred habitat is not available) (Webala, 2010).

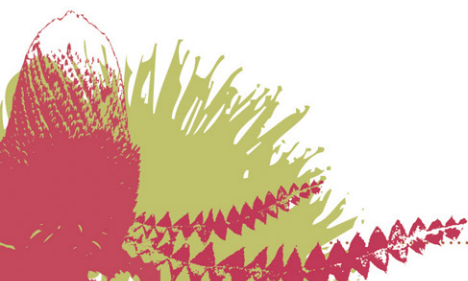


The most important habitat requirement is very large trees, as indicated in [Table 19](#).

Table 19 Mammal Habitat Considerations for Revegetation

Mammals	Habitat Requirements	Diet
<i>Chalinolobus gouldii</i> Gould's Wattled Bat	Very large trees (for roosting hollows) Vegetation 1 – 20 m high (for aerial foraging)	Invertebrates

Wireless Hill has amongst the lowest recorded density of very large trees per hectare of any bushland areas in the City of Melville, as shown in [Table 6](#). There are bat boxes in Wireless Hill Park ([Figure 47](#) in [Section 2.3.5](#)) but no bats were seen within them in May 2017 (Bamford, Shepherd, Browne-Cooper, & Chuk, 2017). Nest boxes can also provide alternative nesting opportunities for possums that may occur, or for re-introductions, and should be constructed with the entrance at the rear, against the trunk to prevent birds from using them (Bamford, Shepherd, Browne-Cooper, & Chuk, 2017).



Reptiles and Amphibians

Wireless Hill Park is a separate management and monitoring unit for reptiles and amphibians. If extinctions occur in Wireless Hill Park, it is unlikely that reptiles and amphibians will not re-colonise the park without assistance. Urban areas are likely to be effective barriers to movement of reptiles between reserves. Most reptile species are sedentary and of low mobility, suggesting that they may have limited capacity to move between patches of habitat isolated by clearing or land-use (Wilson & Valentine, 2009).

Wireless Hill Park is important for reptiles as it is large enough to support viable populations of a range of species (Bamford, Shepherd, Browne-Cooper, & Chuk, 2017).

The 14 native reptile and amphibian species confirmed in Wireless Hill Park are listed in [Table 59](#) in [Appendix 3](#). Reptile species should be well-represented on Wireless Hill Park despite only two being found in the 2017 survey:

- The habitat is variable and offers suitable conditions for a range of species (Bamford, Shepherd, Browne-Cooper, & Chuk, 2017);
- The diversity of reptiles is correlated to the size of bushland remnants on the Swan Coastal Plain with the exception of skinks, as they can persist in small reserves, and amphibians, as most are dependent on wetlands (How & Dell, 2000); and
- Assumptions need to be made as to the presence of some species not confirmed in trapping due to low detection rates. How (1998) estimated that between 250 and 300 individual reptiles/amphibians needed to be captured to be confident 80% of species were recorded in Bold Park; and
- Pitfall traps are the most effective method for surveying reptiles and this was outside the scope of the survey in 2017.

The indicator reptile and amphibian species are listed in [Table 20](#).

Table 20 Reptile and Amphibian Indices

Value	Species	1983 Survey	1998 Survey	2017 Survey	Assets 2008-2017
Very High DPaW-listed Priority 3 Fauna	<i>Lerista lineata</i> Lined Skink	Assumed Present	Confirmed Present	Assumed Present	1 Maintained
High Near end of its distribution and 'significant populations' in Bush Forever area	<i>Lucasium alboguttatum</i> White-spotted Ground Gecko	Confirmed Present	Not Confirmed	Not Assumed Present	1 Not Assessable – may have become extinct prior to 2008
Medium Bushland dependent species recorded in 1 or 2 Melville reserve	<i>Pletholax gracilis</i> Keeled Legless Lizard	Confirmed Present	Assumed Present	Assumed Present	3 Maintained
	<i>Ramphotyphlops australis</i> Southern Blind Snake		Confirmed Present		
	<i>Varanus gouldii</i> Gould's Sand Goanna				
Low Bushland dependent species and recorded in >2 Melville Reserves	<i>Ctenotus australis</i> Long-tailed Ctenotus	Confirmed Present	Confirmed Present	Assumed Present	5 Maintained
	<i>Pogona minor</i> Western Bearded Dragon				
	<i>Myobatrachus gouldii</i> Turtle Frog	Assumed Present			
	<i>Pseudonaja affinis</i> Dugite				
	<i>Tiliqua rugosa rugosa</i> Bobtail	Confirmed Present			



Assumption of presence in 2017 based on site assessment by Bamford Consulting Ecologists
Species assumed present in all years preceding any confirmation of presence onsite



Of the high value reptiles to be managed:

- *Lerista lineata*, the Lined Skink, is a Priority 3 species (from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation) but an elevated conservation status may be more appropriate given the extent of its habitat that has been cleared (Maryan, Gaikhorst, O'Connell, & Callan, 2015). This skink is largely restricted to the Swan Coastal Plain south of the Swan River, including Garden and Rottne Islands, and extending in a narrow strip approximately 20–25 km inland from the coast, south to Binningup (near Bunbury) with a single, old record from Busselton (Maryan, Gaikhorst, O'Connell, & Callan, 2015). The northern most populations occur in the City of Melville. Along with Wireless Hill Park, it was also recorded in Ern Stapleton Reserve and Wal Hughes Reserve in 1999 (Jones & Calver, 1999). The limited information on its biology suggests males are in reproductive condition during spring and females typically lay three eggs around November (Maryan, Gaikhorst, O'Connell, & Callan, 2015). It is restricted to pale sands supporting heathlands and shrublands, particularly in association with banksias (Bush, Maryan, Browne-Cooper, & Robinson, Guide to Reptiles and Frogs of the Perth Region, 2000). It shelters in leaf litter and upper layers of loose sand at bases of shrubs (Bush, Maryan, Browne-Cooper, & Robinson, Guide to Reptiles and Frogs of the Perth Region, 2000) and feeds on invertebrates (Wilson & Swan, 2008);
- *Lucasium alboguttatum*, the White-spotted Ground Gecko occurs on coastal and near coastal dunes, limestone and inland sandplains from Point Quobba (north of Carnarvon) to Perth. It is uncommon at the extreme southern end of its distribution in the Perth area (Bush, Maryan, Browne-Cooper, & Robinson, Guide to Reptiles and Frogs of the Perth Region, 2000). Although three individuals were captured in Wireless Hill Park in December 1983 (Smith, 1985), the only specimen held by the Western Australian Museum south of the Swan River was collected in 1990 from Kensington (ALA, 2017).



The critical habitats for indicator reptiles to be considered during revegetation are summarised in **Table 21**.

Table 21 Reptile Habitat Considerations for Revegetation

Reptile	Habitat Description	Diet
<i>Pseudonaja affinis</i> Dugite	Very common in Perth region. Favoured by some disturbance and high mice numbers.	Vertebrates
<i>Lerista lineata</i> Lined Skink	Require shrub layer with leaf litter and loose sand at bases	Insects and other invertebrates.
<i>Myobatrachus gouldii</i> Turtle Frog	Not wetland dependent Requires coarse dead woody material Eats termites and other small invertebrates Burrows over summer	Invertebrates
<i>Tiliqua rugosa rugosa</i> Bobtail	Home range 2-2.7 ha Variety of vegetation types (including gardens) Shelters beneath dead vegetation and in burrows	Invertebrates, Slugs, Snails, Carrion Flowers and Fruit (including some weeds),
<i>Ctenotus australis</i> Long-tailed Ctenotus	Shrubs	Invertebrates
<i>Ctenotus fallens</i> West Coast Ctenotus	Low vegetation, rocks and partial cover Survives in disturbed areas with introduced grasses	Invertebrates
<i>Lucasium alboguttatum</i> White-spotted Ground Gecko	Nocturnal Shelters in vertical shafts of abandoned spider burrows Rarely found beneath surface debris Uncommon in Perth as is at southern end of distribution	Invertebrates and smaller reptiles
<i>Pletholax gracilis</i> Keeled Legless Lizard	Usually associated with low dense vegetation Semi-arboreal but burrows in winter Eggs deposited in soil beneath rocks or logs	Small spiders, nectar
<i>Ramphotyphlops australis</i> Southern Blind Snake	Spends majority of time underground but can surface at night, particularly after rain in warmer months Shelters beneath a wide variety of cover including beneath leaf litter, rocks and logs Can occur in suburban gardens	Ant eggs, larvae and pupae and termites
<i>Varanus gouldii</i> Gould's Sand Goanna	Ground dwelling but digs a burrow for shelter	Reptiles, insects, mice and carrion
<i>Pogona minor</i> Western Bearded Dragon	Basks on fallen timber and rocks	Invertebrates, smaller reptiles, and some vegetable matter

Habitat Description: Bush, Maryan, Browne-Cooper, & Robinson (2000).

A further consideration is that weeds that occupy extensive areas between shrubs, or have dense rooting patterns can inhibit movement and foraging of a number of reptile species (How & Dell, Vertebrate Fauna of Banksia Woodlands, 1989).



Birds

The 38 native birds confirmed in Wireless Hill Park are listed in [Table 60](#) in [Appendix 3](#).

Bamford, Shepherd, Browne-Cooper, & Chuk (2017) noted that the most abundant native bird species present in 2017 were Singing Honeyeaters and Silvereyes. A number of passerines not recorded on other nearby reserves such as Western Gerygones, Weebills and Striated Pardalotes were also present in good numbers. A Collared Sparrowhawk was also seen within the bushland on two separate visits indicating likely residence. The relatively low densities are likely due to sampling chance and the large area of reserve over which the birds can roam. Smaller reserves possibly attract a higher density of birds through the day due to foraging from a larger number of nearby residences. The bird assemblage recorded was not as diverse as expected given the area the reserve covers and in comparison to other reserves surveyed at the same time.

Indicator species are listed in [Table 22](#). Native birds that are resident and/or breed in the City of Melville and require tree hollows, but are not indicator species if they have colonised Perth and compete with more vulnerable species. *Cacatua roseicapilla*, Galah, has expanded its range since European settlement and was probably originally restricted to north of the Murchison River. It is now is resident in Perth, but was only a casual non-breeding visitor in 1948 (Van Delft, 1997).

Table 22 Bird Indices

Species Values	Birds	1983 Survey	2003 Survey	2017 Survey	Assets 2008-2017
High Listed by WAPC as habitat specialist with reduced populations on Swan Coastal Plain	<i>Acanthiza apicalis</i> Inland Thornbill	Confirmed Present	Confirmed Present	Assumed Present	2 Maintained
	<i>Smicromis brevirostris</i> Weebill	Assumed Present		Confirmed Present	
	<i>Daphoenositta chrysoptera</i> Varied Sittella	Assumed Present	Confirmed Present	Assumed Extinct	1 Not Maintained
<i>Acanthiza chrysorrhoa</i> Yellow-rumped Thornbill	Confirmed Present	Not Confirmed	Not Assessable – may have become extinct prior to 2008		
High Listed by Birdlife Australia as wide-ranging with reduced populations on Swan Coastal Plain	<i>Anthochaera lunullata</i> Western Wattlebird	Assumed Present		Confirmed Present	1 Maintained
Low Bushland dependent species	<i>Barnardius zonarius</i> Australian Ringneck	Confirmed Present	Confirmed Present	Confirmed Present	6 Maintained
	<i>Pardalotus striatus</i> Striated Pardalote				
	<i>Purpureicephalus spurius</i> Red-capped Parrot				
	<i>Phylidonyris novaehollandiae</i> New Holland Honeyeater	Assumed Present			
	<i>Rhipidura fuliginosa</i> Grey Fantail	Confirmed Present	Assumed Present		
	<i>Ninox novaeseelandiae</i> Southern Boobook Owl	Confirmed Present	Assumed Present		

Assumption of presence in 2017 based on site assessment by Bamford Consulting Ecologists
Species assumed present in all years preceding any confirmation of presence onsite



Of the high value birds to be managed:

- Yellow-rumped Thornbills have not been confirmed since 1983 and are potentially locally extinct, although its change in status since the last management plan cannot be assessed as it may have gone extinct prior to 2008. Yellow-rumped Thornbill pairs will often use the same nesting site each year, although they may roam within feeding-flocks in the non-breeding season (Van Delft, 1997). They may require more than 7% cover of native vegetation with 2 km (Davis, Gole, & Dale Roberts, 2012). There is approximately 5% native vegetation in a circle extending 2 km out from the centre of Wireless Hill Park (Figure 15);
- Varied Sittella are rarely recorded in the Perth urban environment (Davis, Gole, & Dale Roberts, 2012). Whilst appropriate habitat is present in the form of shrubs of *Adenanthos cygnorum*, Woolly Bush and the squatter Banksias and dense vegetation, this species would have expected to have been observed in 2017 if present (Bamford, Shepherd, Browne-Cooper, & Chuk, 2017);
- Inland Thornbills were not recorded in 2017 but assumed to be present because there is appropriate habitat and its behaviour is such that it wouldn't necessarily be detected during each and every survey. It is highly sensitive to loss and fragmentation of habitat due to urbanisation and may require more than 8% cover of native vegetation with 2 km (Davis, Gole, & Dale Roberts, 2012). There is approximately 5% native vegetation in a circle extending 2 km out from the centre of Wireless Hill Park (Figure 15). It may require specialised habitats and be favoured by open grassy woodlands, regardless of whether weeds contribute to the open understorey (Davis, Gole, & Dale Roberts, 2012);
- Weebills are listed as a habitat specialist in *Bush Forever* (Government of Western Australia, 2000) but are relatively common in bushland in the Perth Metropolitan Area (Van Delft, 1997) and require trees rather than bushland and builds nests in foliage of Eucalyptus and Acacia trees and shrubs (Johnstone & Storr, 2004). There are no indications of seasonal migration, and there is differing opinions as to whether they are sedentary or nomadic (Van Delft, 1997); and
- Western Wattlebirds and New Holland Honeyeaters are at the lower end of sensitivity to habitat loss and fragmentation due to urbanisation, of the bushland dependent birds in Perth (Davis, Gole, & Dale Roberts, 2012).

Other bushland dependent birds, that are either migratory or have large home ranges are listed in Table 23. *Calyptorhynchus baudinii*, Baudins Black-Cockatoo was recorded in Wireless Hill Park in 1983 (Smith, 1985), there is a degree of uncertainty associated with this identification, and based on distributions it is assumed it was *Calyptorhynchus latirostris*, Carnaby's Black-Cockatoo.

The following bushland dependent birds were excluded from Table 23 as they were recorded in Wireless Hill Park as vagrants, rather than regular visitors:

- *Phaps chalcoptera*, Common Bronzewing
- *Glyciphila melanops*, Tawny-crowned Honeyeater
- *Acanthorhynchus superciliosus*, Western Spinebill



Table 23 Other Bird Species to be Monitored

Species Values	Birds	Status	1983 Survey	2003 Survey	2017 Survey
Very High Matter of National Environmental Significance under EPBC Act 1999 (threatened)	<i>Calyptorhynchus banksii naso</i> Forest Red-tailed Black-Cockatoo	Regular non-breeding migrant			Confirmed Present
	<i>Calyptorhynchus latirostris</i> Carnaby's Black-Cockatoo		Confirmed Present	Confirmed Present	Confirmed Present
Very High Matter of National Environmental Significance under EPBC Act 1999 (migratory)	<i>Merops ornatus</i> Rainbow Bee-eater	Regular breeding migrant	Confirmed Present	Confirmed Present	
High Listed by WAPC as wide-ranging with reduced populations on Swan Coastal Plain	<i>Turnix varia</i> Painted Button-quail	Regular Visitor		Confirmed Present	Confirmed Present
Low Bushland dependent species recorded in more than 2 Melville reserves	<i>Hirundo nigricans</i> Tree Martin	Regular Visitor	Confirmed Present	Confirmed Present	
	<i>Pachycephala rufiventris</i> Rufous Whistler		Confirmed Present	Confirmed Present	
	<i>Todiramphus sanctus</i> Sacred Kingfisher		Confirmed Present		

Of the very high and high value birds to be monitored:

- *Calyptorhynchus latirostris*, Carnaby's Black-Cockatoo, and *Calyptorhynchus banksii*, Red-tailed Black-Cockatoo are threatened migratory birds that would utilise Wireless Hill Park seasonally for feeding, and as a linkage between larger remnants:
 - Neither species breeds in the vicinity;
 - Sites such as these are likely to provide part of an invaluable network of habitat remnants providing food resources for Carnaby's Black-Cockatoo on the Swan Coastal Plain, especially given the potential for removal of pines at Gnangara (Gole, 2003). It may also be important for the survival of the Cockatoos that reserves are not only retained, but also that native vegetation is maintained in good condition (Gole, 2003).
 - Non-breeding feeding habitat is particularly important within 6 km of roost sites (DEC, 2012) and there are roost sites at Wireless Hill (Ardross) and Shirley Strickland Oval (Ardross), and potential roost sites nearby including Point Walter (Bicton), and Groves Park (Attadale) (Burnham, Barrett, Blythman, & Scott, 2010);
 - These birds are granivores, so the dominant overstorey in Wireless Hill Park of Eucalypts, Banksia and Sheoaks represents a significant food source; and
 - Movement corridors with breaks of less than 4 km between other foraging, breeding and roosting sites are important to allow the birds to move between these areas. (Department of Sustainability, Environment, Water, Population and Communities, 2013).
- the Rainbow Bee-eater, is a migratory species that breeds in Perth and has been recorded at 87 sites in the metropolitan area (Van Delft, 1997). Whilst this bird won't reside in gardens or parks (Davis, Gole, & Dale Roberts, 2012) it will construct burrows in any ground not continually disturbed, such as vacant suburban lots (Van Delft, 1997). It was documented breeding onsite in 2003.



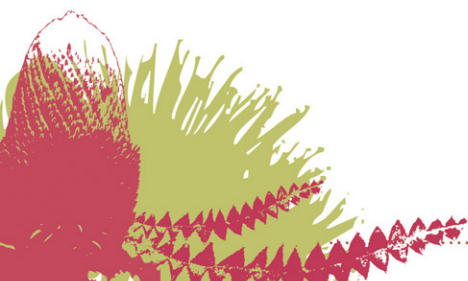
- Painted Button-quail are scarce on the Swan Coastal Plain (but breeding in Bold Park and relatively numerous in Whiteman Park) and are not easily detected except by their calls.

The critical habitats for birds to be considered in revegetation are summarised in **Table 24**.

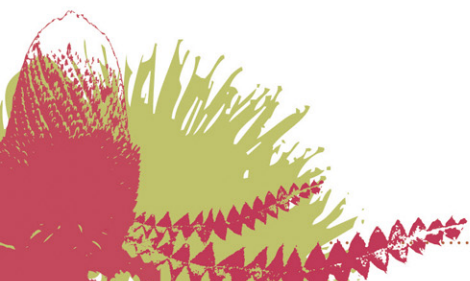
Table 24 Bird Habitat Considerations for Revegetation

Bird	Breeding Confirmed	Habitat			Diet				Comments
		Trees Only	Hollows	Bushland	Seed/Plants	Invertebrates	Nectar	Vertebrates	
<i>Calyptorhynchus banksii naso</i> Red-tailed Black-Cockatoo			X	X	X				Shrubs and trees for perching, nesting and foraging - also forage on mature grasses
<i>Calyptorhynchus latirostris</i> Carnaby's Black-Cockatoo			X	X	X				
<i>Turnix varia</i> Painted Button-quail				X	X				
<i>Ninox novaeseelandiae</i> Southern Boobook Owl			X	X		X		X	Most common owl in Australia Nocturnal - Roosts during the daytime in dense canopies or in a tree-hole. Highly dependent on tree hollows for breeding Typical home range in SW WA 10-100 ha
<i>Hirundo nigricans</i> Tree Martin			X	X		X			Trees with hollows for breeding
<i>Purpureicephalus spurius</i> , Red-capped Parrot			X	X		X			Shrubs as well as some open areas for foraging on insects
<i>Pardalotus striatus</i> Striated Pardalote	Y	X	X			X			
<i>Acanthiza apicalis</i> Inland Thornbill				X		X			Dense shrubs important for protection and nest sites as well as some open areas for foraging
<i>Acanthiza chrysorrhoa</i> , <i>Yellow-rumped Thornbill</i>				X		X			
<i>Merops ornatus</i> Rainbow Bee-eater	Y			X		X			
<i>Daphoenositta chrysoptera</i> Varied Sittella		X				X			Shrubs and trees for perching
<i>Pachycephala rufiventris</i> , Rufous Whistler		X				X			
<i>Rhipidura fuliginosa</i> Grey Fantail		X				X			Dense shrubs important for protection and nest sites as well as some open areas
<i>Smicromnis brevirostris</i> Weebill		X				X			
<i>Anthochaera lunulata</i> , Western Wattlebird				X			X		Shrubs and trees for foraging, perching and nesting. Flowering plants such as Banksia, Eucalyptus, Grevillea, Hakea, Melaleuca
<i>Phylidonyris novaehollandiae</i> New Holland Honeyeater				X			X		
<i>Barnardius zonarius</i> Australian Ringneck		X	X		X				Generalist Bird – no special requirements

Calyptorhynchus latirostris, Carnaby's Black-Cockatoo, and *Calyptorhynchus banksii*, Red-tailed Black-Cockatoo are generally not listed as requiring hollows in City of Melville reserves as neither migratory bird species breeds in the City. However there is an unconfirmed roosting site for *Calyptorhynchus latirostris*, Carnaby's Black-Cockatoo, in



Wireless Hill Park (Kabat, Scott, Kabat, & Barrett, 2012) and both species can utilise tree hollows for roosting.



Invertebrates

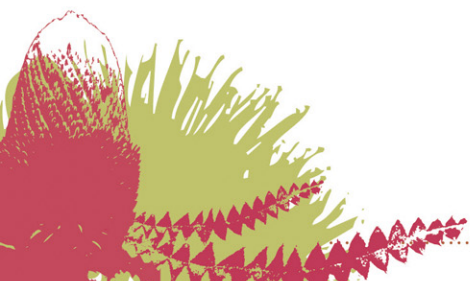
There have been no systematic surveys for invertebrates in bushland in the City of Melville. However, Wireless Hill Park, along with Harry Sandon Park and Wal Hughes Reserve, were surveyed for butterflies and day-flying moths by Williams (2009).

The 5 native butterfly and 1 native day-flying moth species present are listed in [Table 61](#) in [Appendix 3](#):

- The five butterfly species were categorised by Williams (2009) in terms of the following habitat niches:
 - breeding exclusively on native plants and restricted to bushland:
 - *Neolucia agricola*, Fringed Blue, breed exclusively on the widespread native shrubs *Daviesia divaricata* and *Jacksonia sternbergiana*
 - breeding on native and introduced plants, but predominantly restricted to bushland:
 - *Zizina otis labradus*, the Grass Blue Butterfly, occurs in bushland and urban areas but there is no evidence yet that the populations in urban areas are self-sustaining (Williams M. , 2009), although there are several generation each year (Braby, 2004)
 - breeding on both native and introduced plants, but known to be highly vagile (i.e. migratory or vagrant) and not restricted to remnant bushland:
 - *Geitoneura klugei*, Klug's Xenica, is widespread and known to breed on weeds and garden plants in addition to native plants
 - *Lampides boeticus*, Pea Blue, whose major host plants include weeds
 - *Vanessa kershawi*, the Australian Painted Lady, that breeds primarily on the exotic and widespread weed *Arctotheca calendula*, which occurs commonly on roadsides, in gardens and on vacant land, and is also known to be migratory, and as such does not rely upon bushland to sustain populations
- The resident day-flying moth present was:
 - *Synemon* sp. (Perth), which is the interim name for a species complex that is widespread and common in southwest Western Australia. On the Swan Coastal Plain it is associated with banksia woodlands and the only documented larval food plant is the widespread and abundant native sedge *Mesomelaena pseudostygia* (Williams, Williams, Edwards, & Coppen, 2016)

Synemon gratiosa, the Graceful Sun-Moth is a significant species that could occur in Wireless Hill Park as suitable habitat (*Lomandra hermaphrodita*, *Banksia* woodland and open herb/shrubland) is present (Bamford, Shepherd, Browne-Cooper, & Chuk, 2017). Although it was not recorded by Williams (2009) in 6 spring and 2 autumn surveys, each along 2144 metres of tracks in Wireless Hill Park, its low abundance and low detectability means that four or more surveys are needed during its peak flying period (late summer to autumn) to ensure it is detected at a site.

Three conservation significant native bees (*Leioproctus contraries*, *Leioproctus douglasiellus* and *Neopasiphae simplicior*) could occur but their presence could only be determined with targeted surveys (Bamford, Shepherd, Browne-Cooper, & Chuk, 2017).



The indicator species (resident bushland dependent species) are listed in [Table 25](#).

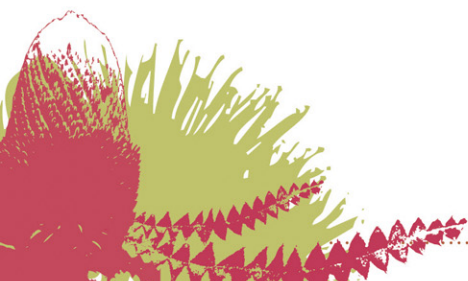
Table 25 Invertebrate Indices

Values	Invertebrates	2009 Survey	Assets 2008-2017
Low Bushland dependent species	<i>Neolucia agricola</i> Fringed Blue	Present	3 species Maintained
	Synemon sp. (Perth)		
Low Possibly bushland dependent species	<i>Zizina otis labradus</i> Grass Blue Butterfly		

The critical habitats for invertebrates to be considered during revegetation are summarised in [Table 26](#).

Table 26 Invertebrate Habitat Considerations for Revegetation

Indicator Species	Diet and Other Requirements
<i>Neolucia agricola</i> Fringed Blue	The native shrubs <i>Daviesia divaricata</i> and <i>Jacksonia sternbergiana</i> for breeding
Synemon sp. (Perth)	The native sedge <i>Mesomelaena pseudostygia</i> as source of food for larvae
<i>Zizina otis labradus</i> Grass Blue Butterfly	Major host breeding plants are native and introduced legumes (see native plants in Table 50) - larvae feed on young leaves, flower buds, flowers and seedbuds Prefers open areas



3 Threats

3.1 Overview

The NAAMP identified the ten most significant threats to natural areas in the City of Melville and details the impacts they can have. These threats (with the exception of stormwater and reticulation, which are specific to small bushland remnants in an urban environment) align with the major biodiversity threatening processes identified in the comprehensive technical review *'Biodiversity values and threatening processes of the Gnangara groundwater system - Report for the Gnangara Sustainability Strategy and the Department of Environment and Conservation'* (Wilson & Valentine, 2009).

The significance of threats can be assessed in a similar manner to that used for assets as indicated in **Figure 55**.

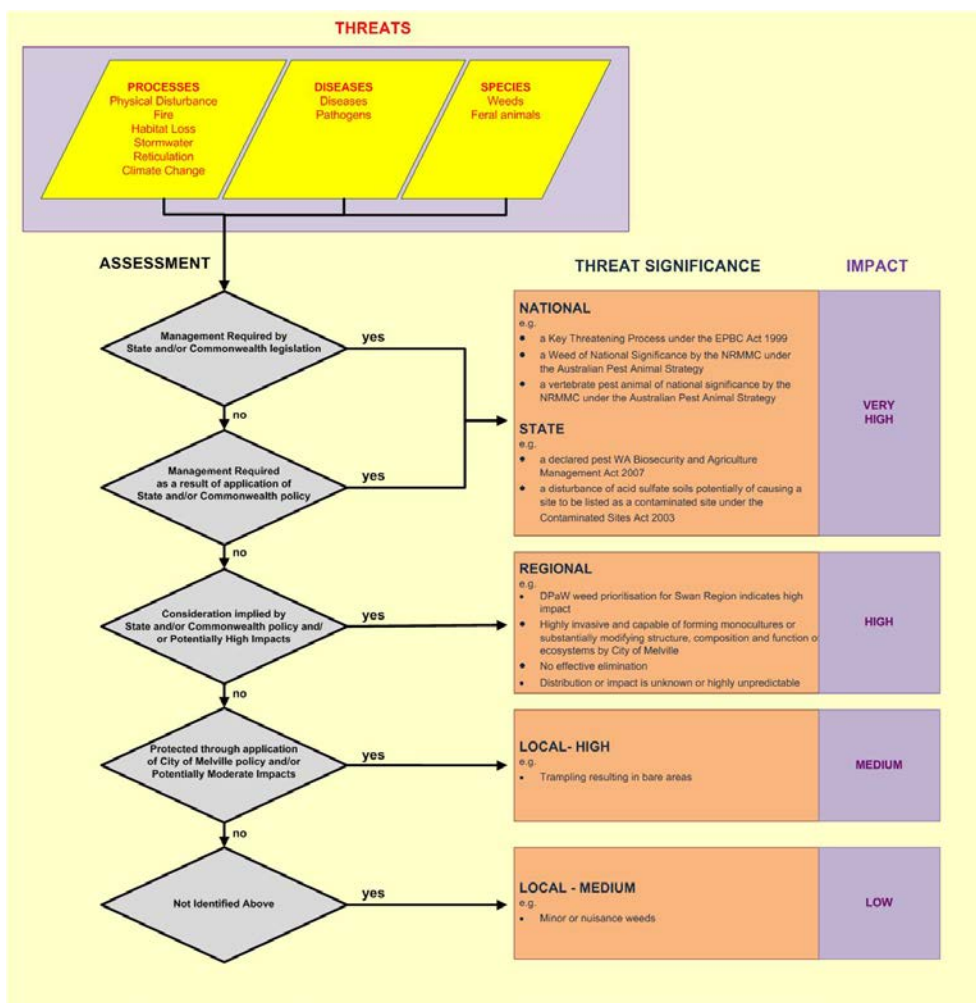
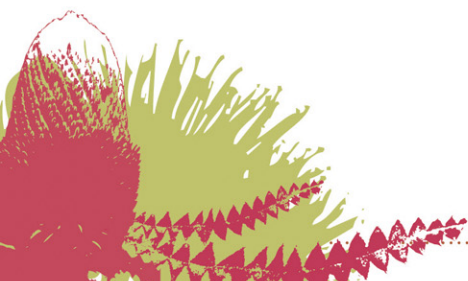


Figure 55 Assessment of Threats in Natural Areas



3.2 Physical Disturbance

There is no data for physical disturbance available, but there was little evidence of any disturbance onsite in 2017, with the exception of dumped furniture and associated rubbish, and geocaching, examples of which are shown in Figure 56 to Figure 59.



Figure 56 Disturbance Example 1



Figure 58 Disturbance Example 3



Figure 57 Disturbance Example 2



Figure 59 Disturbance Example 4

The assumption that physical disturbances were generally minimal, and therefore contained, for 2008-2017 is reflected in Table 27.

Table 27 Physical Disturbance Indices

Impacts	Physical Disturbance	Disturbances 2008-2017	Threats 2008-2017
High Potential to substantially change ecosystem structure, composition or function	Clearing for utilities	No Data	1 Threat Contained
Medium Potential to moderately change ecosystem structure, composition or function	Trampling	No Data	5 Threats Contained
	Sediment/Erosion	No Data	
	Rubbish Dumping	Pockets of rubbish found regularly in "cubbies"	
	Tree Poisoning, Illegal Clearing, Firewood Collection	No Data	
Medium Potentially costly remediation	Vandalism	Graffiti approx. once per year	



3.3 Fire

An individual fire may not necessarily be a threat to the biodiversity, as the flora and fauna of the region has evolved in the context of, adapted to, and in part depends upon, fire. However modified fire regimes (characterised in terms of intensity, frequency, season and scale), especially in the context of external factors such as habitat fragmentation and climate change can lead to the decline and/or local extinction of species.

The two fire scenarios that were identified in the NAAMP as potential triggers for local extinctions of vulnerable species were:

- Large Fires (a fire burning more than one third of a reserve); and
- Repeat Fires (fires burning the same portions of a reserve within eight years).

Fires visible on aerial photographs from 2008 until 2017 are shown in **Figure 60**.

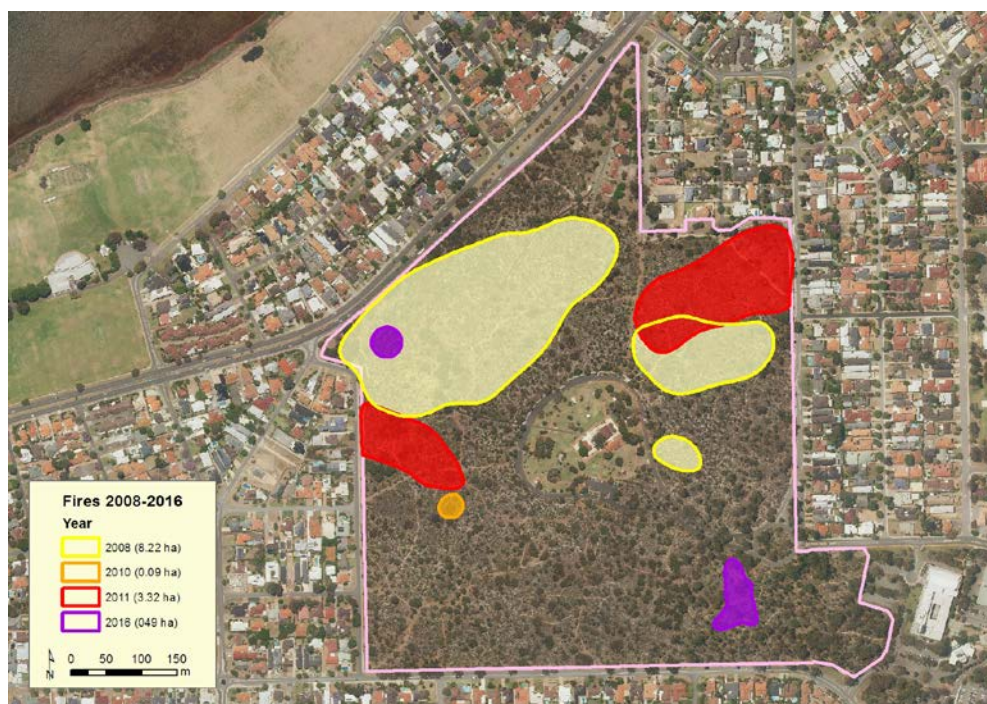
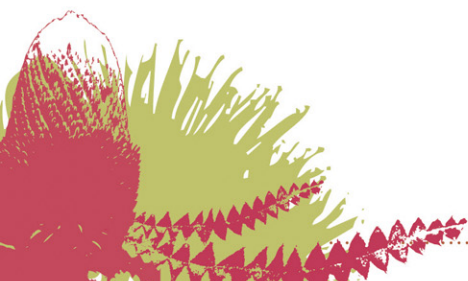


Figure 60 Fires 2008-2017

Table 28 reflects that there was no evidence of large or repeat fires from 2008-2017.

Table 28 Fire Indices

Impacts	Fires	Extent of Fires 2008-2017	Threats 2008-2017
High Potential for local extinctions of ground dwelling species	Large fires	0 ha	Prevented
High Potential for local extinctions of trees and shrubs that regenerate only from seed stored on the plant	Repeated fires	0.46 ha	Contained



3.4 Weeds

There were 94 weed species recorded in the bushland portions of Wireless Hill Park, of which 48 species were individually mapped across the park.

The weed inventory is listed in [Appendix 2](#). Most weeds were rated as High Impact, as shown in [Table 29](#).

Table 29 Number of Weed Species in Each Impact Category

Impact	Total
Very High	6
High	51
Medium	6
Low	31
Total	94

One species has been eradicated from the park since 2008. One individual plant of *Cenchrus setaceus*, Fountain Grass was documented adjacent to Station Walk in 2012 during Grass Weed Surveys (Waters A. , 2012), and no plants were located in 2016.

Methods for surveying weeds were not standardised by the City of Melville until the review of the *Natural Areas Asset Management Plan* (Waters A. , 2013). The extents of weeds in 2016 (based on presence at 406 reference points in a grid with 30 metre spacing - with each point representing approximately 0.25% of the total of the bushland) are listed in [Table 30](#), with distributions mapped in [Appendix 1](#). The following assumptions were made in terms of trends 2008-2017 where comparable data was not available:

- weeds were prevented if not observed in 2016;
- weeds were contained if restricted to small areas in 2016; and
- weeds were not assessable if widespread in 2016.

Annual clumping grasses were present in 2016 but not detected in the grid-based survey because at the time of survey between 25 October and 22 November 2016 the density of standing annual clumping grass plants with flowering heads was below the level at which they could be readily located amongst any perennial clumping grasses present.

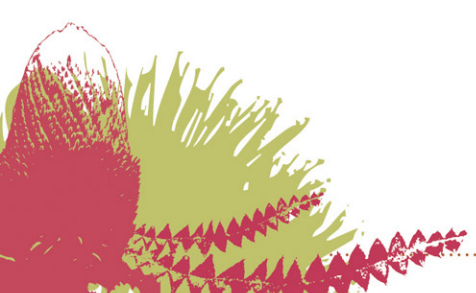


Table 30 Weed Indices

Impact	Weeds	2006	2012 (grasses only)	2016	Threats 2008-2017
Very High	Arum Lily Asparagus Fern Blackberry Golden Dodder Lantana Madeira Vine Narrowleaf Cottonbush One Leaf Cape Tulip Paterson's Curse Tamarisk Willows	0%		0%	11 Prevented
	Bridal Creeper	0%		<1%	3 Increased
	Soldiers	3%		5%	
	Brazilian Pepper	0%		<1%	
	Perennial Clumping Grass	94%	93%	97%	2 Contained
Very Large Trees	No Data		2%		
High	Giant Grasses	0%		0%	1 Prevented
	Annual Clumping Grass	Incompatible Data (51% - Clumping and Non-clumping Annual Grasses)	Incompatible Data (64% - Clumping and Non-clumping Annual Grasses)	<1%	2 Contained
	Perennial Running Grass	No Data	No Data	1%	
	Clumping Geophytes	Incomplete Data (12% - <i>Freesia alba x leichtlinii</i> and <i>Watsonia meriana var. bulbifera</i>)		87%	2 Not Assessable
	Shrubs and Trees	Incomplete Data (9% - <i>Chamaelucium uncinatum</i> and <i>Chamaecytisus palmensis</i>)		17%	
Medium	Perennial Weeds	Incomplete Data		92%	1 Not Assessable
Low	Annual Weeds	Incomplete Data		98%	1 Not Assessable

The numbers of individually GPSed weed plants are listed in Table 31.

Table 31 Number of Plants in 2016 of Selected Weeds

Impact	Weed Group / Species	Weeds	Number of Plants	
Very High	Very Large Trees	<i>Eucalyptus</i> species, Gum Trees	18	
		<i>Lophostemon confertus</i> , Queensland Box Tree	1	
	Bridal Creeper	<i>Asparagus asparagoides</i> , Bridal Creeper	1	
	Brazilian Pepper	<i>Schinus terebinthifolius</i> , Brazilian Pepper	1	
High	Shrubs and Trees	<i>Acacia iteaphylla</i> <i>Acacia podalyriifolia</i> <i>Acacia longifolia</i> <i>Chamaelucium uncinatum</i> , Geraldton Wax <i>Allocasuarina sp</i> <i>Callistemon sp</i> <i>Callitris preissii</i> <i>Brachychiton populneus</i> , Kurrajong <i>Leptospermum laevigatum</i> , Teatree <i>Agonis flexuosa</i> , Peppermint <i>Hakea laurina</i> , Pin Cushion Hakea <i>Olea europaea</i> , Olive <i>Melaleuca quinquenervia</i> <i>Ficus carica</i> <i>Chamaerops humilis</i> <i>Melia azedarach</i> , Chinaberry <i>Grevillea olivacea</i> <i>Gazania linearis</i> , Treasure Flower <i>Freesia alba x leichtlinii</i>	552	
		Clumping Geophytes	<i>Ferraria crispa</i> , Black Flag	1^
			<i>Moraea miniata</i> , Two leaf CapeTulip	1^
			<i>Watsonia meriana var. bulbifera</i> , Bugle Lily	13^

Medium	Perennial Weed	<i>Pelargonium capitatum</i> , Pelargonium	29
Total			617

^ = clumps rather than plants

As a general rule, a site-based approach should be applied to prioritising woody weeds for removal with a focus on shrub and tree weeds in the vicinity of key assets, as well as removing shrub and tree weed species in low numbers. An example is *Asparagus asparagoides*, which is in low enough numbers to be able to eliminate the plant quickly, and which is rated as highly invasive if unmanaged.

Annual weeds (e.g. *Brassica barrelieri subsp. oxyrrhina*) are deemed low priority, however should be managed where they occur or have the potential to impact on high value assets.

3.5 Habitat Loss

Habitat loss can be managed and monitored:

- between reserves (which is outside of the scope of this plan), and
- within reserves (in terms of the extent, quality or continuity of bushland areas).

The distribution of weed cover is shown in [Figure 61](#).

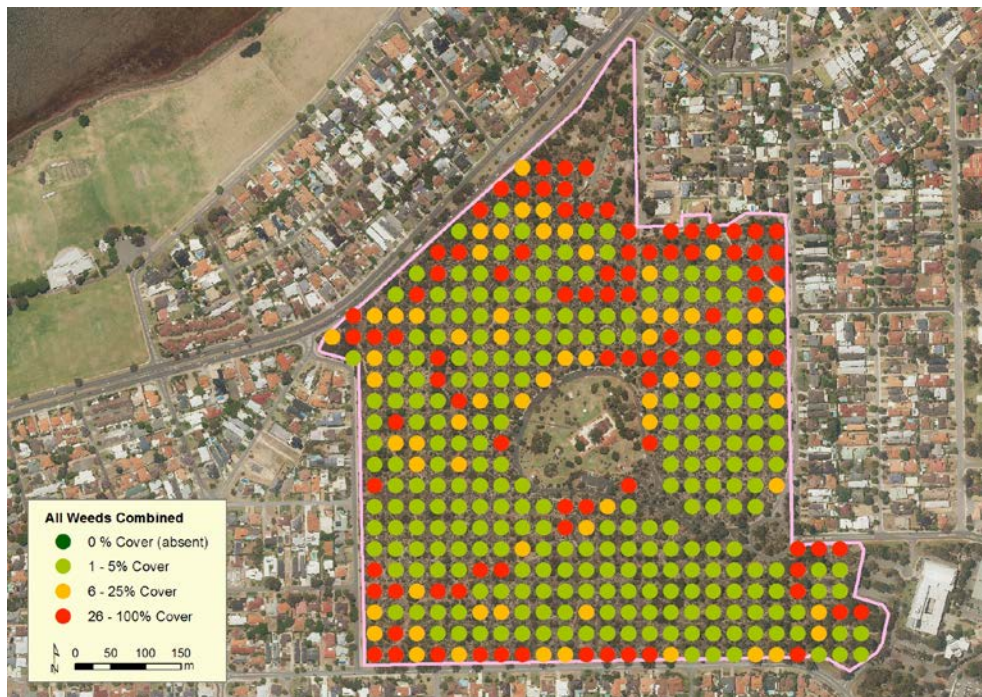
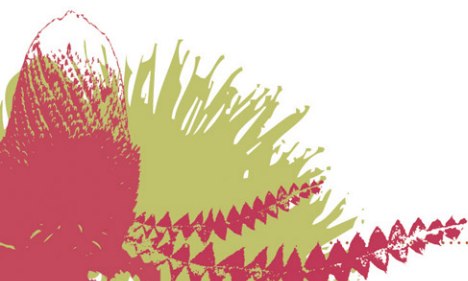


Figure 61 Cover of All Weeds Combined

The extent of bushland in each category of weed cover is indicated in [Table 32](#).

Table 32 Cover of All Weeds Combined

Category	Percent of Monitoring Points
0%	0%
1-5%	62%
6-25%	16%
26-100%	22%
Total	100%



The distribution of bare cover is shown in **Figure 62**.

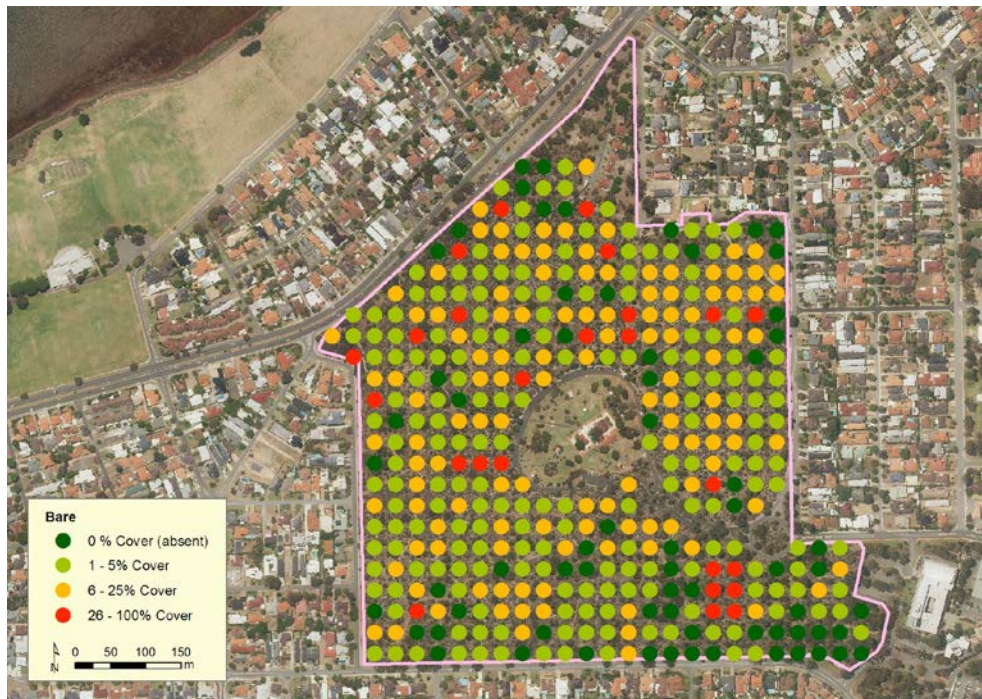


Figure 62 Bare Ground

The extent of bushland in each category of bare ground is indicated in **Table 33**.

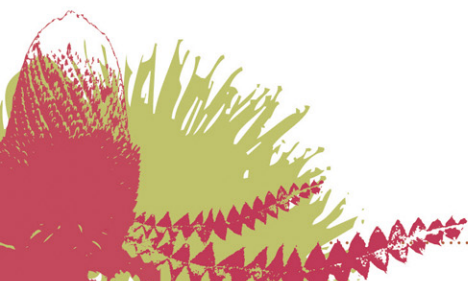
Table 33 Bare Ground Cover

Category	Percent of Monitoring Points
0%	17%
1-5%	47%
6-25%	30%
26-100%	6%
Total	100%

The habitat loss indices are listed in **Table 34**.

Table 34 Habitat Loss Indices

Impact	Habitat Loss	% of Reserve 2008	% of Reserve 2016	Threat 2008-2017
Medium Process of moderate ecosystem function modification <ul style="list-style-type: none"> Reduced natural regeneration Increased fire or erosion risk 	Weed Cover > 25%	No Data	22%	Change Not Assessable
Low Process of low ecosystem function modification <ul style="list-style-type: none"> Reduced natural regeneration Increased fire or erosion risk 	Bare Ground > 25%		6%	Contained



3.6 Feral Animals

The feral animals recorded in Wireless Hill Park are listed in [Table 62](#) in [Appendix 4](#).

Four feral animals are indicator species. The indices for feral animals are only for those species for which some control is practical and effective.

Oryctolagus cuniculus, rabbits, were absent in 2017 (Bamford, Shepherd, Browne-Cooper, & Chuk, 2017). Rabbits would only be present as residents within the park as they have relatively well-defined and small home ranges in the order of 0.2-2 ha (DEPI, 2013). Most dispersal of rabbits is relatively short distances (DEPI, 2013) and Wireless Hill Park is not contiguous with other bushland. Rabbits appear to have been present in low numbers in 2008. The *Wireless Hill Reserve Management Plan 2008* (City of Melville, 2008) noted that 'At one stage in the early 1980's, the European rabbit (*Oryctolagus cuniculus*) was present in large numbers within Wireless Hill Park. Rabbits were almost completely eradicated as a direct result of a programme recommended in the 1985 management plan. It appears that rabbits have not returned to their former numbers since this time'.

Vulpes vulpes, foxes, are sighted and periodically removed from Wireless Hill Park. Wireless Hill Park could sustain foxes as their home ranges in urban areas can be in the order of 30 hectares (Lapidge, Braysher, & Sarre, 2013).

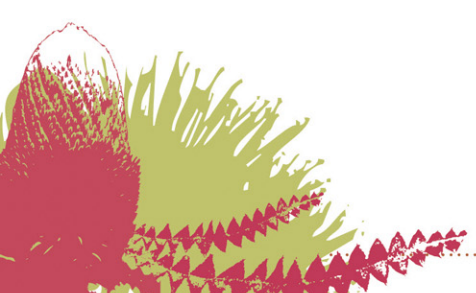
Felis catus, cats, are assumed present. Domestic cats in suburban Canberra catch an average of 10 prey animals per year (with 6% of cats catching five times this) (Grayson & Calver, 2004); and male feral cats may occupy a home range of 10 square kilometres, or larger if food is scarce (DEWHA, 2008).

Apis mellifera, feral honeybee, beehives were absent in 2017 (Bamford, Shepherd, Browne-Cooper, & Chuk, 2017).

The indices are listed in [Table 35](#), with an occurrence defined as specific sightings of dens, warrens, hives or animals (and as control of feral animals is to be initiated within 10 working days from date of observation – the resighting of a den, warren, hive or animal is recorded as an additional occurrence at 10 working day intervals until the elimination of the occurrence).

Table 35 Feral Animal Indices

Impact	Feral Animal	Occurrences 2008-2017	Threat 2008-2017
Very High Key Threatening Process under the EPBC Act 1999	<i>Oryctolagus cuniculus</i> Rabbit	Absent 2017	Eliminated
	<i>Vulpes vulpes</i> Fox	Absent 2017 6 removed since 2011	Eliminated
	<i>Felis catus</i> Feral Cat	Assumed Present	Change Not Assessable
High Competition with native birds for hollows and food (impact level variable)	<i>Apis mellifera</i> Honeybee	Absent 2017	Assumed Prevented



3.7 Diseases and Pathogens

Phytophthora cinnamomi, Dieback, is a microscopic water mould that weakens or kills the plants by reducing or stopping the movement of water and nutrients within the plant (Dieback Working Group, 2000), and 'is one of the major threats to the biodiversity of Western Australia's ecosystems' (DEC, 2010). The related *Phytophthora nicotianae* has also been confirmed within the area infested by *Phytophthora cinnamomi* in Wireless Hill Park (Dieback Treatment Services, 2013).

The areas assessed as infested with *Phytophthora cinnamomi*, Dieback, by Glevan Dieback Consultancy (2002) and Dieback Treatment Services (2013) (2016) are shown in Figure 63.

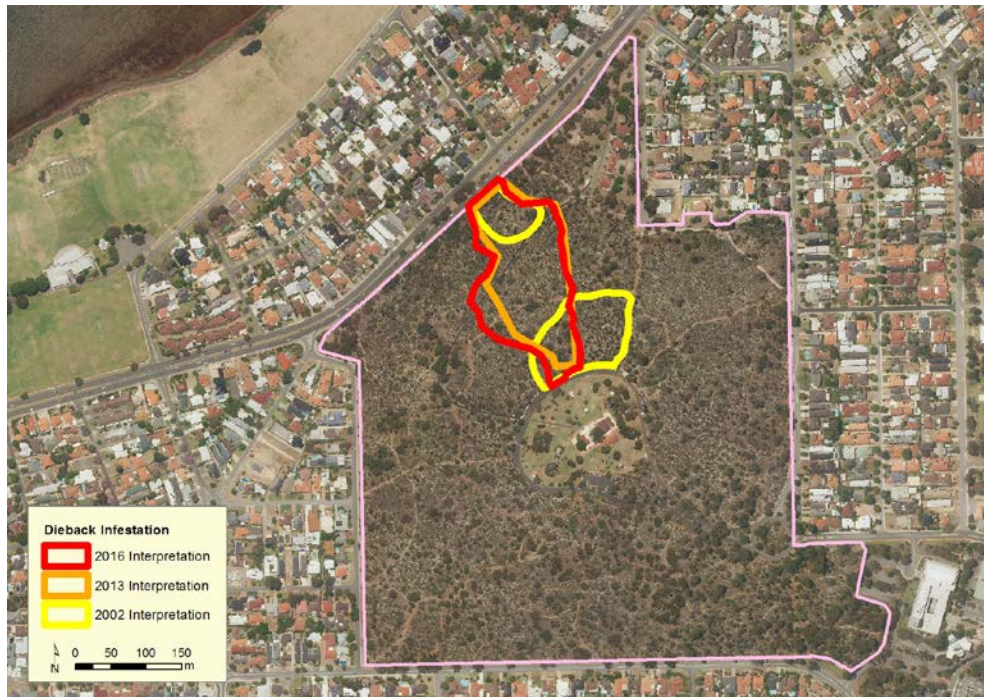


Figure 63 Interpretation of Extent of Dieback Infestation 2002 - 2016

It is assumed there has been significant change in infestation extent since 2002, as differences shown in Figure 63 can be attributed to difficulties in precisely determining the boundaries of an infestation where disease impact is low.

The infestation/s was initially confirmed and mapped as two areas in 2002, but Glevan Dieback Consultancy (2002) noted that:

- The expression of the pathogen was subtle; and
- There was an 'unnaturally open' vegetation between the two infested areas.

When the infestation/s were reassessed in 2013, Dieback Treatment Services (2013) noted that:

- Disease impact was low;
- The infestation was previously mapped as two separate infested areas due to a lack of disease expression (as a result of a combination of Phosphite application, fire activity and drought expression);
- The two sites should be considered as a single infestation for management purposes;
- There were fresh plant deaths on the northern side of the park due to lower than average rainfall but this was not as obvious on the southern side of the reserve; and
- Recent fire activity in the north eastern corner of the park had rendered that section uninterpretable for the presence of *Phytophthora* as any disease symptoms would have been masked by the effects of the fire.



When the infestation was reassessed in 2016, Dieback Treatment Services (2016) noted that:

- Conditions in 2016 were more favourable for the detection of *Phytophthora* symptoms than during 2013, resulting in minor changes to the demarcated *Phytophthora* disease edge and the section of bushland mapped as uninterpretable due to the fire prior to the 2013 assessment was re-categorized as uninfested; and
- The infestation itself was still found to be displaying a subtle *Phytophthora* impact and once again drought impact was seen throughout (although not as severely as in the 2013 assessment), most likely due to the extended dry conditions during the 2015/2016 summer period.

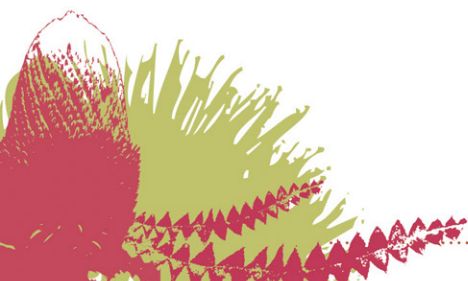
Armillaria luteobubalina, Honey Fungus, is an indigenous parasitic mushroom that is widespread in south west Western Australia that causes decay in roots and stems that can result in the death of the host plant (Shearer, 1994). Whilst no targeted surveys have been undertaken it is assumed to be absent from Wireless Hill Park:

- no occurrences of *Armillaria luteobubalina* have been documented in the City;
- there were also no opportunistic observations of patches of dead susceptible plants, or the parasitic mushroom itself; and
- it occurs most frequently in coastal dunes, and forests east of the Darling Scarp, and rarely occurs in the acidic sands of the Bassendean Dune system (Shearer, 1994).

The diseases and pathogens for which objectives apply are listed in [Table 36](#).

Table 36 Disease and Pathogen Indices

Impact	Diseases and Pathogens	Extent 2002	Extent 2013	Extent 2016	Threat 2008-2017
Very High Key Threatening Process under the EPBC Act 1999	<i>Phytophthora cinnamomi</i> Dieback	Initial Mapping Equivocal	7%	8%	Contained
Medium Native species capable of moderate modification of structure and composition of flora by killing multiple species	<i>Armillaria luteobubalina</i> Honey Fungus	No Data	No Data	No Data	Assumed Prevented



3.8 Stormwater

There are stormwater discharge points into Wireless Hill Park.

There are no water quality parameters for which objectives apply in Wireless Hill Park as these only apply in bushland where stormwater discharges terminate in an open waterbody. Any erosion/sedimentation associated with the stormwater outlets is monitored as a physical disturbance and would be discussed in [Section 3.2](#) if applicable.

3.9 Reticulation

There is reticulated lawn adjacent to bushland in Wireless Hill Park but there have been no ongoing instances of additional water being applied to the bushland. The indices for reticulation are listed in [Table 37](#), with an occurrence defined as specific sightings of excessive drift or leaking (and this is to be rectified within 5 working days from date of observation – the resighting of overspray or leakage is recorded as an additional occurrence at 5 working day intervals until the elimination of the occurrence).

Table 37 Reticulation Indices

Impact	Water Sources	Occurrences 2004-2013	Occurrences 2014 - 2017	Threat 2008-2017
Low Alteration of Surface Water Flows	Overspray / leakages from reticulation	No Data	No Data	Assumed Contained

3.10 Acid Sulfate Soils

Acid Sulfate Soil reactions can potentially occur where:

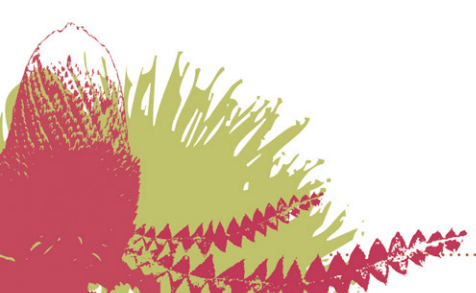
- excavations are dug below the minimum level of the watertable; and/or
- groundwater extraction results in oxidation of soils previously permanently saturated by lowering the minimum level of the watertable.

An occurrence of an acid sulfate soils threat is recorded when these activities are undertaken and the risks associated with acid sulphate soil reactions are not managed at the time.

There is no data on excavations or acid sulphate soil reactions previously occurring in Wireless Hill Park, as reflected in [Table 38](#).

Table 38 Acid Sulfate Soil Indices

Impact	Potential Initiation of ASS Reactions	Occurrences 2004-2013	Occurrences 2008 - 2017	Threats 2008-2017
Very High An occurrence of which could result in the reserve being listed as a contaminated site under the Contaminated Sites Act 2003	Excavations below the minimum level of the watertable	No Data	No Data	Assumed Prevented
	Groundwater extraction resulting in lowering of minimum level watertable			



3.11 Climate Change

The regional climate is becoming hotter and drier (McHugh & Bourke, 2008):

- the annual rainfall in south-west WA has declined by about 10% since the mid-1970s (Hope & Foster, 2005); and
- the mean annual temperatures across Western Australia have increased since 1910 by approximately 0.8°C, with the strongest trend observed since the 1950s (Indian Ocean Climate Initiative, 2009).

The average monthly maximum temperatures and rainfall for nearby Perth Airport are shown in **Table 39**.

Table 39 Monthly Rainfall 2008-2016

Year	Average Monthly Maximum (°C)	Total Rainfall (mm)
2008	24.8	828.2
2009	25.5	615.8
2010	26.0	483.4
2011	26.1	835.8
2012	25.7	649.4
2013	25.8	704.2
2014	25.7	620.8
2015	26.0	578.2
2016	24.4	674.4

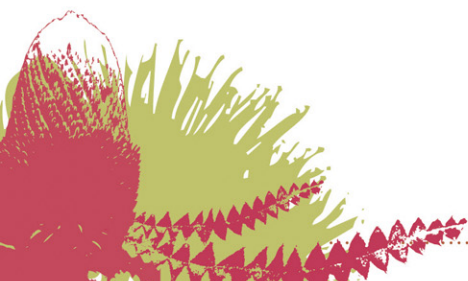
shading = 90% of annual records cooler or 90% of annual records wetter since 1944

The weather during the period 2008-2016 included six years of very hot weather, two years of very dry weather, as indicated in **Table 40**, and this included two years of both very hot and very dry weather.

Table 40 Climate Indices

Impact	Extreme Weather Events	% of Years (2008-2016)	Threats 2008-2016
Very High Key Threatening Process under the EPBC Act 1999	Total Annual rainfall <609 mm 'very much below average' (lowest 10% of records)	22%	2 Increased
	Annual mean maximum temperatures >25.6 °C 'very much above average' (highest 10% of records)	66%	

No objectives apply to containing or preventing climate change as the threat can only be addressed indirectly through management of impacts to assets.



4 Management

4.1 Review of Management 2008-2017

4.1.1 Key Performance Indicators

Key performance indicators measure the degree to which operational reserve plans are implemented. These indicate whether systems are being applied and whether resources are adequate.

On-ground works were undertaken including weed control, plantings and feral animal control. Most works were not fully documented so no audit was undertaken.

Dieback Treatment Services (2016) applied Phosphite in 2004, 2007, 2009 (volunteers), 2011 and 2016 to manage the impact of *Phytophthora cinnamomi*, Dieback (although other groups may have also conducted Phosphite application). The Phosphite was applied via stem injection and foliar spray to the entire infested section of the reserve inclusive of a 10-15 metre buffer into the uninfested section of the reserve.

Infrastructure is summarised in Table 41, with the location of tracks and fences shown in Figure 64, and the location of lights, seats and signs shown in Figure 65.

Table 41 Infrastructure Extents / Numbers

Infrastructure	Extent / Number 2017
Open Tracks	4,848 metres
Signs	100
Seats	12
Lights	6
Fences	3,810 metres
Bollards	1,925 metres

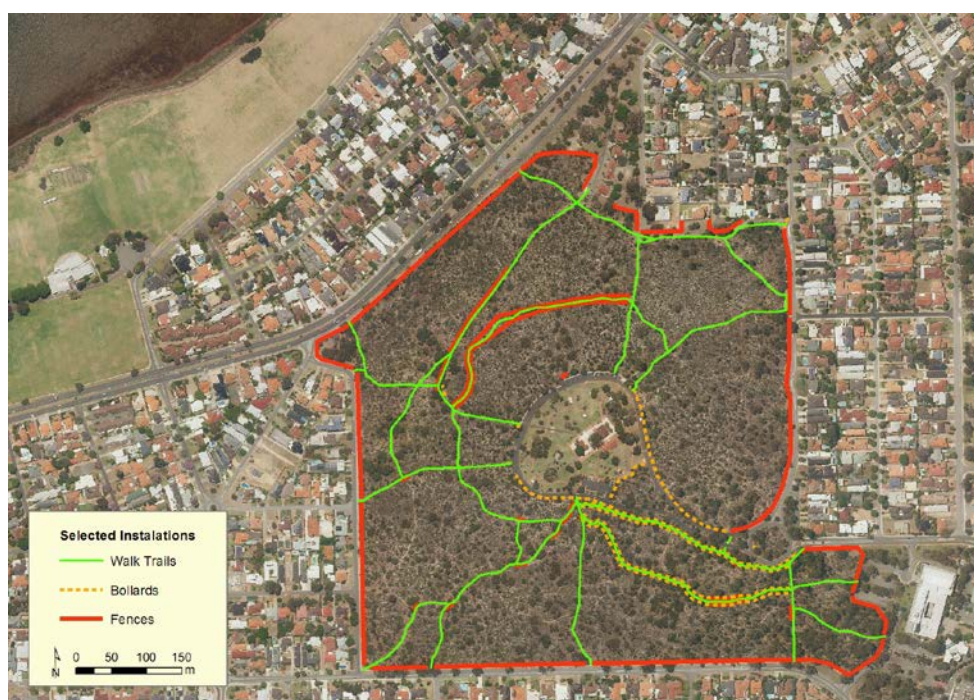


Figure 64 Track, Fence and Bollard Locations

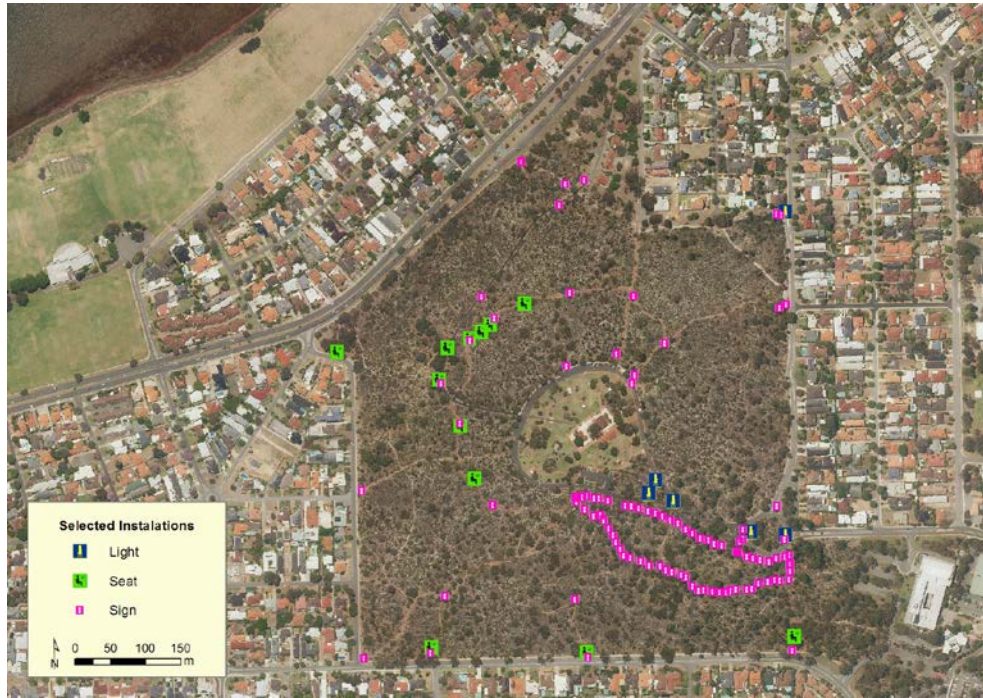
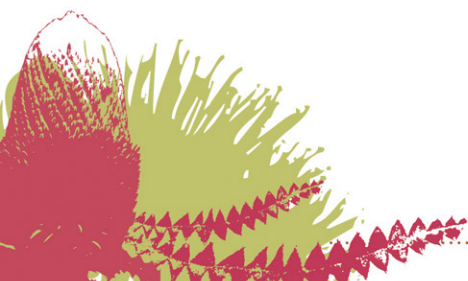


Figure 65 Light, Seat and Sign Locations



4.1.2 Leading Indicators

Leading indicators (trends in threats) indicate for the life of a reserve management plan:

- whether guidelines and procedures are being effective in meeting objectives of preventing, eliminating, containing and managing impacts from threats; and
- provide a feedback mechanism as to whether guidelines and procedures need to be modified.

Trends in threats are categorised in **Table 42**, with many trends not assessable because the previous management plans preceded the standardisation of quantitative data collection.

Table 42 Leading Indicators

Impacts	Prevented (absent or avoided)	Eliminated (no longer present)	Contained (decrease or no change)	Not Contained (increase)	Not Assessable	Total Threat Indices
Very High	11 Weeds 2 Acid Sulfate	2 Ferals	2 Weeds 1 Pathogen	3 Weeds 2 Climate	1 Feral	24
High	1 Fire (large) 1 Feral 1 Weed		1 Disturbance 1 Fire (repeat) 2 Weeds		2 Weeds	9
Medium	1 Pathogen		5 Disturbances		1 Weed 1 Habitat Loss	8
Low			1 Reticulation 1 Habitat Loss		1 Weed	3
Total Threat Indices	17	2	14	5	6	44

4.1.3 Lagging Indicators

Lagging indicators (trends in assets) indicate whether strategic goals of maintaining and enhancing assets are being met.

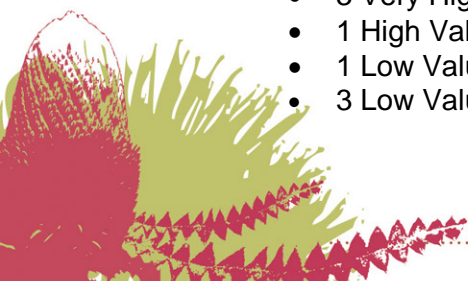
Trends in assets are categorised in **Table 43**, with many trends not assessable because the previous management plans preceded the standardisation of quantitative data collection. Trends apply only for the life of a reserve management plan. Trends were not assessable where assets may have been lost prior to the last management plan in 2008.

Table 43 Lagging Indicators

Values	Enhanced	Maintained	Not Maintained	Not Assessable	Total Assets
Very High		2 Heritage Sites 1 Flora Species 1 Reptile Species		1 Ecological Community Site	5
High		2 Flora Species 3 Bird Species	1 Flora Species 1 Bird Species	2 Reference Sites 1 Reptile Species 1 Bird Species	11
Medium		1 Fauna Habitat Sites 3 Reptile Species		3 Community Sites	7
Low		4 Flora Species 5 Reptile Species 6 bird species 3 Invertebrate Species			18
Total Assets	0	31	2	8	41

In addition the species to be monitored there are:

- 3 Very High Value bird species;
- 1 High Value bird species;
- 1 Low Value mammal species; and
- 3 Low Value bird species.



4.2 Management Objectives 2017-2022

4.2.1 Key Performance Indicators

Under the NAAMP, key performance indicators are measures of the degree of implementation of operational reserve plans. Operational reserve plans are internal City of Melville documents that include work schedules for individual reserves based on guidelines and strategies (that establish default management practices).

The City of Melville is developing and implementing guidelines and strategies. A comprehensive review of these documents is beyond the scope of this reserve management plan but:

- most need further clarification to facilitate the auditing of their implementation; and
- aspects of the guidelines should be specifically reviewed where recommendations for their application below are not directly associated with specifications in the guidelines.

There are no unusual characteristics of Wireless Hill Park that require variations to standard management embedded in any guidelines or strategies, except:

1. The following plants to be managed as weeds in Wireless Hill Park (believed to be planted as opposed to naturally occurring), although may be treated as native in other City of Melville Reserves:
 - *Agonis flexuosa*
 - *Callitris preissii*
 - *Calothamnus quadrifidus*

Confirmation is required as to whether the following plants are only present in the bushland due to plantings:

- *Melaleuca preissiana*
- *Olearia axillaris*
- *Rhagodia baccata*
- *Anigozanthos manglesii*
- *Anigozanthos humilis*
- *Waitzia suaveolens*



4.2.2 Leading Indicators

Leading indicators are associated with changes in the density / abundance / extent / occurrences of threats. The levels of acceptable changes are determined in the framework established in the NAAMP as summarised in [Table 44](#) and applied in [Table 45](#) and [Table 46](#) (objectives for the life of this strategic management plan).

Table 44 Tiered Objectives for Threats and Associated Leading Indicators

Objective	Leading Indicator	Applicable When
Prevent	<ul style="list-style-type: none"> Prevent introduction to or occurrence of 	<ul style="list-style-type: none"> Threat absent from reserve Unplanned Introduction Possible
Eliminate	<ul style="list-style-type: none"> Reduce rate of density / abundance / extent (Eventual complete removal, but in short term may only be reduction of numbers or prevention of seed set onsite) 	<ul style="list-style-type: none"> Large discrepancy between current and potential impact Potential impact high Elimination feasible
Contain	<ul style="list-style-type: none"> Stop, restrict, or reduce rate of spread or frequency of occurrence 	<ul style="list-style-type: none"> Moderate discrepancy between current and potential impact Potential but not current impact high Elimination not feasible
Manage	<ul style="list-style-type: none"> Limit negative impacts on assets 	<ul style="list-style-type: none"> Small discrepancy between current and potential impact Threat "naturalised" or near maximum extent No information on density/abundance/extent
None	<ul style="list-style-type: none"> Not Applicable 	<ul style="list-style-type: none"> Threat absent from reserve Only Planned Introduction Possible

Table 45 Objectives for Weed Species

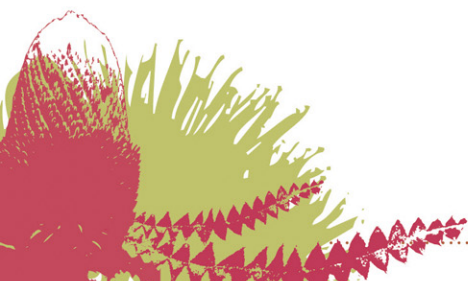
Objective	Impact	Weed Species / Group	2016 Extent	Comments
Prevent	Very High	Arum Lily Asparagus Fern Blackberry Golden Dodder Lantana Madeira Vine Narrowleaf Cottonbush One Leaf Cape Tulip Paterson's Curse Tamarisk Willows	0%	Not Present Onsite
	High	Giant Grasses		
Eliminate	Very High	Brazilian Pepper	<1%	Eliminate 1 Tree
		Bridal Creeper	<1%	Eliminate 1 infestation
		Very Large Trees	2%	19 Trees - poison 4 trees and retain as standing dead trees
	High	Trees and Shrubs	17%	552 shrubs/trees Eliminate 50 shrubs/trees
	High	Clumping Geophytes	87%	Eliminate 1 <i>Moraea miniata</i> infestation 1 <i>Ferraria crispa</i> infestation 13 <i>Watsonia meriana</i> infestations
Medium	All other perennial weeds	92%	Eliminate 29 <i>Pelargonium capitatum</i> plants	
Contain	Very High	Soldiers	5%	Contain to 5% of park
		Very Large Trees	2%	19 Trees -Eliminate seedlings
	High	Annual Clumping Grass	<1%	Elimination not feasible in short to medium term
		Perennial Running Grass	1%	
		Trees and Shrubs	17%	552 shrubs/trees - Eliminate seedlings
Manage	Very High	Perennial Clumping Grasses	97%	Focus in terms of asset protection – Highest priorities are restoration sites and around flora species in low abundance
	High	Clumping Geophytes	87%	
	Medium	All other perennial weeds	92%	



	Low	All other annual weeds	98%	
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Table 46 Objectives for all other Threats

Objective	Impact	Threat	Comments
Prevent	Very High	Acid Sulfate Soil	Monitoring required as groundwater extraction proposed
		Ferals (Foxes)	Absent - occasional incursion may occur and remove/eliminate with 10 working days of observations, before they permanently establish
		Ferals (Rabbits)	
	High	Fires (large)	Prevent fires that burn more than one third of bushland, in consultation with Department of Fire and Emergency Services
	High	Ferals (Bees)	Absent – remove/eliminate with 10 working days of observations, before they permanently establish
Medium	Diseases and Pathogens (Honey Fungus)	Assumed absent - never recorded in the City of Melville Apply appropriate hygiene standards for onground works to prevent introduction	
Contain	Very High	Ferals (Cats)	Trap onsite within 10 working days of sightings Also manage indirectly through revegetation - increase vegetation cover to aid small vertebrates evade predation Vegetation characteristics may be more important to persistence of some native species than cat restrictions around urban bushland (Lilith, Calver, & Garkaklis, 2010)
		Habitat Loss	Limit fragmentation of bushland (e.g. by paths) within reserves
	High	Fire (repeat)	Limit fires burning same portion of bushland, in consultation with Department of Fire and Emergency Services
	Medium	Physical Disturbance	Public access adequately limited through provision of paths and use of soft barriers (such as plantings) and hard barriers (such as fences)
Manage	Very High	Diseases and Pathogens (Dieback)	Manage impacts directly through Phosphite applications and maintaining unfavourable conditions of closed tree canopy and deep leaf litter to reduce soil temperatures.
		Climate Change	Global-scale threat - cannot prevent, eliminate or contain by reserve scale actions. Manage through: <ul style="list-style-type: none"> • revegetation if mass plant deaths occur or are likely. • prioritisation of removal of high water use weeds (especially trees and shrubs) • maintenance of soil moisture through maintenance of canopy and thick leaf litter • limit other factors that could interact cumulatively with climate change to result in permanent change (e.g. repeat fires)
	High	Ferals (Birds)	Regional-scale threat - cannot prevent, eliminate or contain by reserve scale actions. Install only bird and bat boxes that limit use by ferals
	Low	Ferals (Mice)	Likely ongoing presence due to adjacent urban areas - cannot prevent, eliminate or contain Manage indirectly through revegetation to offset seed predation
Reticulation		Manage through maintenance and operation of reticulation to avoid drift or leaks into bushland	



4.2.3 Lagging Indicators

Lagging indicators are associated with changes in the density / abundance / extent / occurrences of assets. The levels of acceptable change are determined in the framework established in the NAAMP as summarised in Table 47 and applied in Table 49 and Table 48.

Table 47 Tiered Goals for Assets and Associated Lagging Indicators

Goal	Lagging Indicator	Applicable When
Enhance	Increase in either <ul style="list-style-type: none"> • extent • density • numbers or • occurrences 	Asset can be enhanced and <ul style="list-style-type: none"> • occurs in only one reserve and/or • at risk of local extinction and/or • minimal cost (e.g. incorporated in revegetation program) and/or • reduces operational costs (e.g. reduces requirements for on-going for threat management)
Maintain	No decrease in either <ul style="list-style-type: none"> • extent • density • numbers or • occurrences 	Asset can be maintained and <ul style="list-style-type: none"> • the asset occurs in a number of reserves and/or • not a risk of local extinction and/or • occurs in only one reserve but insufficient knowledge/resources to enhance
Confirm	Decrease in: <ul style="list-style-type: none"> • number of assets for which their presence is uncertain 	Asset significant and <ul style="list-style-type: none"> • historic but no recent records in reserve and/or • potential to be in reserve based on habitat and/or proximity of other records
Monitor	No indices for management effectiveness	Assets that cannot be maintained by actions within City of Melville boundaries or for which no quantifiable indices exist and: <ul style="list-style-type: none"> • for which reserves are not critical component of habitat (e.g. highly mobile/wide roaming and/or infrequent/irregular visitors to the City of Melville) • there is a risk of local extinction from processes that cannot be mitigated by the City of Melville (e.g. climate change, some pathogens)

Table 48 Goals for Sites

Goal	Priority	Asset	Comments
Maintain	Very High	Ecological Community Site – Banksia woodland Threatened Ecological Community	Maintain very high native plant cover at 72%
		Heritage Site – Scar Tree	Assets that are expected to persist onsite if standard threat management procedures and guidelines are effective and implemented.
		Heritage Site – Heritage Trails	
	Medium	Revegetation Sites – existing plantings	Maintain establishment of plantings
		Revegetation Sites – closed tracks	Revegetate 1,757 m ² to the standard of 'Rehabilitation' in NAAMP.
		Revegetation Sites – bat boxes	Assets that are expected to persist onsite if standard threat management procedures and guidelines are effective and implemented.
Habitat Sites – very large live native trees			
Confirm	High	Reference Sites – Regional flora quadrats	Confirm which starpickets were used to permanently mark sites
	Low	Reference Sites – Regional flora quadrats	Confirm which starpickets were used to permanently mark sites, and document associated data

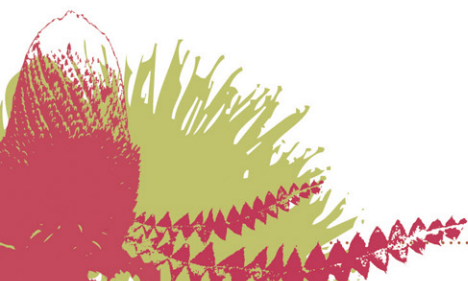
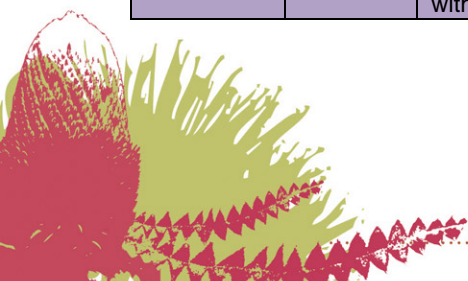
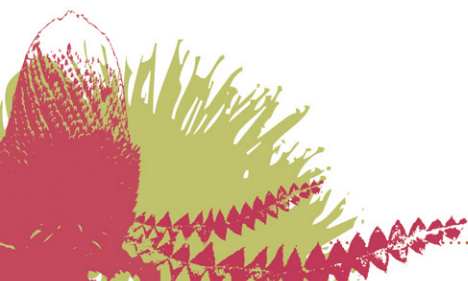


Table 49 Goals for Species

Goal	Priority	Asset	Comments	
Enhance	High	<i>Conospermum triplinervium</i>	Re-introduce species Increase the population from 0 to 10 plants	
	Low	<i>Banksia grandis</i>	Increase the population from 7 to 50 plants	
		<i>Banksia ilicifolia</i>	Increase the population from 4 to 50 plants	
Maintain	Very High	<i>Jacksonia sericea</i>	Abundant in park and can be increased through use as a ground cover along edges of paths	
	High	<i>Smicromnis brevirostris</i>	Resident bird that does not require tree hollows for breeding onsite. Expected to persist onsite if standard threat management procedures and guidelines are effective and implemented.	
	Low	High	<i>Astroloma macrocalyx</i>	1 Plant, propagation likely problematic
		High	<i>Banksia attenuata</i>	Susceptible to dieback, and Phosphite treatments recommended for reapplication in 2019
			<i>Banksia menziesii</i>	
		Low	<i>Tiliqua rugosa rugosa</i>	Reptiles expected to persist onsite if standard threat management procedures and guidelines are effective and implemented.
			<i>Barnardius zonarius</i>	Resident birds that require tree hollows for breeding onsite. Expected to persist onsite if standard threat management procedures and guidelines are effective and implemented.
			<i>Pardalotus striatus</i>	
			<i>Phylidonyris novaehollandiae</i>	
<i>Purpureicephalus spurius</i>				
<i>Anthochaera lunulata</i>				
Monitor	Very High	<i>Calyptorhynchus banksii naso</i>	Migratory bird species: maintain habitats only in form of existing overstorey trees onsite.	
		<i>Calyptorhynchus latirostris</i>		
		<i>Merops ornatus</i>	Migratory bird species: maintain habitats only in form of limiting disturbance of nests	
	Low	<i>Chalinolobus gouldii</i>	Bat with large home range: maintain habitat in form of very large trees	
Confirm	Very High	<i>Lerista lineata</i>	Reptile expected to persist onsite if standard threat management procedures and guidelines are effective and implemented.	
	High	<i>Acanthiza apicalis</i>	Bird expected to persist onsite if standard threat management procedures and guidelines are effective and implemented especially that of habitat connectivity.	
	High	<i>Daphoenositta chrysoptera</i>	Bird species locally extinct. Monitor to identify if it returns if standard threat management procedures and guidelines are effective and implemented.	
		<i>Acanthiza chrysorrhoa</i>		
		<i>Lucasium alboguttatum</i>	Reptiles that are difficult to sample but expected to persist onsite if standard threat management procedures and guidelines are effective and implemented. Opportunity for community-based research project	
	Medium	<i>Pletholax gracilis</i>	Reptiles that are difficult to sample but expected to persist onsite if standard threat management procedures and guidelines are effective and implemented. Opportunity for community-based research project	
		<i>Ramphotyphlops australis</i>		
		<i>Varanus gouldii</i>		
	Low	<i>Ctenotus australis</i>	Reptiles that are difficult to sample but expected to persist onsite if standard threat management procedures and guidelines are effective and implemented. Opportunity for community-based research project	
		<i>Ctenotus fallens</i>		
		<i>Pogona minor</i>		
		<i>Pseudonaja affinis</i>		
		<i>Myobatrachus gouldii</i>	Frog capable of surviving independent of wetlands Eats termites and other small invertebrates - increase lying deadwood and coarse woody material (>10 cm diameter) on ground.	
		<i>Ninox novaeseelandiae</i>	Nocturnal resident bird that requires tree hollows for breeding onsite. Expected to persist onsite if standard threat management procedures and guidelines are effective and implemented.	
		All perennial flora species, with priority being the 33 flora	Map species to facilitate restoration works that reduce fragmentation and increase species in low abundance	



		species listed in Table 15	
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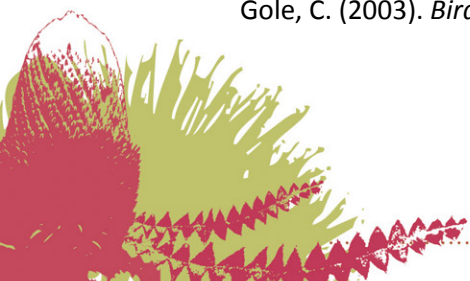


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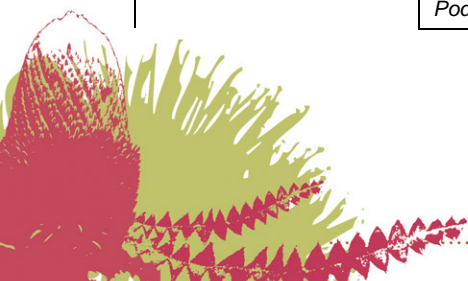


Appendix 1 Native Flora

Map = Confirmed and Distribution Mapped in Report

Table 50 Native Flora Inventory

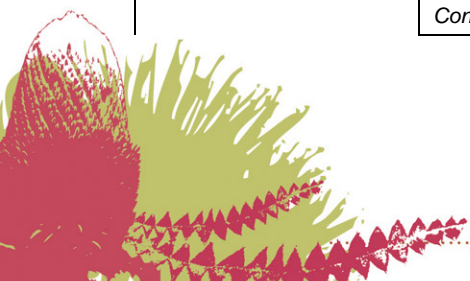
FAMILY	Taxa	Distribution/ Abundance (Creed, 2012) (McGrath, 1999)	Management Plan 1984	CALM Quadrats 1994	Management Plan 1999	Plants at Wireless Hill 1999	Wildflowers in Wireless Hill Park 2012	Orchid Survey 2010-2011	Flora Survey 2016
AMARANTHACEAE	<i>Ptilotus drummondii</i>	Scattered	1		1	1	1		
	<i>Ptilotus polystachyus</i>	Widespread	1		1	1	1		
ANARTHRIACEAE	<i>Lyginia barbata</i>	Scattered	1	1	1	1	1		
	<i>Lyginia imberbis</i>	Scattered				1			
APIACEAE	<i>Eryngium pinnatifidum</i> subsp. <i>pinnatifidum</i>	Widespread	1	1	1	1	1		
	<i>Homalosciadium homalocarpum</i>	-		1					
	<i>Xanthosia huegelii</i>	Scattered	1	1	1	1	1		
ARALIACEAE	<i>Trachymene pilosa</i>	Scattered		1	1	1	1		
ASPARAGACEAE	<i>Acanthocarpus preissii</i>	-	1		1				
	<i>Chamaescilla corymbosa</i> var. <i>corymbosa</i>	Scattered	1	1	1	1	1		
	<i>Laxmannia squarrosa</i>	Widespread	1		1	1	1		
	<i>Lomandra caespitosa</i>	Few		1	1	1			Map
	<i>Lomandra hermaphrodita</i>	Few			1	1	1		
	<i>Lomandra integra</i>	Few				1			Map
	<i>Lomandra nigricans</i>	Widespread	1		1	1	1		
	<i>Lomandra odora</i>	Scattered			1	1	1		
	<i>Lomandra preissii</i>	Widespread			1	1	1		
	<i>Lomandra suaveolens</i>	-			1				
	<i>Sowerbaea laxiflora</i>	Scattered	1	1	1	1	1		
	<i>Thysanotus arenarius</i>	Widespread			1	1	1	1	
	<i>Thysanotus manglesianus</i>	Occasional			1		1		
	<i>Thysanotus multiflorus</i>	-	1		1				
	<i>Thysanotus patersonii</i>	Scattered	1		1	1	1		
	<i>Thysanotus sparteus</i>	Widespread	1		1	1	1		
	<i>Thysanotus thyrsoides</i>	Scattered			1	1	1		
<i>Thysanotus triandrus</i>	Widespread			1	1	1			
ASTERACEAE	<i>Asteridea pulverulenta</i>	Widespread	1	1	1	1	1		
	<i>Brachyscome iberidifolia</i>	Scattered			1	1	1		
	<i>Craspedia variabilis</i>	Occasional				1			
	<i>Lagenophora huegelii</i>	Scattered		1	1	1	1		
	<i>Olearia elaeophila</i>	Few			1	1	1		
	<i>Pithocarpa cordata</i>	Few			1	1	1		
	<i>Podotheca angustifolia</i>	Scattered			1	1	1		
	<i>Podotheca chrysantha</i>	Scattered	1			1	1		
<i>Podotheca gnaphalioides</i>	Scattered			1	1	1			



FAMILY	Taxa	Distribution/ Abundance (Creed, 2012) (McGrath, 1999)	Management Plan 1984	CALM Quadrats 1994	Management Plan 1999	Plants at Wireless Hill 1999	Wildflowers in Wireless Hill Park 2012	Orchid Survey 2010-2011	Flora Survey 2016
	<i>Rhodanthe chlorocephala</i>	Occasional				1			
	<i>Senecio pinnatifolius</i>	Scattered			1	1	1		
	<i>Waitzia suaveolens</i>	Widespread	1		1	1	1		
BRASSICACEAE	<i>Stenopetalum gracile</i>	Scattered				1			
	<i>Stenopetalum robustum</i>	Occasional	1		1	1	1		
CAMPANULACEAE	<i>Isotoma hypocrateriformis</i>	Occasional			1	1	1		
	<i>Lobelia gibbosa</i>	Few	1		1	1	1		Map
	<i>Lobelia tenuior</i>	Scattered			1	1	1		
	<i>Wahlenbergia preissii</i>	Scattered		1	1	1	1		
CASUARINACEAE	<i>Allocasuarina fraseriana</i>	Widespread	1		1	1	1		Map
	<i>Allocasuarina humilis</i>	Widespread	1		1	1	1		
CELASTRACEAE	<i>Tripterooccus brunonis</i>	Scattered	1		1	1	1		
CENTROLEPIDACEAE	<i>Centrolepis drummondiana</i>	-		1					
COLCHICACEAE	<i>Burchardia congesta</i>	Widespread	1	1	1	1	1		
CRASSULACEAE	<i>Crassula colorata</i> var. <i>acuminata</i>	Scattered				1	1		
CYPERACEAE	<i>Lepidosperma aff. squamatum</i>	Occasional				1			
	<i>Lepidosperma angustatum</i>	Scattered	1		1	1	1		
	<i>Lepidosperma scabrum</i>	Scattered	1		1	1	1		
	<i>Lepidosperma</i> sp. (Coastal terete)	-		1					
	<i>Lepidosperma squamatum</i>	-		1					
	<i>Mesomelaena pseudostygia</i>	Widespread	1	1	1	1	1		
	<i>Schoenus clandestinus</i>	-		1					
	<i>Schoenus curvifolius</i>	Scattered			1	1	1		
	<i>Tetraria octandra</i>	Scattered	1	1	1	1	1		
DASYPOGONACEAE	<i>Calectasia narragara</i>	Widespread	1		1	1	1		
	<i>Dasyogon bromeliifolius</i>	Scattered	1	1	1	1	1		
DILLENIACEAE	<i>Hibbertia huegelii</i>	Widespread	1		1	1	1		
	<i>Hibbertia hypericoides</i>	Widespread	1	1	1	1	1		
	<i>Hibbertia racemosa</i>	Scattered	1		1	1	1		
	<i>Hibbertia subvaginata</i>	-			1				
DROSERACEAE	<i>Drosera erythrorhiza</i>	Widespread	1		1	1	1		
	<i>Drosera macrantha</i>	Widespread			1	1	1		
	<i>Drosera menziesii</i> subsp. <i>penicillaris</i>	Widespread	1		1	1	1		
	<i>Drosera paleacea</i> subsp. <i>paleacea</i>	Scattered			1	1	1		
	<i>Drosera pallida</i>	Widespread		1		1			
	<i>Drosera porrecta</i>	-			1				
	<i>Drosera stolonifera</i> subsp. <i>stolonifera</i>	Widespread	1	1	1	1	1		
EPACRIDACEAE	<i>Astroloma ciliatum</i>	Few			1	1	1		



FAMILY	Taxa	Distribution/ Abundance (Creed, 2012) (McGrath, 1999)	Management Plan 1984	CALM Quadrats 1994	Management Plan 1999	Plants at Wireless Hill 1999	Wildflowers in Wireless Hill Park 2012	Orchid Survey 2010-2011	Flora Survey 2016
	<i>Astroloma macrocalyx</i>	Few			1	1	1		Map
	<i>Astroloma pallidum</i>	Scattered	1		1	1	1		
	<i>Conostephium pendulum</i>	Widespread	1	1	1	1	1		
	<i>Conostephium preissii</i>	Scattered	1		1	1	1		
	<i>Leucopogon propinquus</i>	Widespread	1		1	1	1		
	<i>Leucopogon racemulosus</i>	-	1		1				
EUPHORBIACEAE	<i>Monotaxis grandiflora</i>	Scattered	1	1	1	1	1		
FABACEAE	<i>Acacia applanata</i>	Few				1			Map
	<i>Acacia huegelii</i>	Scattered	1		1	1	1		Map
	<i>Acacia pulchella</i>	Scattered	1		1	1	1		Map
	<i>Acacia saligna</i>	Scattered	1		1	1	1		
	<i>Acacia sessilis</i>	Occasional			1	1	1		
	<i>Acacia stenoptera</i>	Widespread	1	1	1	1	1		
	<i>Acacia willdenowiana</i>	Scattered	1	1	1	1	1		
	<i>Bossiaea eriocarpa</i>	Widespread	1		1	1	1		
	<i>Daviesia decurrens</i>	Occasional	1		1	1	1		
	<i>Daviesia divaricata</i> subsp. <i>divaricata</i>	Scattered	1	1	1	1	1		
	<i>Daviesia nudiflora</i> subsp. <i>nudiflora</i>	Scattered	1	1	1	1	1		
	<i>Daviesia physodes</i>	Scattered	1		1	1	1		
	<i>Daviesia triflora</i>	Widespread		1	1	1	1		
	<i>Gastrolobium capitatum</i>	Widespread	1	1	1	1	1		
	<i>Gastrolobium ebracteolatum</i>	-	1		1				
	<i>Gompholobium tomentosum</i>	Widespread	1	1	1	1	1		
	<i>Hardenbergia comptoniana</i>	Widespread	1	1	1	1	1		
	<i>Hovea trisperma</i> var. <i>trisperma</i>	Scattered	1	1	1	1	1		
	<i>Isotropis cuneifolia</i> subsp. <i>cuneifolia</i>	Widespread	1	1	1	1	1		
	<i>Jacksonia alata</i>	-	1		1				
	<i>Jacksonia furcellata</i>	Scattered	1		1	1	1		
	<i>Jacksonia sericea</i>	Widespread	1		1	1	1		Map
	<i>Jacksonia sternbergiana</i>	Widespread	1		1	1	1		
	<i>Kennedia prostrata</i>	Widespread	1	1	1	1	1		
GOODENIACEAE	<i>Dampiera linearis</i>	Widespread	1	1	1	1	1		
	<i>Lechenaultia floribunda</i>	Few	1		1	1	1		Map
	<i>Scaevola canescens</i>	Widespread	1	1	1	1	1		
	<i>Scaevola repens</i> var. <i>repens</i>	Scattered	1	1	1	1	1		
HAEMODORACEAE	<i>Anigozanthos humilis</i> subsp. <i>humilis</i>	Widespread	1		1	1	1		
	<i>Anigozanthos manglesii</i> subsp. <i>manglesii</i>	Widespread	1	1	1	1	1		
	<i>Conostylis aculeata</i>	Widespread	1	1	1	1	1		



FAMILY	Taxa	Distribution/ Abundance (Creed, 2012) (McGrath, 1999)	Management Plan 1984	CALM Quadrats 1994	Management Plan 1999	Plants at Wireless Hill 1999	Wildflowers in Wireless Hill Park 2012	Orchid Survey 2010-2011	Flora Survey 2016
	<i>Conostylis aurea</i>	Widespread			1	1	1		
	<i>Conostylis juncea</i>	Few	1		1	1			Map
	<i>Conostylis setigera</i> subsp. <i>setigera</i>	Widespread	1	1	1	1	1		
	<i>Haemodorum laxum</i>	-			1	1	1		
	<i>Haemodorum spicatum</i>	Scattered	1		1	1	1		
	<i>Phlebocarya ciliata</i>	Scattered	1		1	1	1		
	<i>Phlebocarya filifolia</i>	Scattered			1	1	1		
HALORAGACEAE	<i>Gonocarpus</i> sp.	-	1		1				
HEMEROCALLIDACEAE	<i>Arnocrinum preissii</i>	Widespread	1		1	1	1		
	<i>Caesia micrantha</i>	Scattered			1	1			
	<i>Corynotheca micrantha</i>	Scattered	1		1	1	1		
	<i>Dianella revoluta</i> var. <i>divaricata</i>	Scattered	1	1	1	1	1		
	<i>Johnsonia pubescens</i>	Few			1	1	1		
	<i>Tricoryne elatior</i>	Scattered	1		1	1	1		
IRIDACEAE	<i>Patersonia occidentalis</i>	Widespread	1	1	1	1	1		
JUNCACEAE	<i>Juncus subsecundus</i>	Few				1			
	<i>Luzula meridionalis</i>	Occasional			1	1	1		
LAMIACEAE	<i>Hemiandra pungens</i>	Scattered	1		1	1	1		
LORANTHACEAE	<i>Nuytsia floribunda</i>	Few	1		1	1	1		Map
MOLLUGINACEAE	<i>Macarthuria australis</i>	Widespread	1		1	1	1		
MYRTACEAE	<i>Babingtonia camphorosmae</i>	Scattered	1		1	1	1		Map
	<i>Calytrix flavescens</i>	Occasional	1		1	1	1		
	<i>Calytrix fraseri</i>	Scattered			1	1	1		
	<i>Corymbia calophylla</i>	Widespread	1	1	1	1	1		Map
	<i>Eremaea pauciflora</i>	Scattered	1		1	1	1		
	<i>Eucalyptus gomphocephala</i>	Few							Map
	<i>Eucalyptus marginata</i> subsp. <i>marginata</i>	Widespread	1	1	1	1	1		Map
	<i>Hypocalymma angustifolium</i>	Few				1			
	<i>Hypocalymma robustum</i>	Widespread	1		1	1	1		
	<i>Kunzea glabrescens</i>	Scattered				1			
	<i>Melaleuca systema</i>	Scattered				1			Map
	<i>Melaleuca trichophylla</i>	Few				1			Map
	<i>Regelia inops</i>	Few			1	1	1		Map
	<i>Scholtzia involocrata</i>	Few			1	1	1		Map
	<i>Verticordia densiflora</i> var. <i>densiflora</i>	Few	1		1	1	1		Map
ORCHIDACEAE	<i>Caladenia arenicola</i>	Scattered			1	1			Map
	<i>Caladenia discoidea</i>	Scattered	1		1	1	1		Map
	<i>Caladenia falcata</i>	Occasional							Map

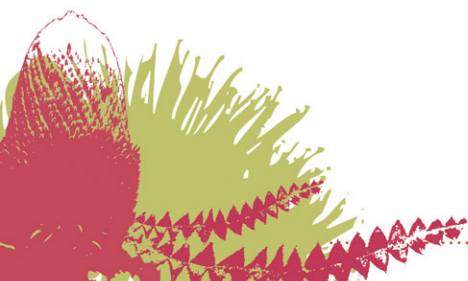


FAMILY	Taxa	Distribution/ Abundance (Creed, 2012) (McGrath, 1999)	Management Plan 1984	CALM Quadrats 1994	Management Plan 1999	Plants at Wireless Hill 1999	Wildflowers in Wireless Hill Park 2012	Orchid Survey 2010-2011	Flora Survey 2016
	<i>Caladenia flava</i> subsp. <i>flava</i>	Widespread	1		1	1	1	Map	
	<i>Caladenia georgei</i>	Scattered	1	1	1	1	1		
	<i>Caladenia latifolia</i>	Occasional			1	1	1	Map	
	<i>Caladenia longicauda</i>	Scattered	1		1	1	1	Map	
	<i>Cyanicula gemmata</i>	Few			1	1	1		
	<i>Diuris corymbosa</i> / <i>magnifica</i>	Widespread				1		Map	
	<i>Diuris longifolia</i>	Widespread	1	1	1	1	1		
	<i>Eriochilus dilatatus</i>	Occasional	1		1	1	1		
	<i>Lyperanthus serratus</i>	Scattered	1	1	1	1	1	Map	
	<i>Microtis media</i> subsp. <i>densiflora</i>	Scattered			1	1	1	Map	
	<i>Pheladenia deformis</i>	Few	1		1	1	1	Map	
	<i>Prasophyllum hians</i>	Scattered	1		1	1	1		
	<i>Prasophyllum parvifolium</i>	Few			1	1	1	Map	
	<i>Prasophyllum plumiforme</i>	Scattered				1		Map	
	<i>Pterostylis aff. nana</i>	Scattered				1			
	<i>Pterostylis barbata</i>	Few						Map	
	<i>Pterostylis recurva</i>	Few			1	1	1	Map	
	<i>Pterostylis sanguinea</i> / <i>vittata</i>	Widespread	1		2	1	1	Map	
	<i>Pyrorchis nigricans</i>	Scattered			1			Map	
	<i>Thelymitra campanulata</i>	-						Map	
	<i>Thelymitra crinita</i>	-						Map	
	<i>Thelymitra macrophylla</i>	Occasional				1		Map	
PHYLLANTHACEAE	<i>Phyllanthus calycinus</i>	Scattered	1		1	1	1		Map
PITTOSPORACEAE	<i>Billardiera fraseri</i>	Few				1			Map
POACEAE	<i>Amphipogon turbinatus</i>	Widespread		1	1	1	1		
	<i>Austrostipa compressa</i>	Widespread		1	1	1	1		
	<i>Neurachne alopecuroidea</i>	Occasional			1	1	1		
	<i>Poa drummondiana</i>	-		1					
POLYGALACEAE	<i>Comesperma calymega</i>	Scattered	1		1	1	1		
PORTULACACEAE	<i>Calandrinia corrigioloides</i>	Widespread			1	1	1		
	<i>Calandrinia liniflora</i>	Scattered			1	1	1		
PROTEACEAE	<i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i>	Widespread	1		1	1	1		
	<i>Banksia attenuata</i>	Widespread	1	1	1	1	1		
	<i>Banksia grandis</i>	Few	1		1	1	1		Map
	<i>Banksia ilicifolia</i>	Few	1		1	1	1		Map
	<i>Banksia lindleyana</i>	Scattered	1		1	1	1		
	<i>Banksia menziesii</i>	Widespread	1	1	1	1	1		Map
	<i>Banksia sessilis</i> var. <i>cygnorum</i>	Scattered	1		1	1	1		Map
	<i>Conospermum triplinervium</i>	Extinct	1		1	1	1		Map

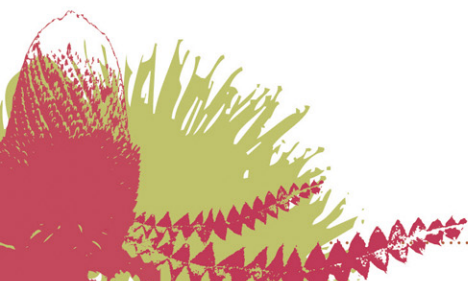


FAMILY	Taxa	Distribution/ Abundance (Creed, 2012) (McGrath, 1999)	Management Plan 1984	CALM Quadrats 1994	Management Plan 1999	Plants at Wireless Hill 1999	Wildflowers in Wireless Hill Park 2012	Orchid Survey 2010-2011	Flora Survey 2016
	<i>Dryandra lindleyana</i>	Widespread		1					
	<i>Grevillea vestita</i>	Scattered	1		1	1	1		Map
	<i>Hakea prostrata</i>	Scattered	1		1	1	1		
	<i>Persoonia saccata</i>	Scattered	1		1	1	1		Map
	<i>Petrophile linearis</i>	Widespread	1	1	1	1	1		
	<i>Petrophile macrostachya</i>	Widespread	1		1	1	1		
	<i>Stirlingia latifolia</i>	Widespread	1	1	1	1	1		
	<i>Synaphea spinulosa</i>	Scattered	1		1	1	1		Map
RESTIONACEAE	<i>Chordifex sinuosus</i>	Few				1			
	<i>Desmocladius fasciculatus</i>	Scattered		1	1	1	1		
	<i>Desmocladius flexuosus</i>	Scattered	1	1	1	1	1		
	<i>Hypolaena exsulca</i>	Widespread		1	1	1	1		
	<i>Lepidobolus chaetocephalus</i>	-			1				
	<i>Lepidobolus preissianus</i>	Scattered		1		1	1		
RUBIACEAE	<i>Opercularia vaginata</i>	Widespread	1		1	1	1		
RUTACEAE	<i>Boronia ramosa</i>	Occasional			1	1	1		
	<i>Philotheca spicata</i>	Occasional	1	1	1	1			
STYLIDIACEAE	<i>Levenhookia pusilla</i>	-	1		1				
	<i>Levenhookia stipitata</i>	Scattered			1	1	1		
	<i>Stylidium amoenum</i>	-	1		1				
	<i>Stylidium brunonianum</i>	Widespread	1		1	1	1		
	<i>Stylidium carnosum</i>	Scattered	1		1	1	1		
	<i>Stylidium piliferum</i>	Widespread	1		1	1	1		
	<i>Stylidium repens</i>	Few				1			Map
	<i>Stylidium schoenoides</i>	Scattered	1		1	1	1		
THYMELAEACEAE	<i>Pimelea rosea</i>	Scattered	1		1	1	1		Map
	<i>Pimelea sulphurea</i>	Widespread	1		1	1	1		
VIOLACEAE	<i>Hybanthus calycinus</i>	Widespread	1		1	1	1		
XANTHORRHOEACEAE	<i>Xanthorrhoea brunonis</i>	Widespread	1		1	1	1		
	<i>Xanthorrhoea preissii</i>	Widespread	1	1	1	1	1		
ZAMIACEAE	<i>Macrozamia fraseri</i>	Widespread	1	1	1	1	1		
	Total	219	130	65	184	194	168	19	33

Table 51 Dubious Flora Inventory



FAMILY	Taxa	Distribution/ Abundance	Management Plan 1984	CALM Quadrats 1994	Management Plan 1999	Plants at Wireless Hill 1999	Wildflowers in Wireless Hill Park 2012	Orchid Survey 2010-2011	Flora Survey 2016
ASTERACEAE	<i>Olearia axillaris</i>	Few							Map
CHENOPODIACEAE	<i>Rhagodia baccata</i>	Few							Map
MYRTACEAE	<i>Melaleuca preissiana</i>	Few							Map



Very High and High Value Native Flora Species

Astroloma macrocalyx, Swan Berry



Figure 66 *Astroloma macrocalyx* Photo



Figure 67 *Astroloma macrocalyx* Distribution 2016

Table 52 Abundance of *Astroloma macrocalyx* Shrubs in the City of Melville

Species	South-Eastern (uninfested) Reserves (2 reserves)	South-Eastern (infested) Reserves (8 reserves)#	Eastern Reserves (3 reserves)	Bullcreek Reserves (7 reserves)	North-West Reserves (3 reserves)	Estuarine Reserves+ (4 reserves)	Heathcote Reserve (1 reserve)	Wireless Reserve (1 reserve)	Piney Lakes Reserve (1 reserve)	Quenda (1 reserve)	Central (modified) (2 reserves)	Central (2 reserves)	Total (35 reserves)
<i>Astroloma macrocalyx</i>	0	0	0	0	?extinct	0	0	1	0	0	0	0	1

Astroloma macrocalyx, Swan Berry

- Occurs from Regans Ford to Williams (Barrett & Pin Tay, 2005)
- Occurs on grey or yellow sand (Barrett & Pin Tay, 2005)
- Occurs on Karrakatta and Bassendean soils (Powell & Emberson, 1996)
- Scattered in Kings Park (Barrett & Pin Tay, 2005)
- 'poorly reserved' in the region (Government of Western Australia, 2000)
- One plant recorded in Wireless Hill Park at a different location in 1999, just north of ring road (McGrath, 1999)

Banksia Tree Species

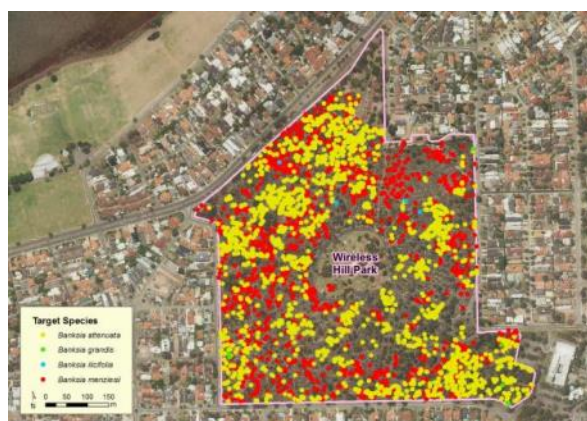


Figure 68 *Banksia* tree Distribution 2016

Table 53 Abundance of Banksia Trees in the City of Melville

Species	Wireless Reserve (1 reserve)	South-Eastern (infested) Reserves (8 reserves)#	Estuarine Reserves+ (4 reserves)	Piney Lakes Reserve (1 reserve)	Central (2 reserves)	Eastern Reserves (3 reserves)	Quenda (1 reserve)	Bullcreek Reserves (7 reserves)	Central (modified) (2 reserves)	North-West Reserves (3 reserves)	South-Eastern (uninfested) Reserves (2 reserves)	Heathcote Reserve (1 reserve)	Total (35 reserves)
<i>Banksia attenuata</i>	2218	578	98	110	207	28	10	22	65	>26*	16	7	3385
<i>Banksia grandis</i>	7	6	1	24	4	0	3	5	0	13	5	0	68
<i>Banksia ilicifolia</i>	4	138	0	0	1	16	0	22	0	1	6	0	188
<i>Banksia littoralis</i>	0	23	4^	91	0	0	140	0	0	0	0	0	258
<i>Banksia menziesii</i>	1529	694	177	202	180	152	20	78	46	>74*	48	40	3240
<i>Banksia prionotes</i>	0	0	168	0	0	52^	0	0	0	0	0	0	220
Total	3758	1439	448	427	392	248	173	127	118	114	75	47	7359

All trees counted except where * indicates only trees with trunk >30 cm diameter counted

^assumed planted

#updated to include Dudley Hartree

Banksia littoralis, Swamp Banksia

- Resprouts after fire (George, 1996)
- Occurs in low-lying winter damp areas, often in association with *Melaleuca preissiana* (George, 1996)
- Slow-growing, flowers 5-7 years after germinating from seed (Collins, Collins, & George, 2009)
- 85% of all known occurrences in Western Australia consist of less than 100 plants (Taylor & Hopper, 1991)

Banksia ilicifolia, Holly-leaved Banksia

- Is at significant risk of local extinction in Kings Park due to low abundance (Crosti, Dixon, Ladd, & Yates, 2007)

Banksia attenuata, Slender Banksia and *Banksia menziesii*, Firewood Banksia:

- Are both susceptible to dieback;
- Appear to be increasing in Ron Carroll Reserve as they recover from fire;
- Appear to be in decline in Heathcote Reserve, and the North-West and the Estuarine Reserves;
- Have both declined in Kings Park over a 60 year period due to post dispersal seed predation and seasonal deaths (Crosti, Dixon, Ladd, & Yates, 2007).
- Are both in lower densities in long isolated small urban bushland remnants (within 30 km of the Perth CBD on Bassendean or Spearwood soils), with high fire frequencies and declining water tables possibly amongst the contributing factors (Ramalho, 2012).

Banksia grandis, Bull Banksia

- Is at significant risk of local extinction in Kings Park due to its low abundance, where there was an average of 2.11 plants/ha over 267 hectare of bushland, or approximately 560 plants (Crosti, Dixon, Ladd, & Yates, 2007);
- The natural replacement rate is slow given it doesn't set seed until more than ten years old (George, 1996); and
- Seeds are generally deposited within 15 metres of the parent plant (Powell, 2009).



Conospermum triplinervium, Tree Smokebush



Figure 69 *Conospermum triplinervium* Photo

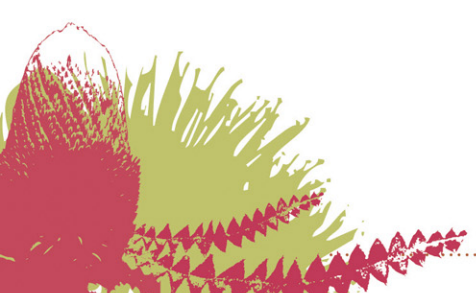
Table 54 Abundance of *Conospermum triplinervium* Trees in the City of Melville

Species	South-Eastern (uninfested) Reserves (2 reserves)	South-Eastern (Infested) Reserves (8 reserves)#	Eastern Reserves (3 reserves)	Bullcreek Reserves (7 reserves)	North-West Reserves (3 reserves)	Estuarine Reserves+ (4 reserves)	Heathcote Reserve (1 reserve)	Wireless Reserve (1 reserve)	Piney Lakes Reserve (1 reserve)	Quenda (1 reserve)	Central (modified) (2 reserves)	Central (2 reserves)	Total (35 reserves)
<i>Conospermum triplinervium</i>	0	0	0 (extinct)	0	1	0	0 (extinct)	0 (extinct)	3 [^]	0	3	0	7

^assumed planted

Conospermum triplinervium, Tree Smokebush:

- Previously recorded, but now extinct in Wireless Hill Park
- Limited to a small area in the southern part of Wireless Hill Park, just east of the slab path in 1999 (McGrath, 1999)
- Also previously recorded, but now extinct at Point Walter and Heathcote
- Ambiguous whether planted in Ken Ingram Park and Piney Lakes Reserve
- On the Swan Coastal Plain it usually grows in sand over limestone (Powell, 2009) and is present, but with a restricted habitat, in Kings Park (Main & Serventy, 1957)
- Some individuals and populations are fire sensitive as most plants lack a lignotuber, although a few plants in Kings Park have regenerated from lignotubers (Bennett, 2013) and plants resprouted after a fire in 1992 at Point Walter (Greening Western Australia Point Walter Group, 1994)
- Easy to propagate and rapidly establishes (can reach 3 metres and flowers in 3 years) (Sainsbury, 1991)
- Different forms of species exist (Sainsbury, 1991) so source of propagation material important



Jacksonia sericea



Figure 70 *Jacksonia sericea* Photo



Figure 71 *Jacksonia sericea* Distribution 2016

Table 55 Abundance of *Jacksonia sericea* Shrubs in the City of Melville

Species	South-Eastern (uninfested) Reserves (2 reserves)	South-Eastern (infested) Reserves (8 reserves)#	Eastern Reserves (3 reserves)	Bullcreek Reserves (7 reserves)	North-West Reserves (3 reserves)	Estuarine Reserves+ (4 reserves)	Heathcote Reserve (1 reserve)	Wireless Reserve (1 reserve)	Piney Lakes Reserve (1 reserve)	Quenda (1 reserve)	Central (modified) (2 reserves)	Central (2 reserves)	Total (35 reserves)
<i>Jacksonia sericea</i>	0	0	0	0	0	0	0	>1300	@^	0	0	9^	>1300

@present but not counted

^assumed planted

Jacksonia sericea:

- Occurs from Neerabup National Park, through suburban Perth, to the Mandurah-Pinjarra area (Kelly, Taylor, Langley, Spooner, & Coates, 1993)
- Typically occurs on Cottesloe soils (Powell & Emberson, 1996)
- Previously estimated >1300 plants in Wireless Hill Park (Kelly, Taylor, Langley, Spooner, & Coates, 1993)
- Grows on sandy or calcareous soils, often overlying limestone, in *Banksia menziesii*-*Banksia attenuata* open woodland or low heath, sometimes in association with *Eucalyptus marginata* and *Eucalyptus gomphocephala* (Kelly, Taylor, Langley, Spooner, & Coates, 1993)
- More abundant in open areas and can be favoured by disturbance (Kelly, Taylor, Langley, Spooner, & Coates, 1993)
- Is listed as Priority 4 species by DPaW, which means it is considered either Rare, Near Threatened or in need of monitoring
 - (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.
 - (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for Vulnerable, but are not listed as Conservation Dependent.
 - (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Melaleuca systema, Coastal Honeymyrtle



Figure 72 *Melaleuca systema* Photo



Figure 73 *Melaleuca systema* Distribution 2016

Table 56 Abundance of *Melaleuca systema* Shrubs in the City of Melville

Species	South-Eastern (uninfested) Reserves (2 reserves)	South-Eastern (infested) Reserves (8 reserves)#	Eastern Reserves (3 reserves)	Bullcreek Reserves (7 reserves)	North-West Reserves (3 reserves)	Estuarine Reserves+ (4 reserves)	Heathcote Reserve (1 reserve)	Wireless Reserve (1 reserve)	Piney Lakes Reserve (1 reserve)	Quenda (1 reserve)	Central (modified) (2 reserves)	Central (2 reserves)	Total (35 reserves)
<i>Melaleuca systema</i>	0	0	0	0	0	142	extinct	10	0	0	0	0	152

@present but not counted

^assumed planted

Melaleuca systema:

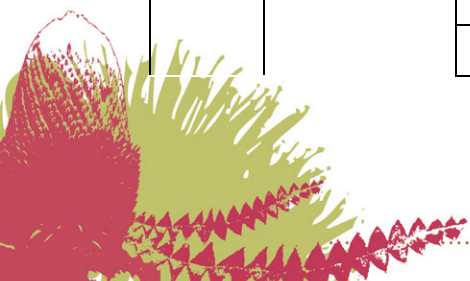
- Common on limestone and dune areas, particularly heathland in secondary dunes (Dixon, 2011).
- Potential establishment sites on limestone outcrops in Point Walter and Heathcote Reserves.
- Readily propagated from seed (Dixon, 2011).
- Exceptional species for coastal restoration with rapid growth, long life expectancy and abundant flowering within two years of planting. Must be planted with species of similar growth forms such as *Olearia axillaris* and *Phyllanthus calycinus*. Avoid exposed sites as the species is particularly susceptible to wind and salt damage (Dixon, 2011)
- Potential to be confused with superficially similar small *Kunzea glabrescens*, Spearwood.

Appendix 2 Weeds

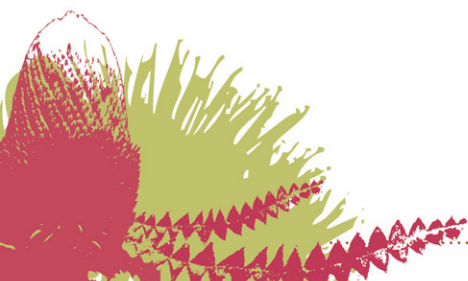
Table 57 Weed Inventory

Impact	Weed Group / Species	FAMILY	Species	Common Name	Management Plan 1984	CALM Quadrats 1994	Management Plan 1999	Plants at Wireless Hill 1999	Wildflowers in Wireless Hill Park 2012	Flora Survey 2016
Very High	Brazilian Pepper	Anacardiaceae	<i>Schinus terebinthifolius</i>	Brazilian Pepper			1			Figure 74
	Bridal Creeper	Asparagaceae	<i>Asparagus asparagoides</i>	Bridal Creeper						
	Soldiers	Asparagaceae	<i>Lachenalia reflexa</i>	Soldiers		1	1	1	1	
	Perennial Clumping Grass	Poaceae	<i>Ehrharta calycina</i>	Perennial Veldt Grass	1	1	1		1	Figure 75
			<i>Eragrostis curvula</i>	African Lovegrass			1		1	
			<i>Lolium perenne</i>	Perennial Ryegrass					1	
High	Annual Clumping Grasses	Poaceae	<i>Avena barbata</i>	Bearded Oat	1		1			Figure 76
			<i>Avena fatua</i>	Wild Oat		1			1	
			<i>Bromus diandrus</i>	Great Brome			1		1	
			<i>Ehrharta longiflora</i>	Annual Veldt Grass					1	
			<i>Lagurus ovatus</i>	Hare's Tail Grass	1		1			
	Clumping Geophytes	Iridaceae	<i>Ferraria crispa</i>	Black Flag						Figure 77
			<i>Freesia alba x leichtlinii</i>	Freesia	1		1		1	
			<i>Moraea miniata</i>	Two-leaf Cape Tulip						
			<i>Watsonia meriana var. bulbifera</i>	Bugle Lily			1		1	
			<i>Gladiolus caryophyllaceus</i>	Wild Gladiolus	1	1	1	1	1	
			<i>Romulea flava</i>						1	
			<i>Romulea rosea</i>	Guildford Grass			1	1	1	
			<i>Oxalis glabra</i>	Fingerleaf Oxalis			1	1	1	
	<i>Oxalis pes-caprae</i>	Soursob			1	1	1			
	Perennial Running Grasses	Poaceae	<i>Cenchrus longisetus</i>	Feathertop	1		1			Figure 78
	Shrubs and Trees	Apocynaceae	<i>Nerium oleander</i>	Oleander			1			Figure 79
		Casuarinaceae	<i>Allocasuarina species</i>	Sheoak						
		Cupressaceae	<i>Callitris preissii</i>	Rottnest Island Pine, Maro						
		Fabaceae	<i>Acacia iteaphylla</i>	Flinders Range Wattle						
<i>Acacia longifolia</i>			Sydney Golden Wattle							
<i>Acacia podalyriifolia</i>			Queensland Silver Wattle							
<i>Chamaecytisus palmensis</i>			Tagasaste			1				
<i>Daviesia aphylla</i>				1		1				
<i>Daviesia gracilis</i>				1		1				
Malvaceae		<i>Brachychiton populneus</i>	Kurrajong							
Meliaceae		<i>Melia azedarach</i>	White Cedar			1				
Myrtaceae		<i>Agonis flexuosa</i>	Peppermint							
	<i>Callistemon species</i>	Bottlebrush								
	<i>Calothamnus</i>	One-sided					1			

Impact	Weed Group / Species	FAMILY	Species	Common Name	Management Plan 1984	CALM Quadrats 1994	Management Plan 1999	Plants at Wireless Hill 1999	Wildflowers in Wireless Hill Park 2012	Flora Survey 2016	
			<i>quadrifidus</i>	Bottlebrush							
			<i>Chamelaucium uncinatum</i>	Geraldton Wax	1		1	1	1		
			<i>Corymbia citriodora</i>	Lemon Scented Gum				1			
			<i>Eucalyptus caesia</i>	Caesia				1			
			<i>Eucalyptus cladocalyx</i>	Sugar Gum				1			
			<i>Eucalyptus erythrocorys</i>	Illyarrie					1	1	
			<i>Eucalyptus species</i>	Gum Tree							
			<i>Leptospermum laevigatum</i>	Coast Teatree							
			<i>Lophostemon confertus</i>	Queensland Box Tree							
			<i>Melaleuca nesophila</i>	Mindiyed							
			<i>Melaleuca scabra</i>	Rough Honeymyrtle			1		1	1	
		Oleaceae	<i>Olea europaea</i>	Olive							
		Proteaceae	<i>Banksia baxteri</i>	Baxter's Banksia						1	
			<i>Banksia ericifolia</i>							1	
			<i>Banksia hookeriana</i>	Hooker's Banksia						1	
			<i>Banksia media</i>	Southern Plains Banksia						1	
			<i>Banksia praemorsa</i>	Cut-leaf Banksia						1	
			<i>Grevillea olivacea</i>	Olive Grevillea							
			<i>Hakea bucculenta</i>	Red Pokers						1	
			<i>Hakea coriacea</i>	Pink Spike Hakea							1
<i>Hakea laurina</i>	Pincushion Hakea						1				
<i>Hakea species</i>	Hakea										
<i>Hakea victoria</i>	Royal Hakea							1			
Medium	Other Perennial Weeds	Aizoaceae	<i>Carpobrotus edulis</i>	Hottentot Fig	1		1	1			
		Asphodelaceae	<i>Trachyandra divaricata</i>		1		1				
		Asteraceae	<i>Gazania linearis</i>	Gazania			1				
		Fabaceae	<i>Daviesia gracilis</i>		1		1				
		Geraniaceae	<i>Pelargonium capitatum</i>	Rose Pelargonium	1	1	1	1	1	Figure 80	
		Poaceae	<i>Cenchrus echinatus</i>	Burrgrass				1			
			<i>Cenchrus setaceus</i>	Fountain Grass				1		1	
Low	Annual Weeds	Asteraceae	<i>Arctotheca calendula</i>	Cape Weed		1	1	1	1		
			<i>Conyza bonariensis</i>	Flaxleaf Fleabane			1				
			<i>Conyza sumatrensis</i>							1	
			<i>Hypochaeris glabra</i>	Smooth Catsear	1	1	1				
			<i>Monoculus monstrosus</i>	Stinking Roger		1	1	1	1		
			<i>Sonchus oleraceus</i>	Common Sowthistle		1					
			<i>Ursinia anthemoides</i>	Ursinia	1	1	1	1	1		
		Brassicaceae	<i>Brassica barrelieri</i> subsp. <i>oxyrrhina</i>	Smooth-stem Turnip						1	



Impact	Weed Group / Species	FAMILY	Species	Common Name	Management Plan 1984	CALM Quadrats 1984	Management Plan 1999	Plants at Wireless Hill 1999	Wildflowers in Wireless Hill Park 2012	Flora Survey 2016
		Brassicaceae	<i>Heliophila pusilla</i>				1		1	
		Campanulaceae	<i>Wahlenbergia capensis</i>	Cape Bluebell	1	1	1	1	1	
		Caryophyllaceae	<i>Petrorhagia dubia</i>			1				
			<i>Petrorhagia velutina</i>	Velvet Pink			1	1	1	
			<i>Silene gallica</i>	French Catchfly	1	1	1	1	1	
		Cyperaceae	<i>Isolepis marginata</i>	Coarse Club-rush			1	1		
		Euphorbiaceae	<i>Euphorbia peplus</i>	Petty Spurge					1	
		Fabaceae	<i>Lupinus cosentinii</i>	Sandplain Lupin			1			
		Fabaceae	<i>Medicago polymorpha</i>	Burr Medic					1	
			<i>Trifolium angustifolium</i>	Narrowleaf Clover				1	1	
			<i>Trifolium arvense</i>	Hare's Foot Clover	1		1		1	
			<i>Trifolium campestre</i>	Hop Clover					1	
			<i>Trifolium hirtum</i>	Rose Clover					1	
		Geraniaceae	<i>Erodium botrys</i>	Long Storksbill			1		1	
			<i>Erodium moschatum</i>	Musky Crowfoot					1	
		Orobanchaceae	<i>Orobanche minor</i>	Lesser Broomrape			1		1	
		Papaveraceae	<i>Fumaria capreolata</i>	Whiteflower Fumitory					1	
		Poaceae	<i>Aira caryophyllea</i>	Silvery Hairgrass		1				
			<i>Briza maxima</i>	Blowfly Grass	1	1	1	1	1	
			<i>Briza minor</i>	Shivery Grass		1	1			
		Primulaceae	<i>Lysimachia arvensis</i>	Pimpernel			1		1	
		Scrophulariaceae	<i>Dischisma capitatum</i>	Woolly-headed Dischisma			1	1	1	
		Solanaceae	<i>Solanum nigrum</i>	Black Berry Nightshade					1	
				94	19	16	50	28	41	47



Weed Distributions

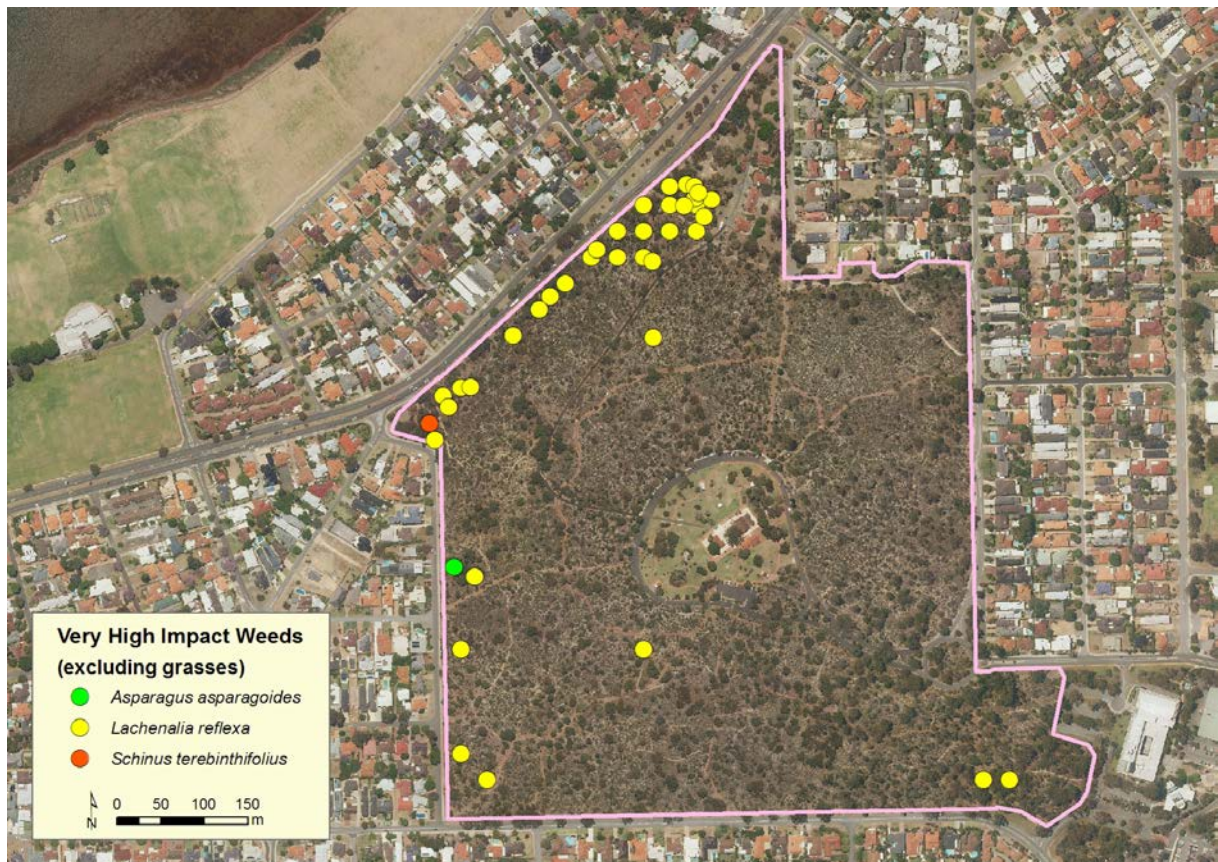


Figure 74 Very High Impact Weeds (excluding grasses)

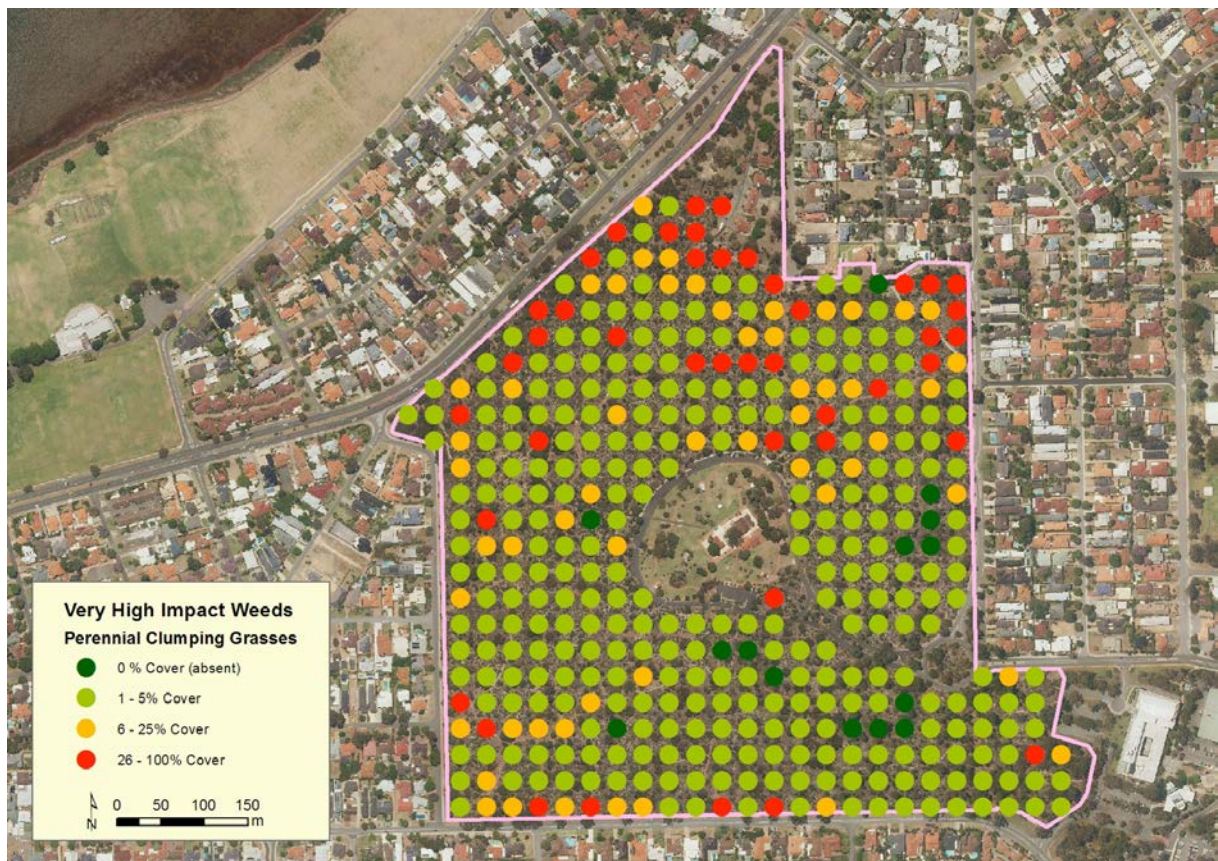


Figure 75 Very High Impact Perennial Clumping Grasses



Figure 76 High Impact Annual Clumping Grasses



Figure 77 High Impact Weeds (geophytes)



Figure 78 Very High Impact Perennial Running Grasses

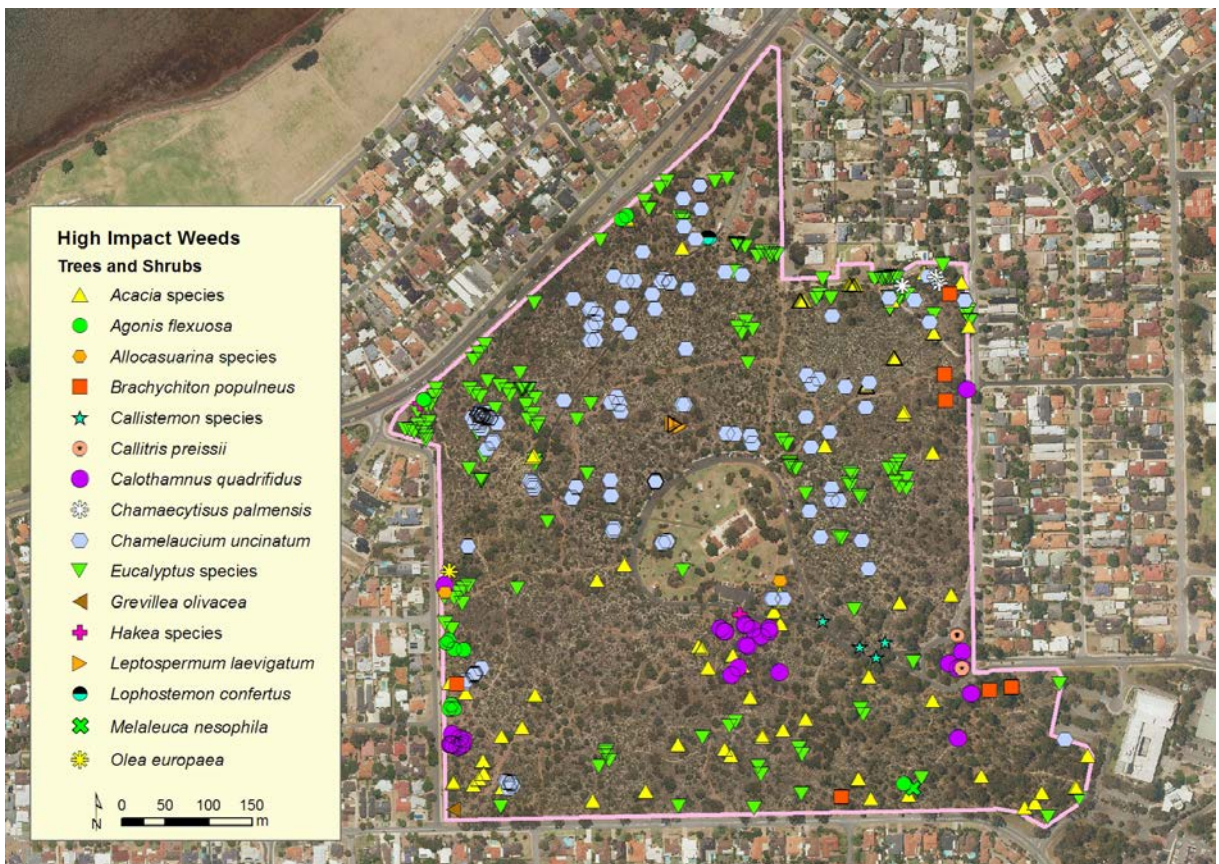


Figure 79 High Impact Weeds (shrubs and trees)



Figure 80 Medium Impact Perennial Weeds



Figure 81 Low Impact Annual Weeds



Appendix 3 Native Fauna

Locally extinct species excluded from list

“At Risk” categories

(species of particular sensitivity in urban areas):

X = listed as “at risk” by City of Melville

= additionally identified by BCE

“D” = deleted/removed by BCE

Status categories:

CS 1 = listed under legislation

CS2 = listed as Priority by DPaW.

Survey categories:

Shading = not surveyed at that time

No shading = surveyed at that time

Population categories:

R = Resident

Mb. = Regular breeding migrant

Mnb = Regular non-breeding migrant

Vis = Visitor

Vag = Vagrant

Table 58 Native Mammal Inventory

Family	Species	At risk category	Conservation Status	City of Melville Population	Wireless Hill Park Population	Confirmed 1983	Confirmed 1998	Confirmed 2003	Confirmed 2001-2005	Confirmed 2016
Vespertilionidae (vesper bats)	Gould's Wattle Bat <i>Chalinolobus gouldii</i>	X		R	R					1

Table 59 Native Reptile and Amphibian Inventory

Family	Species	At risk category	Conservation Status	City of Melville Population	Wireless Hill Park Population	Confirmed 1983	Confirmed 1998	Confirmed 2003	Confirmed 2001-2005	Confirmed 2016
Myobatrachidae (ground frogs)	Turtle Frog <i>Myobatrachus gouldii</i>	#		R	R		1			
Gekkonidae (geckoes)	White-spotted Ground Gecko <i>Lucasium alboguttatum</i>					1				
Pygopodidae (legless lizards)	Keeled Legless Lizard <i>Pletholax gracilis</i>	X		R	R	1				
Agamidae (dragon lizards)	Western Bearded Dragon <i>Pogona minor</i>	#		R	R	1	1			
Varanidae (monitors or goannas)	Gould's Sand Goanna <i>Varanus gouldii</i>	X		R	R	1	1			
Scincidae (skink lizards)	Fence Skink <i>Cryptoblepharus buechananii</i>			R	R		1			1
	West Coast Ctenotus <i>Ctenotus fallens</i>	#		R	R	1				
	Western Limestone Ctenotus <i>Ctenotus australis</i>	#		R	R	1	1			
	Two-toed Earless Skink <i>Hemiergis quadrilineata</i>			R	R		1			
	Perth Lined Lerista <i>Lerista lineata</i>	X	CS2	R	R		1			
	Dwarf Skink <i>Menetia greyii</i>			R	R	1	1			
	Bobtail Skink <i>Tiliqua rugosa</i>	#		R	R	1	1			1
Typhlopidae (blind snakes)	Southern Blind Snake <i>Ramphotyphlops australis</i>	X		R	R	1				
Elapidae (front-fanged snakes)	Dugite <i>Pseudonaja affinis</i>	#		R	R		1			

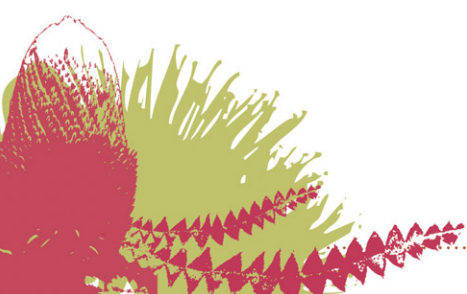
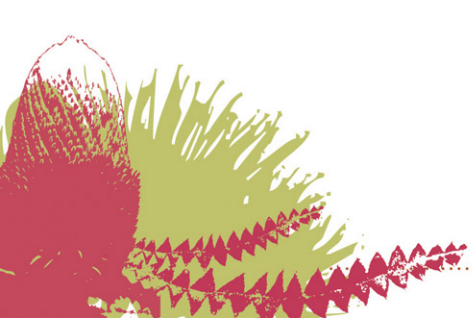


Table 60 Native Bird Inventory

Family	Species	At risk category	Conservation Status	City of Melville Population	Wireless Hill Park Population	Confirmed 1983	Confirmed 1998	Confirmed 2003	Confirmed 2001-2005	Confirmed 2016
Columbidae (pigeons and doves)	Common Bronzewing <i>Phaps chalcoptera</i>	X		Vis	Vag			1		
Ardeidae (herons and egrets)	Australian White Ibis <i>Threskiornis molucca</i>			Vis	Vis					1
Accipitridae (kites, hawks and eagles)	Collared Sparrowhawk <i>Accipiter cirrhocephalus</i>			R	R			1		1
Falconidae (falcons)	Nankeen Kestrel <i>Falco cenchroides</i>			R	Vis	1				
Turnicidae (button-quails)	Painted Button-quail <i>Turnix varia</i>	X		R	Vis			1		1
Cacatuidae (cockatoos)	Forest Red-tailed Black-Cockatoo <i>Calyptorhynchus banksii naso</i>	X	CS1	R	Vis					1
	Carnaby's Black-Cockatoo <i>Calyptorhynchus latirostris</i>	X	CS1	M?b	Vis	1		1		1
	Galah <i>Cacatua roseicapilla</i>	D		R	Vis			1		
Psittacidae (lorikeets and parrots)	Australian Ringneck <i>Barnardius zonarius</i>	X		R	R	1		?b		1
	Red-capped Parrot <i>Purpureicephalus spurius</i>	X		R	R	1		?b		1
Cuculidae (cuckoos)	Fan-tailed Cuckoo <i>Cuculus pyrrhophanus</i>	#		Mb	Vag	1				
Strigidae (hawk-owls)	Southern Boobook Owl <i>Ninox novaeseelandiae</i>	#		R	R	1				
Halcyonidae (forest kingfishers)	Sacred Kingfisher <i>Todiramphus sanctus</i>	X		Mb	Mb	1				
Meropidae (bee-eaters)	Rainbow Bee-eater <i>Merops ornatus</i>	X	CS1	Mb	Mb	1		b		
Acanthizidae (thornbills and allies)	Weebill <i>Smicrornis brevirostris</i>	X		R	R					1
	Western Gerygone <i>Gerygone fusca</i>			R	R	1		1		1
	Inland Thornbill <i>Acanthiza apicalis</i>	X		R	R	1		1		
	Yellow-rumped Thornbill <i>Acanthiza chrysorrhoa</i>	X		R	E	1				
Pardalotidae (pardalotes)	Striated Pardalote <i>Pardalotus striatus</i>	X		R	R	1		b		1
Meliphagidae (honeyeaters)	Western Spinebill <i>Acanthorhynchus superciliosus</i>	X		R	Vag			1		
	Singing Honeyeater <i>Lichenostomus virescens</i>			R	R	1		1		1
	Western Wattlebird <i>Anthochaera lunullata</i>	X		R	R					1
	Red Wattlebird <i>Anthochaera carunculata</i>			R	R	1		?b		1
	Tawny-crowned Honeyeater <i>Glyciphila melanops</i>	#		Vis	Vag			1		
	Brown Honeyeater <i>Lichmera indistincta</i>			R	R	1		1		1
	New Holland Honeyeater <i>Phylidonyris novaehollandiae</i>	X		R	R			1		1
	White-cheeked Honeyeater <i>Phylidonyris nigra</i>			R	R			?b		1
Neosittidae (sittellas)	Varied Sittella <i>Daphoenositta chrysoptera</i>	#		E	E			1		
Campephagidae (cuckoo-shrikes)	Black-faced Cuckoo-shrike <i>Coracina novaehollandiae</i>			R	R	1		1		1
Pachycephalidae (whistlers)	Rufous Whistler <i>Pachycephala rufiventris</i>	#		R	Vis	1		1		
Artamidae (woodswallows)	Grey Butcherbird <i>Cracticus torquatus</i>			R	R	1		1		1
	Australian Magpie <i>Gymnorhina tibicen</i>			R	R	1		1		1
Rhipiduridae (fantails, willie wagtail)	Grey Fantail <i>Rhipidura fuliginosa</i>	#		R	R	1				1
	Willie Wagtail <i>Rhipidura leucophrys</i>			R	R			1		1
Corvidae (ravens and crows)	Australian Raven <i>Corvus coronoides</i>			R	R	1		1		1
Monarchidae (flycatchers)	Magpie-lark <i>Grallina cyanoleuca</i>			R	R	1		1		
Timaliidae (white-eyes)	Silvereye <i>Zosterops lateralis</i>			R	R	1		1		1
Hirundinidae (swallows)	Welcome Swallow <i>Hirundo neoxena</i>			R	Vis	1		1		1
	Tree Martin <i>Hirundo nigricans</i>	X		R	Vis	1		1		1

Table 61 Native Invertebrate Inventory

Family	Species	At risk category	Conservation Status	City of Melville Population	Wireless Hill Park Population	Confirmed 1983	Confirmed 1998	Confirmed 2003	Confirmed 2001-2005	Confirmed 2016
Castniidae (Moths)	<i>Synemon</i> sp. (Perth)	X			R				1	
Lycaenidae (Butterflies)	Fringed Blue <i>Neolucia agricola</i>	X			R				1	
	Grass-blue Butterfly <i>Zinia otis labrudus</i>				R				1	
	Long-tailed Pea-blue <i>Lampides boeticus</i>				Vis				1	
Nymphalidae (Butterflies)	Australian Painted Lady <i>Vanessa kershawi</i>				Vis				1	
	Klug's Xenica <i>Geitoneura klugii</i>				R				1	



Appendix 4 Non-native Fauna

Survey categories:

Shading = not surveyed at that time

No shading = surveyed at that time

?b = potential to breed onsite but not confirmed

Table 62 Feral Animal Inventory

	Family	Species	Confirmed 1983	Confirmed 2003	Confirmed 2001-2005	Confirmed 2017
Mammals	Muridae (rats and mice)	House Mouse <i>Mus musculus</i>	1			
		Brown Rat <i>Rattus norvegicus</i>				1
		Black Rat <i>Rattus rattus</i>				1
	Leporidae (rabbits and hares)	Rabbit <i>Oryctolagus cuniculus</i>				
	Canidae (foxes and dogs)	European Red Fox <i>Vulpes vulpes</i>				1
	Felidae (cats)	Feral Cat <i>Felis catus</i>				
Birds	Columbidae (pigeons and doves)	Rock Dove <i>Columba livia</i>		1		
		Spotted Dove <i>Streptopelia chinensis</i>	1	1		
		Laughing Dove <i>Streptopelia senegalensis</i>	1	?b		
	Cacatuidae (cockatoos)	Eastern Long-billed Corella <i>Cacatua tenuirostris</i>				1
	Psittacidae (lorikeets and parrots)	Rainbow Lorikeet <i>Trichoglossus moluccanus</i>		1		
	Halcyonidae (forest kingfishers)	Laughing Kookaburra <i>Dacelo novaeguineae</i>	1	1		
Invertebrates	Nymphalidae (Butterflies)	Monarch <i>Danaus plexippus</i>			1	
	Pieridae (Butterflies)	Cabbage White Butterfly <i>Pieris rapae</i>			1	

