SHIRE OF toodyay
place of plenty

LOCAL BIODIVERSITY STRATEGY 2024-2035

Safeguarding the Legacy of Nature: A Commitment to Conserve and Restore

Adopted by Council on 18 December 2024 (CRN: OCM324/12/24)

Acknowledgement of Country

The Shire of Toodyay acknowledges the traditional custodians of this land, the Noongar people, encompassing the Yued, Ballardong, and Whadjuk language groups.

We pay tribute to the elders—past, present, and emerging—who have cared for and sustained this land for generations. Their enduring stewardship and profound knowledge enrich our community and guide our efforts to preserve and enhance biodiversity within the Shire. We recognize and honor the ongoing contributions of all Aboriginal and Torres Strait Islander peoples, which are vital to the cultural fabric of our region.

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Artwork Title: Three Moort (families)
Artist: Sarah Miles
Description: The image represents the area across Toodyay Valley where three Noongar language groups—Yued, Ballardong, and Whadjuk—lived.

President's Message

I am pleased to present the Shire of Toodyay's Local Biodiversity Strategy. The Strategy was developed using detailed mapping and geographical information, research on biodiversity, and networking with stakeholders to gather their insights. A review of an early draft has resulted in a more user friendly and less cost intensive Strategy.

This Strategy focuses on steps that can be actioned rather than just detailed and complex information. It is hoped that the Strategy will facilitate effective implementation and present opportunities for community engagement.

I would like to extend my thanks to **Mrs Zenab Azam**, our Environmental Sustainability Officer, whose dedication and expertise were keys to crafting this comprehensive strategy.

I encourage our community to actively engage with this Strategy, and continue to participate in conservation efforts in the Shire.

Cr Mick McKeown,
President, Shire of Toodyay

About the Shire

The Shire of Toodyay is a picturesque region renowned for its rolling hills, rich history, and strong sense of community. As one of Western Australia's oldest towns, Toodyay boasts a charming blend of heritage architecture and modern amenities. Located approximately 85 kilometres east of Perth, Toodyay is a gateway to the Avon Valley, a region celebrated for its natural beauty and diverse ecosystems. A significant portion of the Shire's population engages in hobby farming, contributing to its agricultural character and rural identity.

The Shire supports a variety of habitats including jarrah and wandoo woodlands, wildflowers, seasonal wetlands, and remnant vegetation crucial for the survival of native species. The native species such as the Carnaby's Black Cockatoo and the Western Brush Wallaby highlight the region's importance for conservation.

Looking ahead, the Shire is committed to enhancing its biodiversity through collaborative partnerships with local stakeholders, government agencies, and community groups. Key priorities include expanding wildlife corridors, protecting critical habitats, and promoting sustainable land management practices. By integrating biodiversity conservation into planning and development frameworks, the Shire aims to ensure that future generations can continue to enjoy and benefit from Toodyay's natural heritage.

"This document is delivered by the Shire of Toodyay with support from the Western Australian Government's State NRM Program and WALGA"

Executive Summary

What?

Biodiversity is simply the variety of life found in a particular place. It's about all the different plants, animals, and tiny living things that share our surroundings.

Now What?

The local biodiversity strategy aims to conserve the natural diversity by protecting, enhancing, and managing significant remnant vegetation within shire of Toodyay.

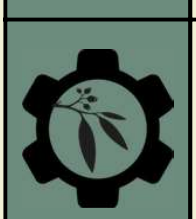
So What?

The Shire, renowned for its unique biodiversity, is now facing a decrease in its variety of species, primarily attributed to unfortunate historical decisions and habitat loss due to anthropogenic activities.

Vision

To protect, retain and enhance areas of native vegetation and natural biodiversity in the shire of Toodyay, to preserve biodiversity

To achieve, our Shire will focus on four goals:

	**Protect** Protect biodiversity in Shire of Toodyay through planning, decision making, and commitment to implementation.
	**Restore** Restoring the natural environment in the Shire of Toodyay by habitat rehabilitation and revegetation.
	**Enhance** Enhance biodiversity by appropriate management, awareness, and reducing biodiversity threats.
	**Collaborate** Foster collaboration among educational institutions, public, and Aboriginal owners to enhance regional biodiversity.

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1.0 Introduction

1.1 What is Biodiversity?

Biodiversity is used to describe the variety of life on Earth. It encompasses the diverse range of plants, animals, microorganisms, and the ecosystems they inhabit. From the towering trees of a forest to the microscopic bacteria in a handful of soil, biodiversity is the foundation of our planet's health and well-being.

This diversity is essential for the functioning of ecosystems, providing services such as clean air, water purification, climate regulation, and food production. It also underpins human well-being, contributing to our cultural, spiritual, and economic needs.

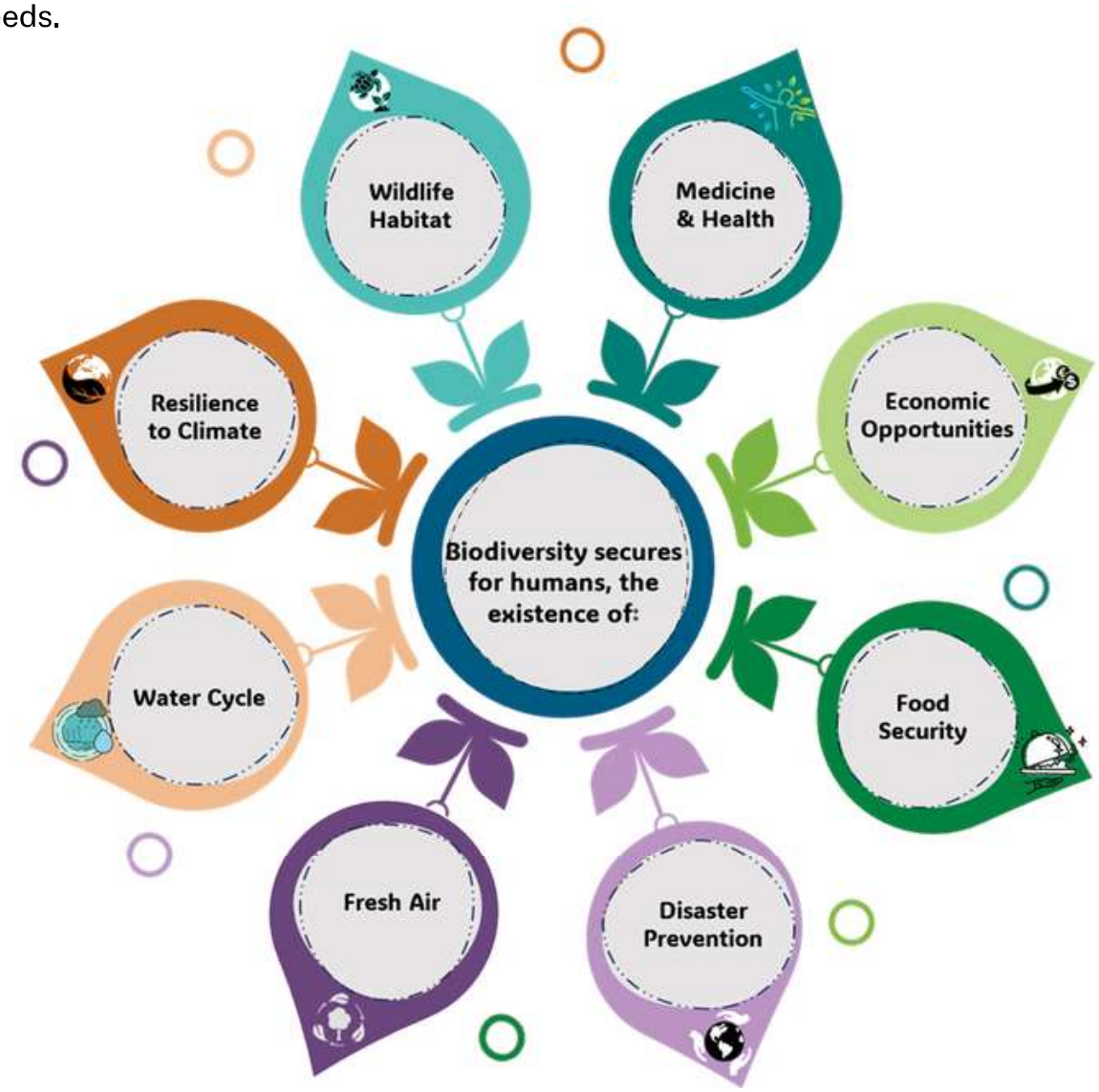


Figure 1.1: Importance of biodiversity

1.0 Introduction

1.2 Cutural Ties to Biodiversity by Indigenous People

The Noongar people, as traditional custodians of the Shire of Toodyay for over 45,000 years, have a deep, enduring connection to the land, viewing it as a living entity imbued with spirit. This connection is not only physical but also cultural and spiritual, with sacred sites such as **Bilya** (waterways), **Worl** (the sky), **Djirda** (birds), **Boya** (rocks), **Kaart** (granite outcrops), **Bidi** (Tracks) and **Boorn** (trees) playing a central role in their traditions. These natural features are integral to Noongar cultural identity, reflecting creation stories and guiding their role as caretakers of the environment. This relationship between land, culture, and spirituality is fundamental to how the Noongar people manage the landscape.

Noongar land management is based on principles of sustainability and balance, with practices that have been passed down through generations. A key method, **firestick farming** (controlled burning), is used to regenerate plant life, reduce bushfire risks, and enhance biodiversity. Seasonal patterns, guided by the six **Noongar bonar** (seasons), inform resource management, ensuring that only what is necessary is taken from the land. This holistic approach supports the health of both the environment and the Noongar community, ensuring a balanced and sustainable use of natural resources.

Biodiversity is also of critical importance to the Noongar people, as it is intricately linked to their cultural heritage and the health of the environment. Sacred waterways, for example, hold ecological significance and are central to cultural practices.

However, colonisation drastically altered this balance, severing Noongar people from their waterways and disrupting traditional practices tied to these landscapes. The loss of access to sacred sites, along with the environmental degradation caused by colonial land management, has led to both cultural and ecological dislocation.

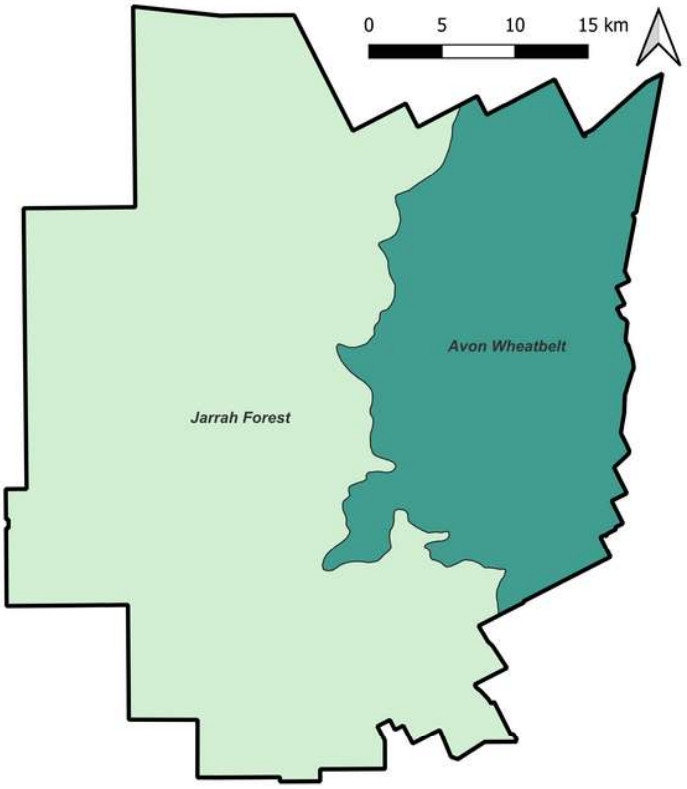
The Noongar Kaartdijin Aboriginal Corporation contributed to the preparation of this content.

2.0 Biodiversity in Toodyay

2.1 Biodiversity in the Shire of Toodyay

2.1.1 Flora and Fauna

The Shire of Toodyay is located in the south-western region of Western Australia, renowned for its exceptional biodiversity. Approximately 48% of the Shire is covered by relatively intact remnant vegetation, although pressures from clearing, development, and other human activities have impacted these valuable ecosystems.



The region is characterised by a mosaic of vegetation communities, including jarrah and wandoo woodlands, crucial for supporting a diverse range of native flora and fauna. The Shire is renowned for its natural beauty, characterized by vibrant wildflowers and a diverse range of endemic bird species. Significant portions of remnant vegetation are located in public reserves and private lands, with many bush remnants being relatively small in size (detailed information is listed in Appendix A as per DBCA priority list).

Priority Flora
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Priority Fauna
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Threatened Ecological Communities
3

2.0 Biodiversity in Toodyay

2.2 Biodiversity Assets in the Shire of Toodyay

2.2.1 Waterways*

The waterways of the Shire of Toodyay are an important part of the region's natural environment and culture. The Noongar people's deep connection to waterways, particularly through the spiritual presence of the **Wagyl** (Creator / Spirit Snake), emphasizes the interconnectedness of cultural and environmental biodiversity. The Wagyl, a powerful creator spirit, is believed to have carved out the rivers, waterbodies, and landscapes, embodying both life force and ecological balance.

These waterways are not just physical entities that benefit biodiversity; they carry spiritual significance, sustaining cultural practices, stories, and the very essence of Noongar identity. All waterways are sacred sites. By caring for these waterways, the Noongar people uphold their responsibility to the land and its ecosystems, integrating traditional ecological knowledge with biodiversity conservation. This connection highlights how water bodies are crucial to maintaining spiritual, cultural, and biological diversity.

Waterways as a Food Source

Waterways and wetlands have long provided Noongar people with essential food resources, including fish, duck, frogs, turtles, and a variety of aquatic plants, which are deeply embedded in their traditional diets and cultural practices. These water sources are not only vital for sustenance but are also part of a broader ecological knowledge system that ensures sustainable harvesting and respect for the land.

Seasonal Burning of Wetlands

The seasonal burning of wetlands, an important traditional practice, was used as a land management tool to promote the health of these ecosystems.

These controlled burns helped regenerate plant life, attract wildlife, flush out small reptiles, and maintain the biodiversity necessary to sustain food sources. This practice, passed down through generations, reflects a profound understanding of the interconnectedness between fire, land, and water, playing a crucial role in both food security and ecosystem health. Integrating these time-honoured methods with contemporary biodiversity strategies can enhance the sustainability of wetland environments. The wetlands are shown in Figure 2.1.

**The Noongar Kaartdijin Aboriginal Corporation contributed to the preparation of this content.*

2.0 Biodiversity in Toodyay

2.2 Biodiversity Assets in the Shire of Toodyay

The Avon River, a key waterway, flows through Toodyay, forming a critical part of the larger Avon catchment area, which eventually connects to the Swan River. This river system supports diverse ecosystems and provides essential water resources for agriculture, wildlife, and human use. Additionally, smaller creeks and tributaries in the region contribute to the hydrological network, maintaining soil health and biodiversity. The Avon River's riparian zones are rich with native flora and fauna, playing a key role in flood management and water filtration. The detail of the reserves is listed in table B1 that can be found in Appendix B.

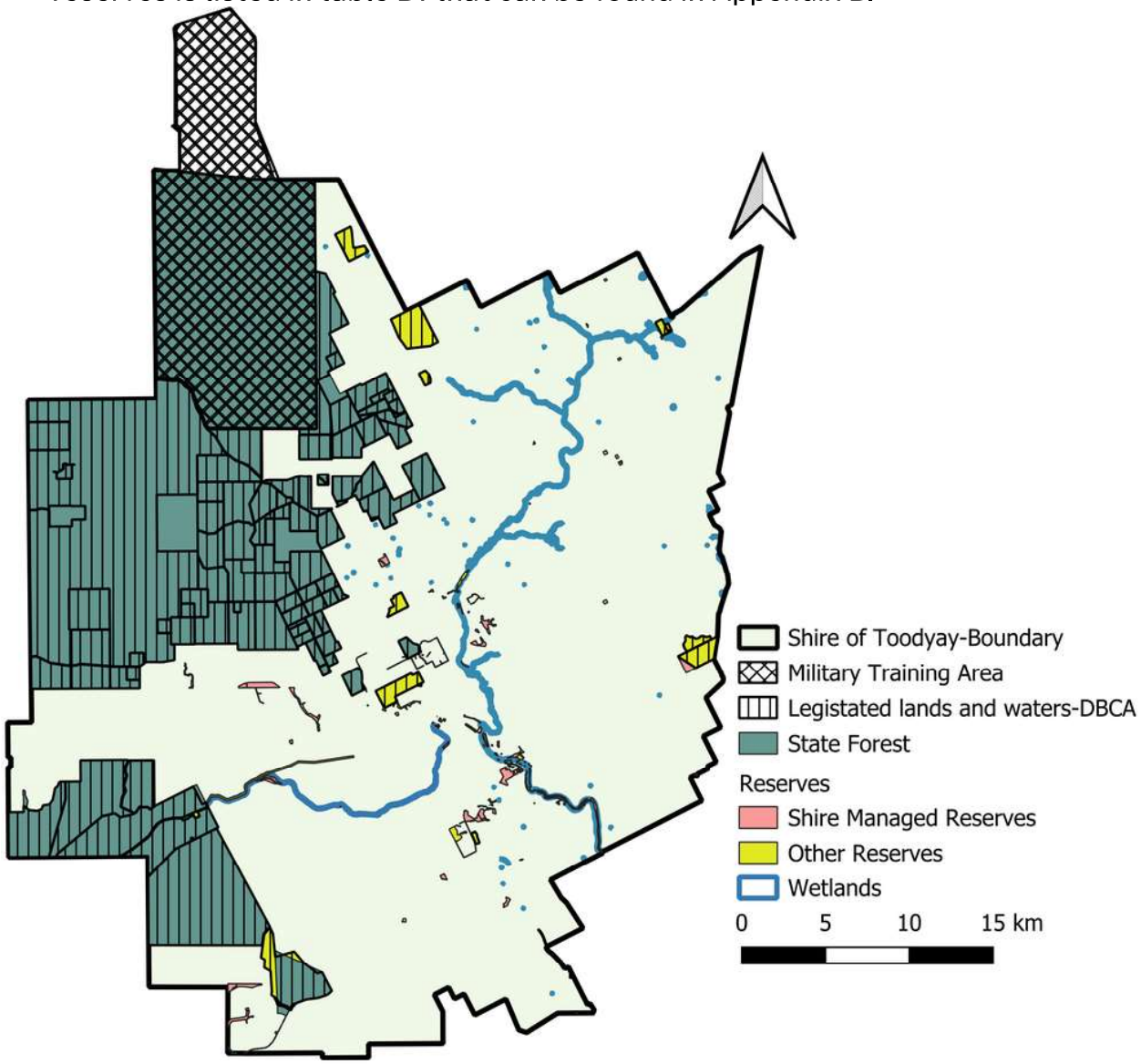


Figure 2.1: Biodiversity Assets in the Shire of Toodyay (DBCA,2018)

2.0 Biodiversity in Toodyay

2.2 Biodiversity Assets in the Shire of Toodyay

2.2.2 Vegetation Complexes

Vegetation complexes are a way of describing and classifying areas of land according to their plant communities and the physical environment. This includes factors like soil type, landforms, and climate. Each complex represents a unique combination of these features and supports specific types of vegetation. The Shire of Toodyay is located on the Darling Plateau, which contains a variety of landforms such as valleys, uplands, and swamps. These landforms host different vegetation complexes, each with a unique extent and conservation status. The map of the vegetation complexes is shown in Figure 2.3, which illustrates the current extent of the vegetation complexes.

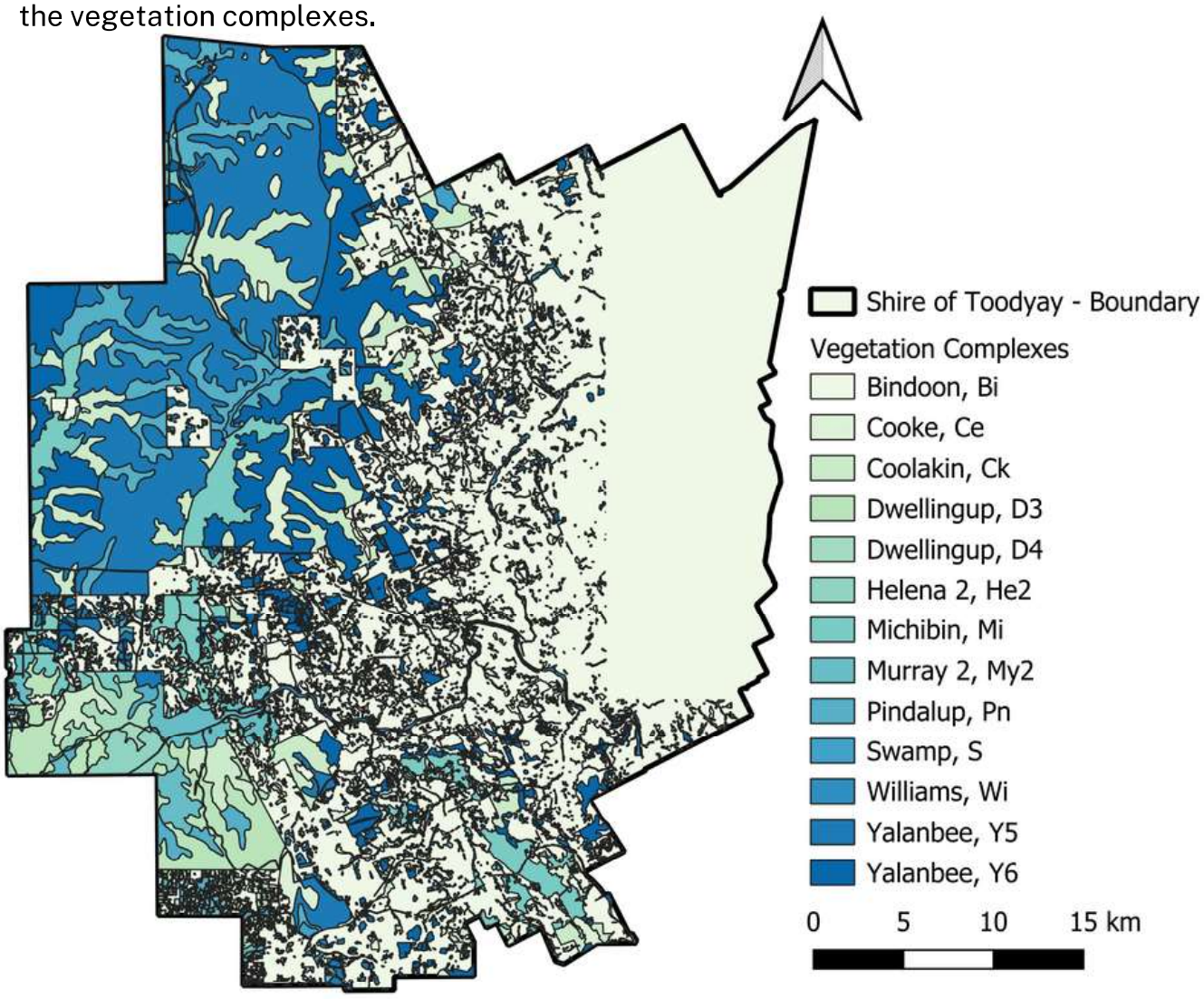


Figure 2.2: Current Vegetation Complexes in the Shire of Toodyay

2.0 Biodiversity in Toodyay

2.2 Biodiversity Assets in the Shire of Toodyay

2.2.2 Vegetation Complexes

Table 01 below highlights key vegetation complexes in the region, providing details on their pre-European extent (before settlement) and current extent (the area left). The percentage left reveals the extent of vegetation loss over time.

Table 01: Vegetation complexes within the Shire of Toodyay (DBCA, 2019)

Subregion of the South-West Forests	Broad landform	Vegetation Complex Name	Pre-European Extent (ha)	Current Extent (ha)	% Remaining*	Proportion of the Vegetation Complex Class Mapping extent within Shire of Toodyay (%)
Darling Plateau	Valleys	Bindoon	25,361.25	8,213.67	32.39	70.34
Darling Plateau	Valleys	Coolakin	24,258.29	12,276.15	50.61	14.79
Darling Plateau	Uplands	Cooke	2,050.84	1,864.29	90.90	5.58
Darling Plateau	Uplands	Dwellingup, D3	5,488.52	4,365.02	79.53	58.48
Darling Plateau	Uplands	Dwellingup, D4	2,062.06	1,214.70	58.91	1.56
Darling Plateau	Valleys	Helena 2	819.57	808.97	98.71	5.02
Darling Plateau	Valleys	Michibin	13,085.62	7,248.62	55.39	7.79
Darling Plateau	Valleys	Murray 2	3,342.38	2,568.80	76.86	5.63
Darling Plateau	Valleys	Pindalup	7,885.59	6,311.38	80.04	4.72
Darling Plateau	Depressions and Swamps on Uplands	Swamp	485.21	384.12	79.17	0.90
Darling Plateau	Valley Floors and Swamps	William	3,283.36	831.11	25.31	11.33
Darling Plateau	Uplands	Yalanbee,Y5	21,389.19	18,455.40	86.28	16.89
Darling Plateau	Uplands	Yalanbee, Y6	30,742.06	16,540.4	53.80	15.54
	Highlighted vegetation complexes have less than 30% of pre-European extent remaining at bioregional level.					
	Highlighted vegetation complexes have less than 15% of pre-European extent remaining at Shire level.					

2.0 Biodiversity in Toodyay

2.2 Biodiversity Assets in the Shire of Toodyay

2.2.3 Vegetation Associations

Vegetation associations are groupings of plant species that naturally grow together in specific environments, shaped by factors such as soil type, climate, and topography. Unlike vegetation complexes, which describe broader landform and environmental features, vegetation associations focus on the specific plant species that coexist in an area. These associations are important for understanding local biodiversity and how different plant communities interact within their habitats.

In the Shire of Toodyay, various vegetation associations occur across different bioregions, including the Avon Wheatbelt and Jarrah Forest. Each association supports unique plant species, playing a vital role in the local ecosystem. The table below (Table 02) and Figure 2.3 provides details on the Pre-European extent of these vegetation associations and current extent of these vegetation associations.

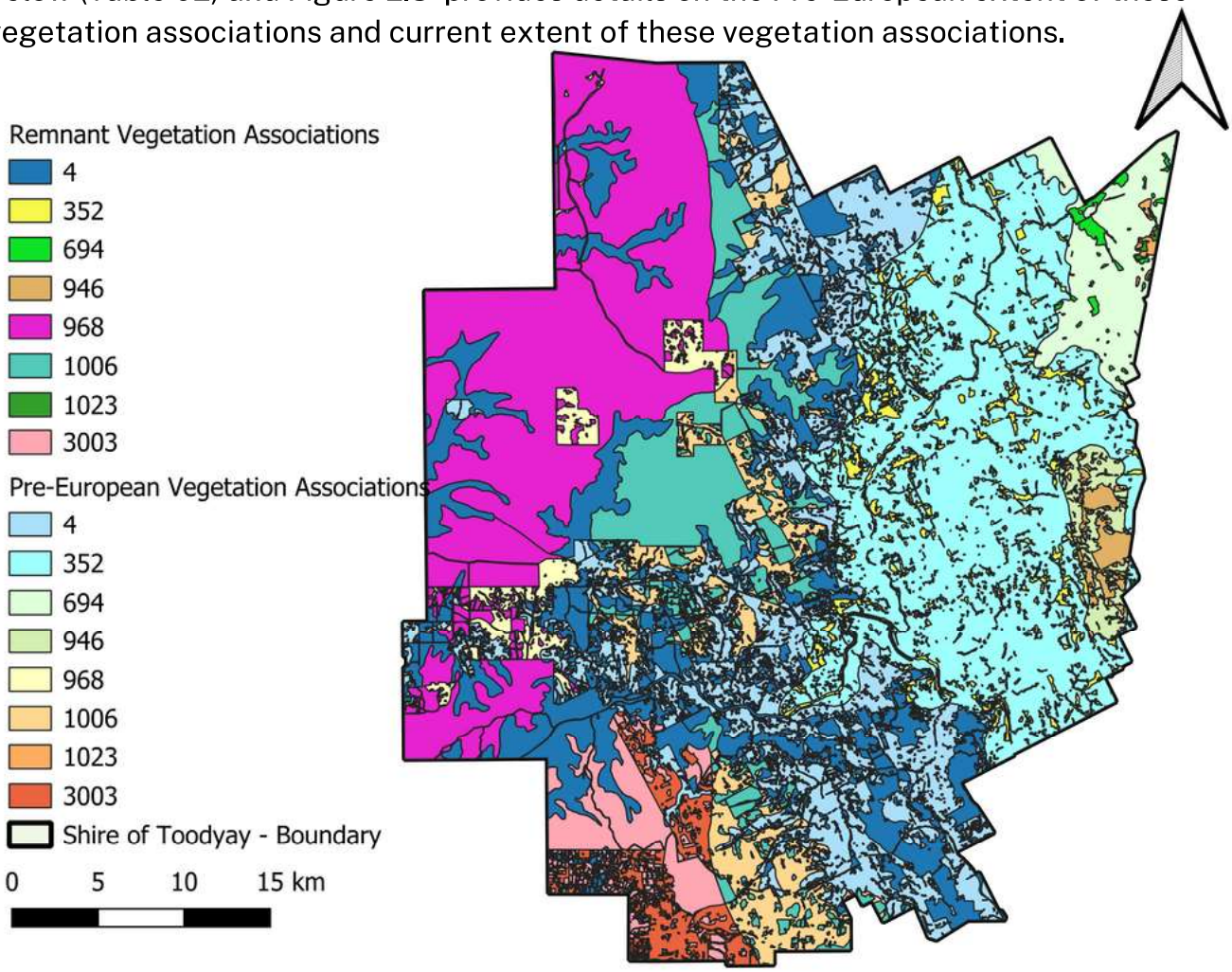


Figure 2.3: Pre-European and Current Extent of Vegetation Associations in the Shire of Toodyay

2.0 Biodiversity in Toodyay

2.2 Biodiversity Assets in the Shire of Toodyay

2.2.3 Vegetation Associations

Vegetation associations in the Shire of Toodyay are quite diverse, ranging from forests dominated by gum trees to mixed woodlands. While some of these associations have seen significant reductions, others remain relatively well-preserved.

Table 02: Summary of Vegetation Associations and Extent in the Shire of Toodyay (DPIRD, 2020)

Bioregion	System	Vegetative Association	Description	Pre-European Extent in the Shire of Toodyay (ha)	Current Extent in the Shire of Toodyay (ha)	Percentage of Vegetative Association Remaining (%)
Avon Wheatbelt	Bannister	4	Wheatbelt; York gum, salmon gum etc. Eucalyptus loxophleba, E. salmonophloia. Goldfields; gimlet, redwood etc. E. salubris, E. oleosa. Riverine; rivergum E. camaldulensis. Tropical; messmate, woolyb	35832.69	15287.45	42.66
	Goomalling	694	Jarrah, marri and wandoo, Eucalyptus marginata, Corymbia calophylla, E. wandoo.	6022.57	531.41	8.82
		1023	Jarrah, marri and wandoo Eucalyptus marginata, Corymbia calophylla, E. wandoo.	211.69	63.41	29.95
	York	352	Jarrah, marri and wandoo, Eucalyptus marginata, Corymbia calophylla, E. wandoo.	43375.13	6009.22	13.85
		946	Jarrah, marri and wandoo, Eucalyptus marginata, Corymbia calophylla, E. wandoo.	3103.78	1267.47	40.84

2.0 Biodiversity in Toodyay

Bioregion	System	Vegetative Association	Description	Pre-European Extent in the Shire of Toodyay (ha)	Current Extent in the Shire of Toodyay (ha)	Percentage of Vegetative Association Remaining (%)
Jarrah Forest	Bannister	4	Wheatbelt; York gum, salmon gum etc. Eucalyptus loxophleba, E. salmonophloia. Goldfields; gimlet, redwood etc. E. salubris, E. oleosa. Riverine; rivergum E. camaldulensis. Tropical; messmate, woolyb	35832.69	15287.45	42.66
		1006	Jarrah, marri and wandoo, Eucalyptus marginata, Corymbia calophylla, E. wandoo.	20929.17	12781.67	61.07
	Chittering	4	Jarrah, marri and wandoo, Eucalyptus marginata, Corymbia calophylla, E. wandoo.	4963.81	4669.33	94.07
		968	Jarrah, marri and wandoo, Eucalyptus marginata, Corymbia calophylla, E. wandoo.	26257.28	24768.76	94.33
	East Darling	4	Jarrah, marri and wandoo, Eucalyptus marginata, Corymbia calophylla, E. wandoo.	10202.89	7447.78	72.99
		968	Jarrah, marri and wandoo, Eucalyptus marginata, Corymbia calophylla, E. wandoo.	7995.35	6310.75	78.93
		3003	Jarrah, marri and wandoo, Eucalyptus marginata, Corymbia calophylla, E. wandoo.	9278.415	5684.82	61.27

2.0 Biodiversity in Toodyay

Bioregion	System	Vegetative Association	Description	Pre-European Extent in the Shire of Toodyay (ha)	Current Extent in the Shire of Toodyay (ha)	Percentage of Vegetative Association Remaining (%)
Jarrah Forest	Mogumber	4	Jarrah, marri and wandoo, Eucalyptus marginata, Corymbia calophylla, E. wandoo.	982.126	664.907	67.70
	York	352	Jarrah, marri and wandoo, Eucalyptus marginata, Corymbia calophylla, E. wandoo.	43375.13	6009.22	13.85
	Total			248362.74	106783.64	
	Highlighted vegetation complexes have less than 30% of pre-European extent remaining at bioregional level.					
	Highlighted vegetation complexes have less than 15% of pre-European extent remaining at bioregional level					

2.2.4 Natural Areas

The reserves and Local Natural Areas (LNAs) in the Shire of Toodyay are vital for preserving local biodiversity and supporting ecological health. These areas provide essential habitats for a wide variety of native flora and fauna, including several threatened and priority species like Grevillea flexuosa, Grevillea West Toodyay and others. By protecting and managing these areas, the Shire helps maintain ecological balance, safeguard genetic diversity, and preserve ecosystems critical for wildlife survival. In a landscape increasingly impacted by agriculture, urban development, and climate change, these reserves and LNAs act as refuges for native species, offering vital protection.

2.0 Biodiversity in Toodyay

2.2 Biodiversity Assets in the Shire of Toodyay

LNAs in the Shire cover approximately 85,231 hectares, with 31,551 hectares in private ownership and 395 hectares on land managed by the Shire itself. These areas exist outside proclaimed water catchments, DBCA-managed lands, and regional parks, making them critical to the overall conservation efforts in the region. They play a crucial role in supporting threatened species and maintaining ecological linkages, which are essential for species movement, genetic exchange, and long-term resilience.

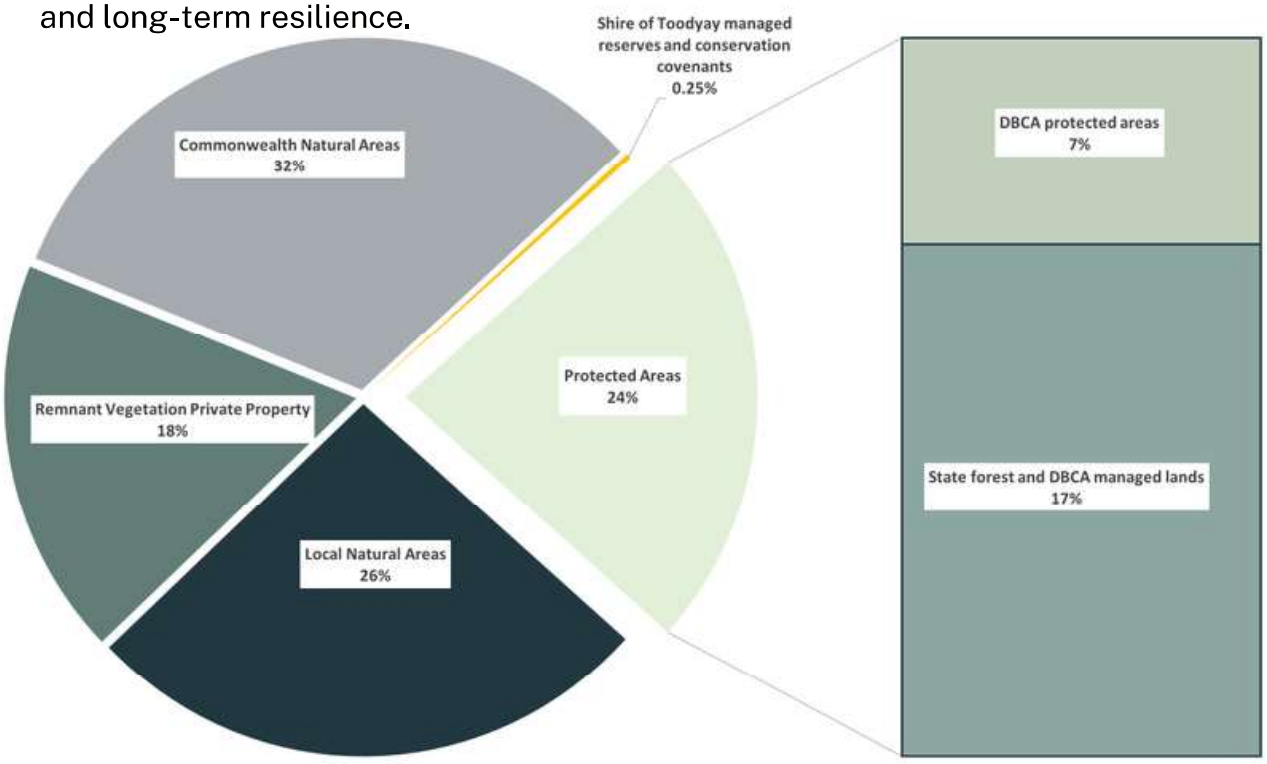


Figure 2.4: Division of biodiversity assets in the Shire of Toodyay (DPIRD, 2020)

2.3 Ecological Linkages in the Shire of Toodyay

Ecological linkages are crucial networks that connect various natural habitats across a landscape, facilitating the movement of plant and animal species between them. These connections help maintain biodiversity by linking isolated habitats, allowing species to migrate, find resources, and exchange genetic material. This connectivity supports the viability of species populations, preserves a diverse range of ecosystems, and enhances the overall ecological health of the region. Additionally, ecological linkages bolster resilience to environmental changes, support essential ecological processes like pollination and seed dispersal, and contribute to the provision of vital ecosystem services.

2.0 Biodiversity in Toodyay

Guiding Principles for Establishing Ecological Linkages (Del Marco et al 2004, Davis and Brooker 2008, Molloy et al. 2009):

- Aim for a heterogeneous matrix of habitats rather than a homogenous one. Utilise existing native vegetation matrix and complex landscapes with minimal disturbance.
- The widest possible diversity of habitat types should be sought within a linkage with similar habitats (preferably) with less than 500 m – 1000 m apart.
- Where continuous stands of native vegetation are not available, ecological linkages should be made up of remnants that form stepping stones between larger intact patches.
- Provision of large regional linkages is preferable in supporting a wide range of communities and species, supporting their movement over generations to localised corridors.
- Regional corridors should be 500 m wide where possible and a minimum of 300 m.
- The number of linkages connecting to any given patch should be maximized as this improves overall connectivity and long-term viability.
- Ecological linkages should be selected along directions that facilitate normal migrations and aid in adaptation of species and assemblages to climate change, such as North-South, East-West, high points in the landscape, riparian communities. Patches at high points in the landscape, in the line of sight of other patches are important for species dispersal and home range utilisation.
- Re-vegetation is a viable strategy for establishing or strengthening corridors in cleared landscapes, with priority given to opportunities to expand existing remnant vegetation. Aim to form continuous vegetated linkages or corridors at least 100 m wide. If this is not possible, ensure stepping stones of reconstructed or created habitat are at least 2 ha to 4 ha in size and no more than 500 m to 1000 m apart.
- Avoid or mitigate impacts of gaps in linkages caused by roads and other barriers to fauna mobility.
- Open canopies over highly disturbed understorey may be of little value, except for highly mobile species.

2.0 Biodiversity in Toodyay

2.3 Ecological Linkages in the Shire of Toodyay

Habitat fragmentation is recognised as contributing to biodiversity decline (McKinney 2002). Landscape connectivity is essential for both plant and animal species population viability. However, pressures from expanding urban areas and land clearing have negative impacts on landscape connectivity. It is becoming increasingly apparent that there is a role for private land conservation to play in the maintenance of habitat corridor networks and landscape connectivity.

In the Perth Metropolitan Region and the Southwest of Western Australia, regional ecological linkages were identified by WALGA's Biodiversity Projects (Del Marco et al. 2004). Regional linkages connect regionally significant natural areas and provide a framework within which Local Governments can identify local ecological linkages. The local linkages identified within Figure 2.6 aim to connect locally significant natural areas to other locally and regionally significant areas. The viability of any natural area depends on its proximity to other natural areas, the quality of linkages or barriers in the landscape between them (Del Marco et al 2004). Ecological linkages should include the major variations in plant communities and fauna habitat typical of the region.

To provide continuity with connecting boundaries to neighbouring Shires, connectivity analysis was based on the methodology detailed in the Shire of Northam Local Biodiversity Strategy prepared by WALGA (2015). 'Patches' were defined as a mapped, contiguous unit of vegetation derived from the current remnant vegetation extent (DPIRD, 2020). A measure of fragmentation was considered a proxy for connectivity for this analysis to inform the designation of ecological linkages (Figure 2.5). Fragmentation provides a measure for each patch based on its size how closely each border surrounding patches. The measure was based on the following expression:

F (S, P, d) = Area (S within P buf d) / Area (P buf d);

whereby S is the set of all remnants in the landscape, P is each remnant, and d is a buffer distance.

Effectively, this expression calculates the sum of all remnant vegetation within the specified buffer area for each patch of remnant vegetation. The set of buffer distances considered was 10m, 20m, 50m, and 100m, with the final result being the mean of the outcome for each buffer distance. Low numbers correspond to greater patch fragmentation and vice versa.

2.0 Biodiversity in Toodyay

2.3 Ecological Linkages in the Shire of Toodyay

To represent 'grades' of fragmentation, the results were grouped as follows:

Value Range	Legend Description
0 - 0.2	1
0.2 - 0.4	2
0.4 - 0.6	3
0.6 - 0.8	4
> 0.8	5

Areas of comparatively low fragmentation (figure 2.5) were then assessed visually to determine the most likely pathways of ecological linkage with consideration to the following:

- 'Regional Connectivity' is a measure for a patch and a network to which it belongs in how the network deviates from the "ideal" shape of a well-connected network (a circle). Ecological linkages were selected to be continuations of existing regional ecological linkage mapping for the Perth Metropolitan Region (WALGA, 2004) and the ecological linkages mapped in the neighbouring Shire of Chittering (Shire of Chittering, 2010).

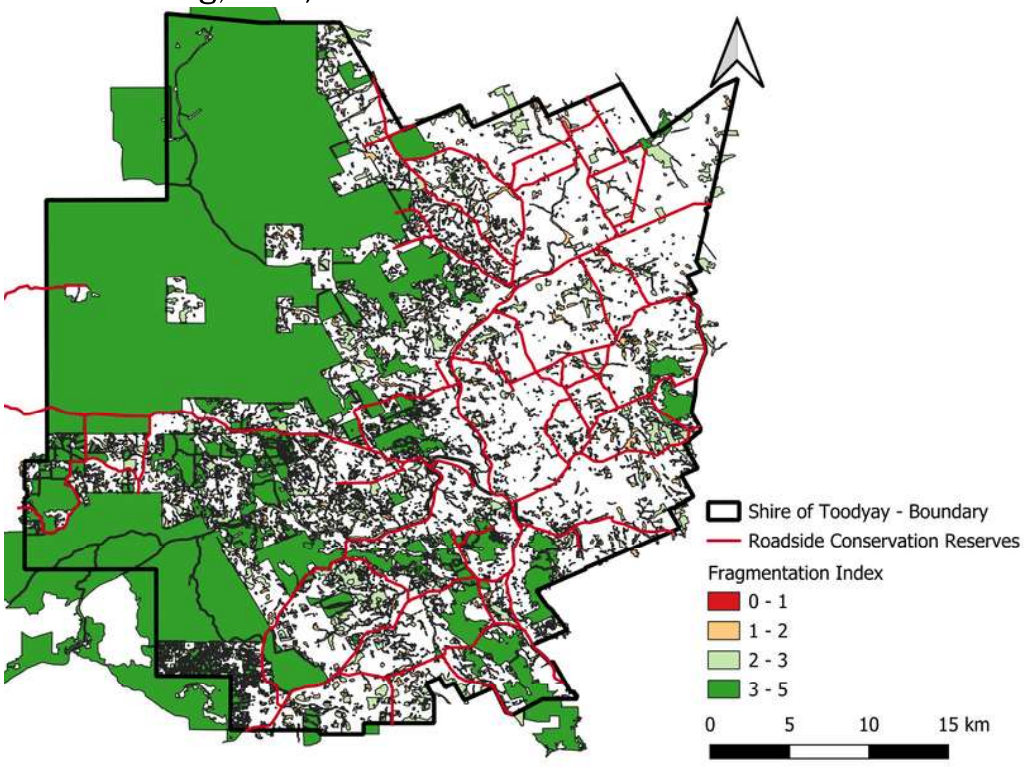


Figure 2.5: Fragmentation Analysis of remnant vegetation in the Shire of Toodyay

2.0 Biodiversity in Toodyay

2.3 Ecological Linkages in the Shire of Toodyay

- 'Fragmentation' - measure for a patch and its immediate surrounds and how this local network deviates from the ideal circle. Thin, small patches not closely bordering large patches are considered highly fragmented and large compact patches are considered least fragmented.
- A 'patch' - defined as a mapped contiguous unit of vegetation, based on the combine layer of the 2019 native vegetation extent mapping (DPIRD 2020).

Road reserves are managed as road reserves and not LNAs. However, road reserves are mapped and classified according to roadside conservation committee protocols and can act as corridors and buffers (illustrated in Figure 2.5).

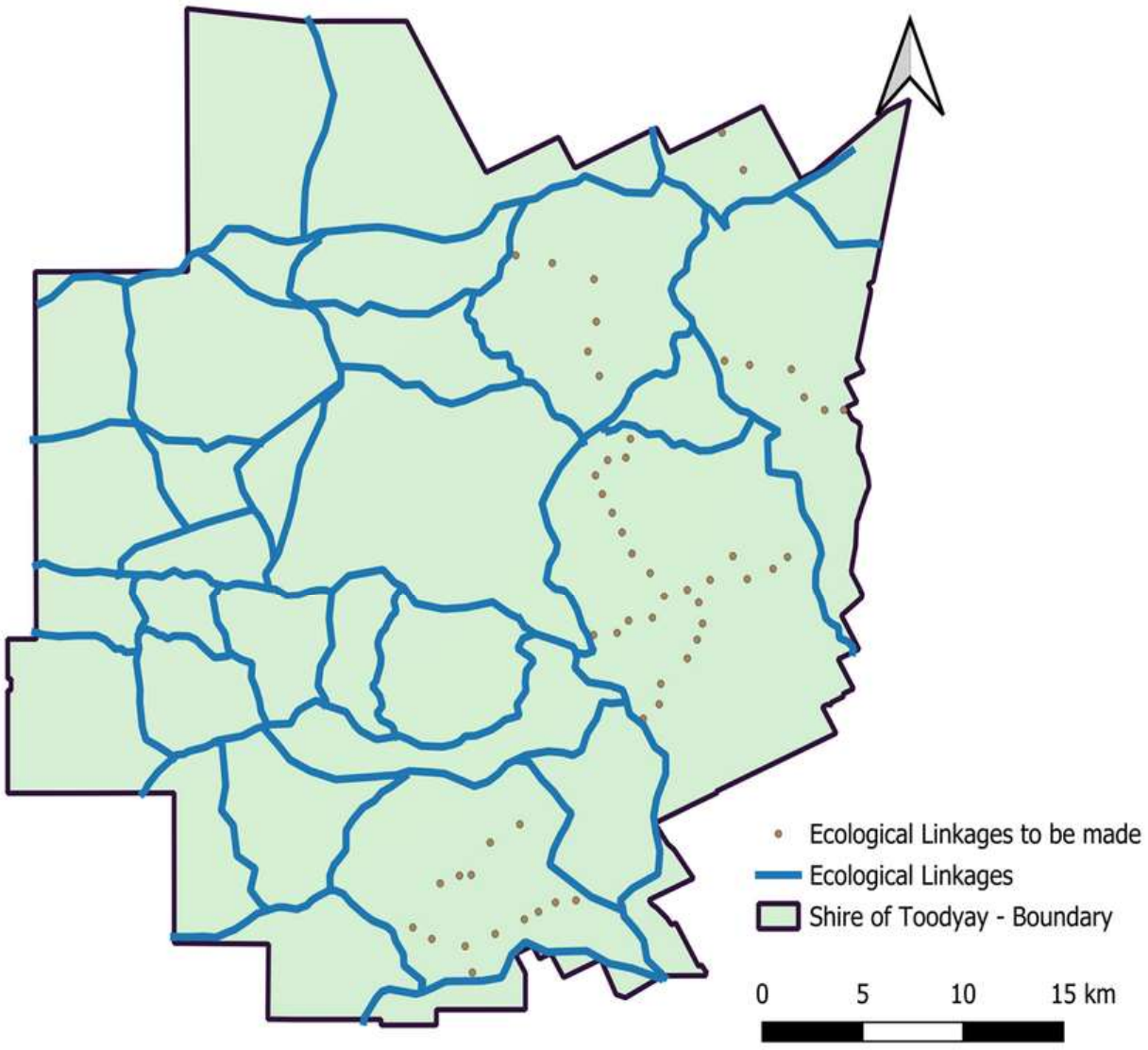


Figure 2.6: Ecological linkages in the Shire of Toodyay

3.0 Key Biodiversity Threats

Major Threats to Biodiversity in the Shire of Toodyay

A major threatening process is defined as a processes that threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological communities. Australia's biodiversity is under significant threats. As a global hotspot for mammal extinctions, Australia has lost 34 mammal species since European Settlement (Threatened Species Recovery Hub, 2020). Compounding this issue with the fact that a 70% of Australia's species remain undiscovered (Cresswell *et al.*, 2021), highlighting the potential scale of biodiversity loss.

Within the Shire of Toodyay, a complex interplay of historical and ongoing threats impacts the region's ecosystems as mentioned in Figure 3.1. Historical land-clearing practices, coupled with ongoing pressures from wildfire, mining, climate change, and deforestation, have significantly impacted the region's ecosystems. The introduction of invasive species has further exacerbated the decline in native biodiversity, disrupting ecological balance and threatening local species. Cumulatively, these pressures lead to habitat degradation and ultimately can cause native flora and fauna to become extinct.

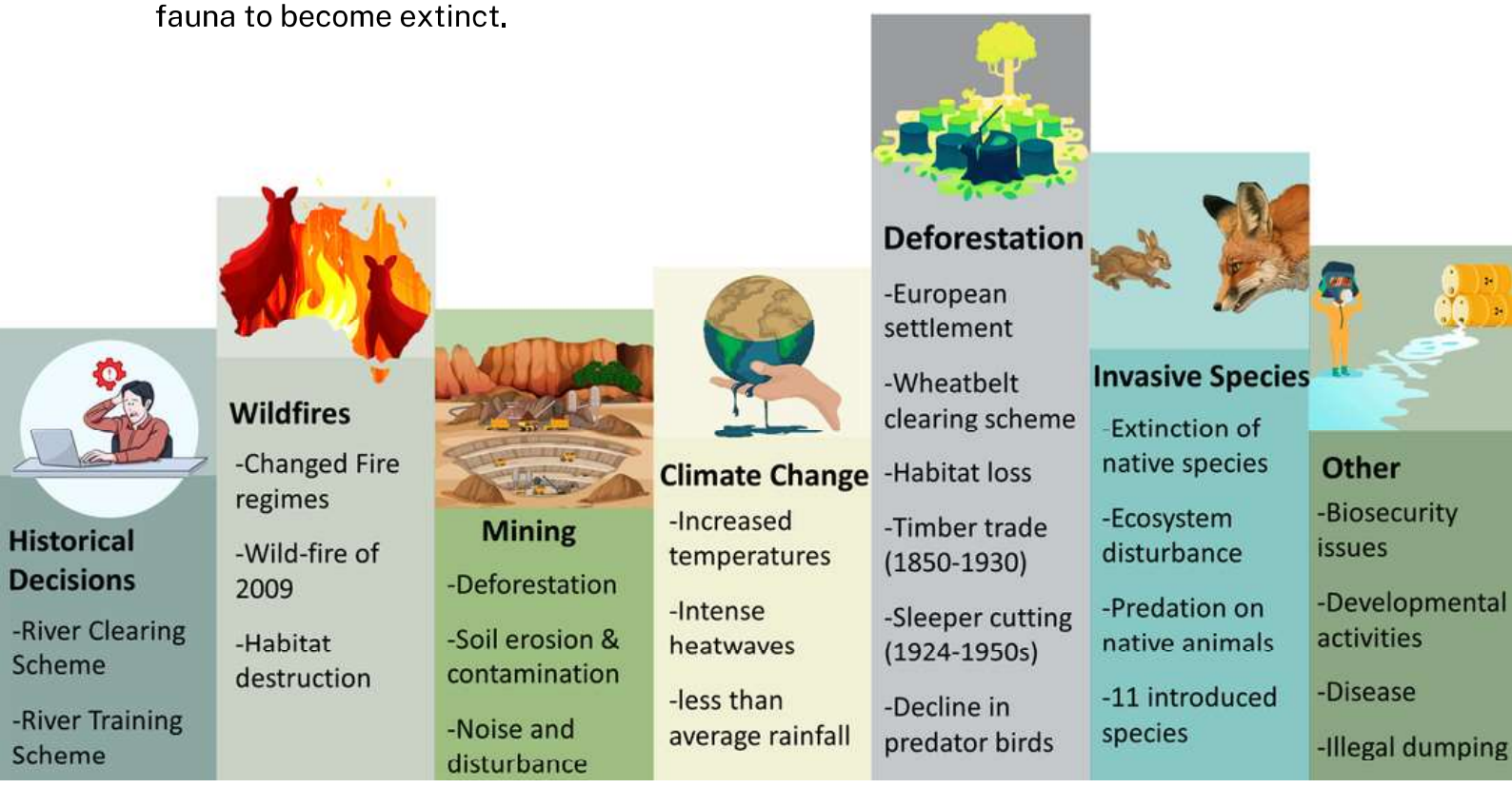


Figure 3.1: Key biodiversity threats in the Shire of Toodyay

3.0 Key Biodiversity Threats

3.1 Historical Decisions

1.Woodland Clearing

Prior to European settlement, the Avon River was a vibrant ecosystem, characterized by a braided channel, diverse vegetation, and abundant wildlife. This pristine environment held immense cultural and spiritual significance for the Aboriginal Nyoongar people.

The introduction of widespread clearing for agriculture dramatically altered the river's natural state. The removal of native bushland disrupted the hydrological cycle, leading to rising groundwater levels and soil salinization. As a result, the once fresh Avon River transformed into a brackish and saline waterway. Over 75% of the original woodland and heath vegetation was lost, and the river's fringing vegetation suffered severe degradation due to grazing and salinity (Water and Rivers Commission, 1999).

2.River Training Scheme

The Avon River Training Scheme was a direct response to the severe flooding of the 1950s that hit Northam, Toodyay, and York. This project, carried out from the mid-1950s to the mid-1970s, involved a large-scale engineering effort to control the river's flow (Water and Rivers Commission, 1999).

Bulldozers were employed to transform the naturally braided river into a single, deepened channel. Extensive riverine bushland was cleared to expedite the movement of floodwaters. The accelerated water flow caused by the straightened channel led to increased erosion and sediment mobilization. This resulted in the infilling of once deep and ecologically crucial river pools, disrupting aquatic habitats and altering the river's natural processes. The removal of riparian vegetation, essential for stabilizing banks and providing shade, further exacerbated the negative impacts. The Avon River Training Scheme, intended as a solution to flood management, ultimately proved to be a harmful intervention that significantly compromised the river's ecological integrity and resilience.

3.0 Key Biodiversity Threats

3.2 Wild-Fires

Wildfires in the Shire of Toodyay have significant and multifaceted impacts on local biodiversity. The destruction of native habitats, such as eucalypt forests and wheatbelt woodlands, directly threatens species that rely on these ecosystems. Many plant species, including those not adapted to frequent fires, face declines or extinctions due to habitat loss. Fauna is also directly impacted by flames and smoke or lose their homes and food sources. The increased soil erosion that follows fire further exacerbates the problem, leading to diminished plant regrowth and long-term ecosystem degradation.

Recovery from wildfires is often a slow process, with the health of the ecosystem depending on the ability of species to repopulate and regenerate. However, frequent or intense fires can alter natural fire regimes, disrupt species dynamics, and create opportunities for invasive non-native species to establish themselves. For example, the fire in December 2009, which destroyed approximately 3,000 hectares of the beautiful Toodyay bushland, had notable ecological impacts. This devastating event led to a surge in weed growth in the affected areas (Toodyay Naturalists' Club,2010) .

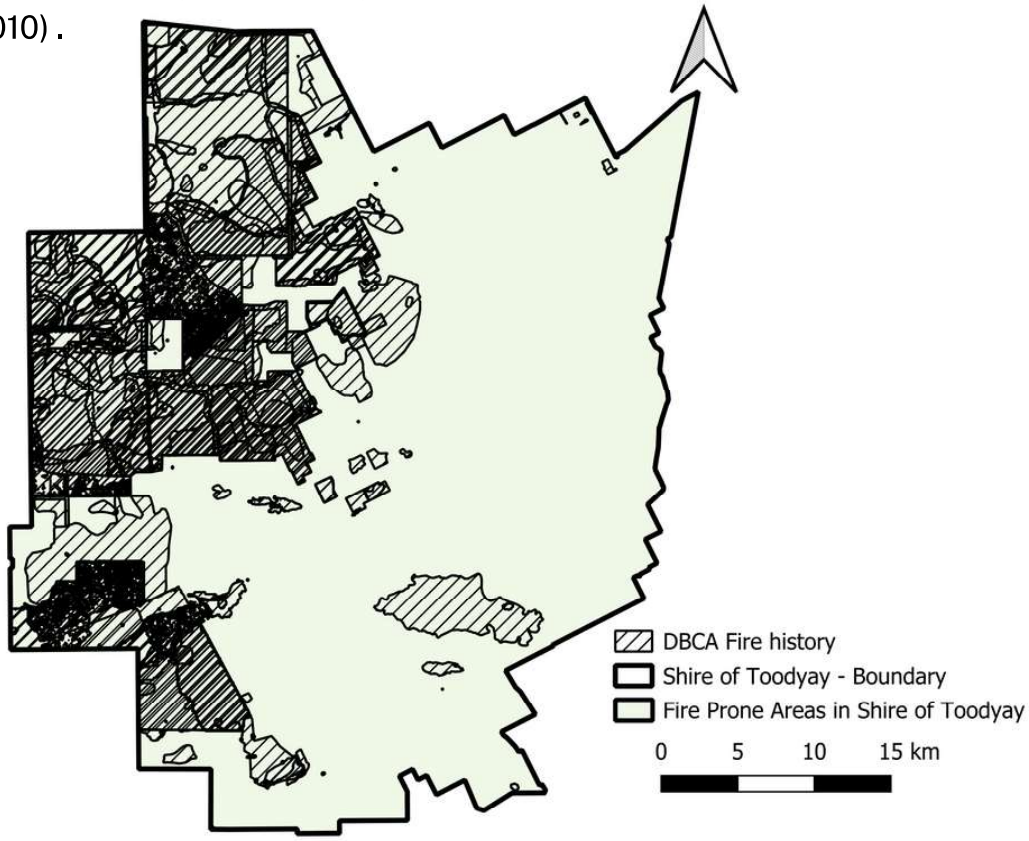


Figure 3.2: Bush Fire prone areas and DBCA Fire history in the Shire of Toodyay (DFES, 2021; DBCA 2023)

3.0 Key Biodiversity Threats

3.3 Mining

Mining is an important primary industry and a major source of employment and contributor to Western Australia's economy. In the Shire of Toodyay, exploration has identified notable mineral deposits, including in environmentally sensitive areas. However, mining activities pose considerable risks to local biodiversity. The exploration activity within the Shire increases the risk to, and pressure on biodiversity assets. Basic raw materials that are currently extracted within the Shire include sand and gravel, clay and rock aggregate generally used for road and domestic construction purposes.

Additionally, mining activities lead to habitat destruction and fragmentation. The dust and noise from mining machinery also disturb wildlife and degrade plant health. Mining operations cause soil and water pollution, alter natural water flows, and facilitate the spread of other biological threats such as diseases and invasive species. The resulting contamination can impact plant and aquatic life.

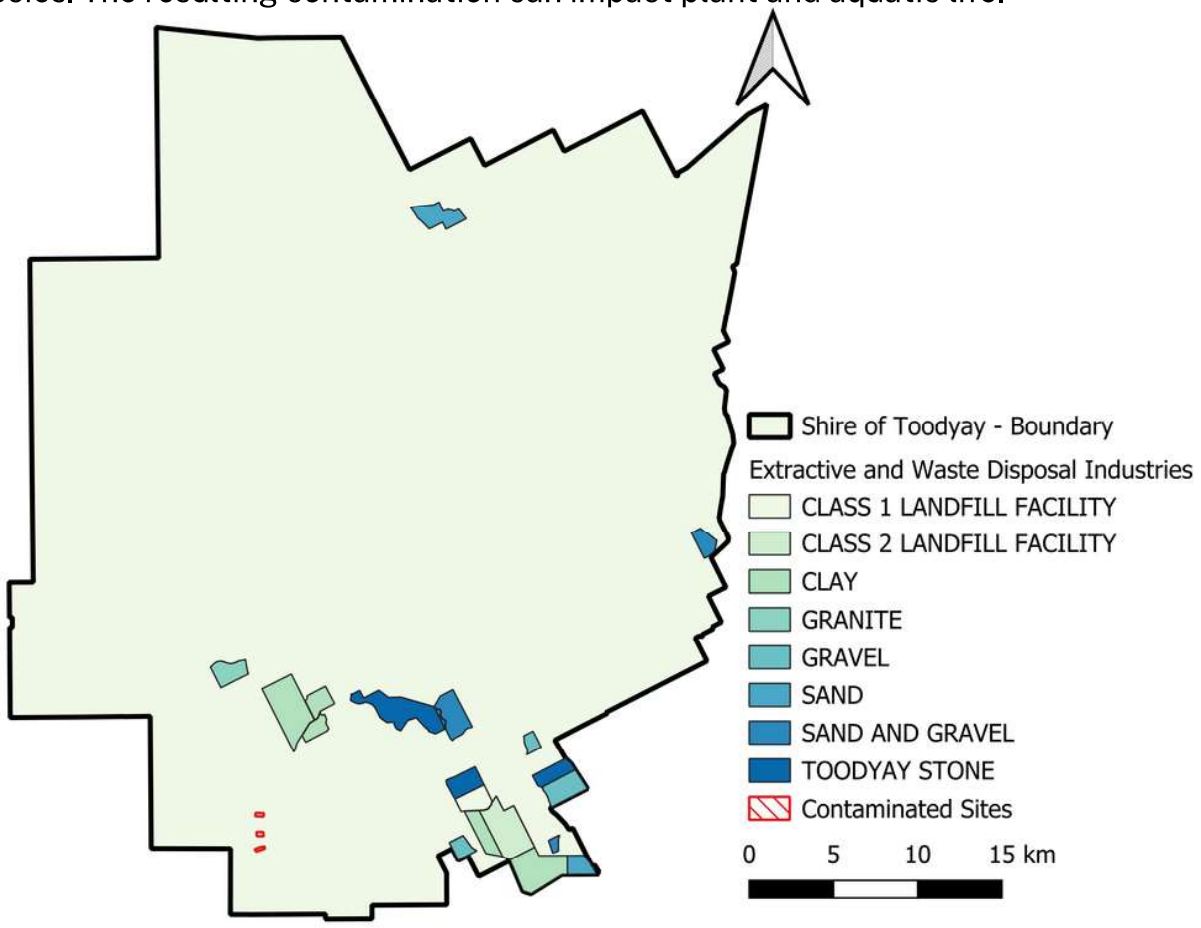


Figure 3.3: Extractive Industries and waste disposal sites in the Shire of Toodyay

3.0 Key Biodiversity Threats

3.4 Climate Change

The Shire of Toodyay is experiencing significant climate change impacts. Since 1950, average temperatures have risen by 1.1°C, with projections indicating further increases of 1.0°C to 2.0°C by 2050 (Australian Bureau of Meteorology, 2023). This warming trend has resulted in more frequent and intense heatwaves, posing risks to public health and agriculture.

Concurrently, the region has experienced a decline in annual rainfall of about 10-20% over recent decades, with expectations of a further decrease of up to 20% by 2050 (CSIRO, 2022;Department of Water and Environmental Regulation, 2022). Reduced rainfall, coupled with increased evaporation, is intensifying drought conditions, impacting water resources and agricultural productivity.

Changes in seasonal patterns are disrupting farming practices, making it more difficult for local farmers to plan and manage their crops. Crop yields, particularly for wheat and barley, have decreased due to drought and heat stress. The region's reliance on irrigation is exacerbating water scarcity issues. As per literature, In Australia, agricultural profits have fallen by 23% over the past two decades, and this trend is expected to continue (Australian National University, 2021).

Rising temperatures and prolonged dry periods have increased the frequency and intensity of wildfires, leading to significant tree mortality and forest degradation. These conditions are altering species distributions, with many native plants and animals struggling to adapt. Vulnerable species, such as jarrah and marri eucalyptus, are particularly at risk. Additionally, reduced streamflow and groundwater recharge are impacting aquatic ecosystems (McFarlane *et al.*, 2012). The loss of biodiversity and ecosystem services poses a long-term threat to the region's ecosystem.

3.0 Key Biodiversity Threats

3.5 Deforestation

Deforestation in the Shire of Toodyay began with European settlement and has had a significant impact on the region's biodiversity. Initially, clearing activities were primarily for grazing purposes. By the late 1800s, the level of land clearance was notably low. However, in 1850, the discovery of sandalwood outside the Jarrah Forest region sparked a trade that persisted until 1930. Additionally, the Homestead Act of 1893, introduced by John Forest, facilitated the transfer of Crown lands and provided support for their clearing. By 1894, assistance programs were in place to help farmers clear Crown land (Erickson, 1974).

In 1924, The timber trade, focusing on manna and jam (*Acacia acuminata*) trees was commenced and continued for 15 years, targeting the district's finest timber. Green wandoo and white timber were also cut for fire-wood. Following World War II, jarrah and wandoo timber became increasingly scarce, leading to the establishment of industrial extraction operations in 1952 (Chitty & Edgecombe, 2013). By 1972, these operations had significantly depleted the poorer-grade wandoo timber. Additionally, the River Training Scheme also cleared vegetation along riverbanks (Erickson, 1974).

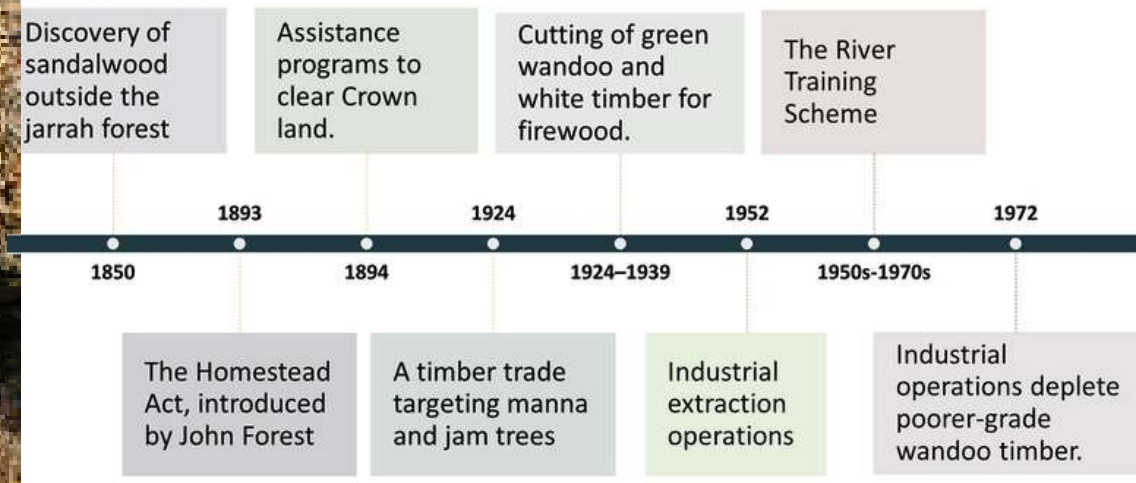


Figure 3.4: Historical timeline of deforestation in the Shire of Toodyay

3.0 Key Biodiversity Threats

Ongoing deforestation in the Shire of Toodyay significantly impacts the region, causing a sharp decline in biodiversity as many plant and animal species face threats from habitat loss and fragmentation. This loss of native vegetation leads to soil degradation, reducing stability and increasing erosion, which hampers agricultural productivity and natural regeneration. Altered water cycles disrupt local hydrology, resulting in decreased water retention and increased runoff, exacerbating pollution and drought conditions. The ecological imbalance affects the entire food web, impacting herbivores, pollinators, and predators. Furthermore, habitat fragmentation challenges species survival, leading to population declines and, in some cases, local extinctions. Immediate action is essential to mitigate these adverse effects and restore the region's ecological health.

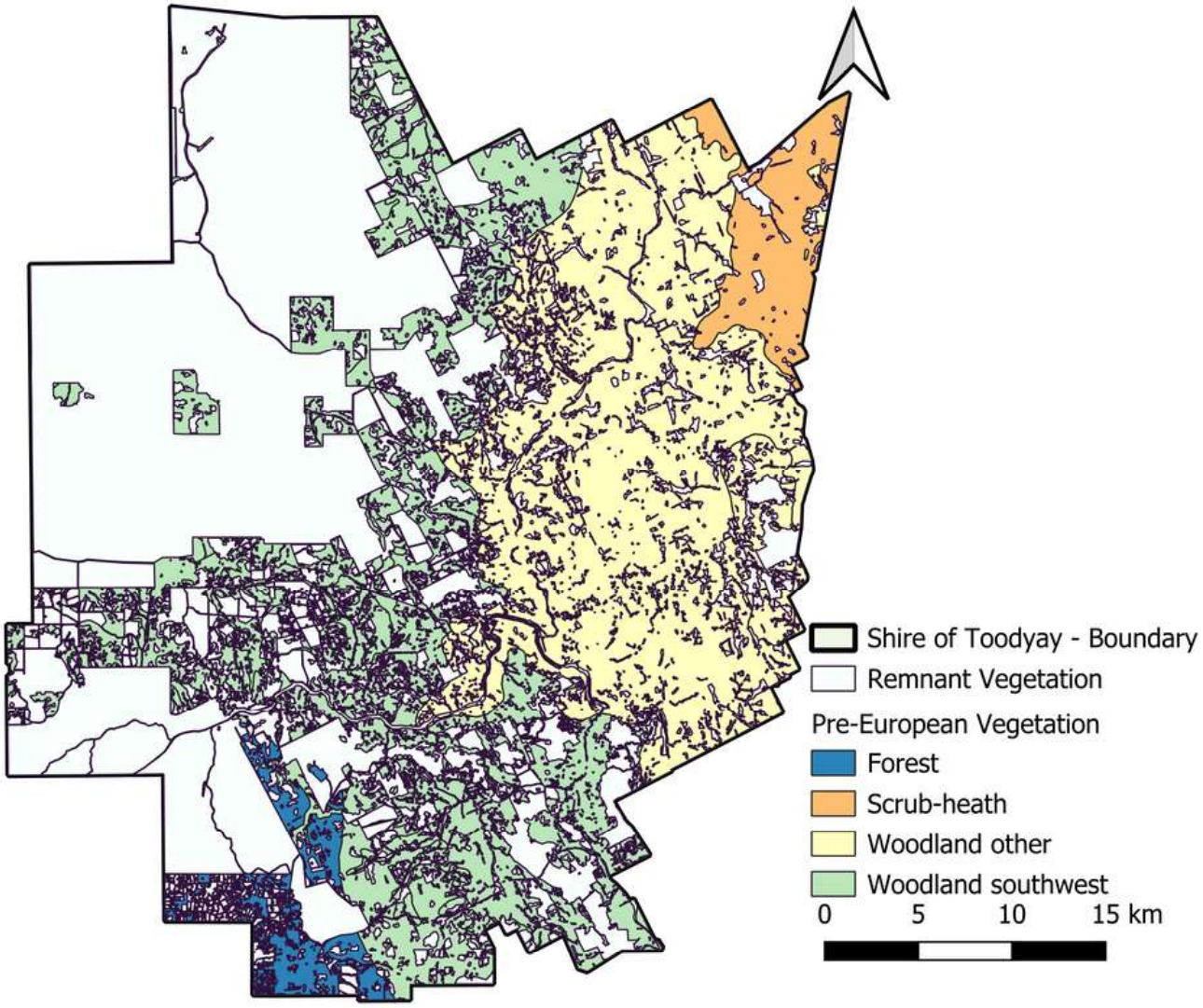


Figure 3.5: Map depicting the extent of Pre-European vegetation and remnant vegetation in the Shire of Toodyay (DPIRD, 2020)

3.0 Key Biodiversity Threats

3.6 Introduced and Invasive Species

Introduced species are organisms brought into a new environment, intentionally or accidentally, where they are not native. While not all introduced species become problematic, some can turn invasive. Invasive species are introduced organisms that spread rapidly and disrupt local ecosystems, economy, and human health. These species often dominate resources, outcompete native species, and introduce diseases or parasites to which local wildlife has no immunity. In the Shire of Toodyay, notable invasive species include European rabbits, foxes, cats, pigs, and European honey bees. According to the Department of Biodiversity, Conservation and Attractions (DBCA, 2020), there are 12 introduced fauna species in the Shire of Toodyay. These species impact biodiversity in multiple ways: foxes and cats prey on native wildlife, European honey bees compete for nesting sites, and rabbits and pigs contribute to land degradation through soil disturbance and erosion. The combined pressures from these invasive species intensify the challenges facing native species in fragile ecosystems.

Table 3.1: Key pest and invasive species in the Shire of Toodyay

Scientific name	Common Name	Scientific name	Common Name
Fauna		**Flora**	
Felis catus	Cat	Ricinus communis	Castor oil plant
Vulpes vulpes	Red fox	Tamarix aphylla	Tamarisk
Oryctolagus cuniculus	Rabbit	Arundo donax.	False bamboo
Sus scrofa	Pig	Watsonia meriana	Watsonia
Rattus rattus	Rat	Moraea flaccida	Cape tulip
Mus musculus	House mouse	Gomphocarpus fruticosus	Narrow leaf cotton bush
Trichoglossus moluccanus	Rainbow lorikeet	Asparagus asparagoides	Bridal creeper
Dacelo novaeguineae	Laughing kookaburra	Eragrostis curvula	Love grass
Streptopelia senegalensis	Laughing turtle dove	Junkus acutis	Spike rush
		Solanum hystrix	Afghan thistle

3.0 Key Biodiversity Threats

3.7 Others

3.7.1 Biosecurity Issues

A biosecurity risk is anything that could increase the impacts of pests, diseases, weeds or contaminants on the economy, environment or community. Biosecurity threats, such as the introduction of plant or animal diseases, pose a significant risk to the Shire of Toodyay's biodiversity. These diseases can devastate native plant and animal populations, leading to ecosystem collapse. For instance, the outbreak of Phytophthora dieback has caused widespread mortality in native vegetation, disrupting critical habitats and impacting countless species.

3.7.2 Illegal Dumping

Illegal dumping is a pressing environmental issue with severe consequences for biodiversity. The reporting of ten illegal dumping incidents within the Shire of Toodyay over the past six months, involving hazardous materials such as chemicals, tyres, and asbestos, underscores the severity of this issue. These contaminants can leach into soil and water bodies, poisoning wildlife and destroying habitats. Furthermore, the physical disruption caused by dumping can disturb sensitive ecosystems and disrupt wildlife movement patterns.

3.7.3 Weeds

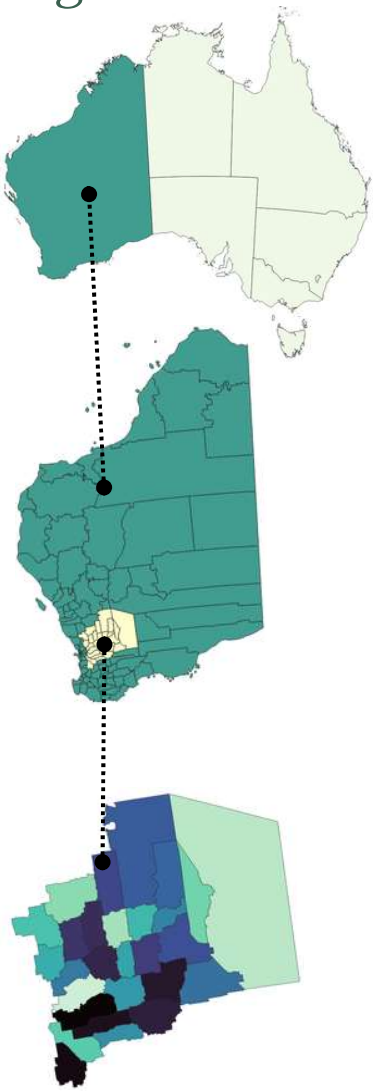
Invasive weeds are a persistent threat to native plant communities. They rapidly colonize disturbed areas, outcompete native species for resources, and alter ecosystem processes. Weeds such as blackberry, gorse, and Paterson's curse have significantly impacted the Shire of Toodyay's biodiversity. An observational study conducted in 1973 revealed a notable shift in pigeon populations following the removal of native bushland. While the Bronzewing Pigeon population declined, the Crested Pigeon population experienced an increase. This disparity is attributed to the latter species' adaptation to consuming the seeds of the invasive Patterson's Curse weed, which proliferated in the disturbed environment (Toodyay Naturalists' Club, 2010). This case exemplifies the complex interplay between introduced species, native biodiversity, and habitat alteration (A detailed list of weeds is listed in Appendix C).

3.7.4 Developmental Activities

Urbanization and infrastructure development are major drivers of habitat loss and fragmentation, leading to a decline in biodiversity. Clearing of native vegetation for housing, roads, and commercial buildings reduces available habitat for wildlife, isolates populations, and disrupts ecological processes. The expansion of urban areas further exacerbates habitat fragmentation.

4.0 Protecting Toodyay's Biodiversity

4.1 Legal and Strategic Framework for Biodiversity Conservation: National, State, Regional and Local Regulations



4.1.1. National Legislation and Strategies

- *Environmental Protection and biodiversity Conservation Act 1999 (EPBC Act)*
- *Australia's strategy for Nature 2019-2030*
- *Threatened species Action Plan 2022-2032*
- *Nature Repair Act 2023*

4.1.2. State Legislation and Strategies

- *Biodiversity Conservation Act 2016*
- *Environmental Protection Act 1986*
- *Native Vegetation Policy for Western Australia*
- *Conservation and Land Management Act 1984*
- *Planning and Development Act 2005*

4.1.3. Shire's Strategic and Regulatory Framework

- *The Shire of Toodyay Local Planning Strategy 2018*
- *Shire of Toodyay Local Planning Scheme*
- *The Shire of Toodyay Local Planning Policy*
- *Shire of Toodyay Environmental Management Strategy 2015*

Please Note:

Regulatory Framework for Native Vegetation Clearance

In Western Australia, it is illegal to clear native vegetation or collect native plants and animals without proper authorization. Landowners can find information regarding what actions are authorized under the *Environmental Protection Act (EP Act)* and *the Biodiversity Conservation Act (BC Act)* by visiting the Department of Water and Environmental Regulation's website or consulting local government resources.

4.0 Protecting Toodyay's Biodiversity

4.2 Local Framework for Protecting Biodiversity

The Shire of Toodyay has established a range of local and regional strategic planning documents that incorporate numerous provisions for biodiversity. This Local Biodiversity Strategy complements the Shire's existing Statutory Planning Framework by identifying and prioritizing key biodiversity assets and areas for improvement to enhance decision-making and biodiversity conservation.

Shire of Toodyay's Strategic Community Plan (2013)

The Strategic Community Plan outlines the Shire's economic, developmental, community, and environmental aspirations. The relevant objectives related to conservation and biodiversity include:

a) Retaining, enhancing, protecting, and promoting the ecological integrity and biological diversity of the Shire.

b) Protecting the valued landscape characteristics of the Shire's natural and rural landscapes for the benefit of residents and tourists.

c) Protecting and managing natural environmental resources of national, regional, and local significance, and minimizing the environmental impact associated with land use and development.

Shire of Toodyay Local Planning Strategy (2017)

The Local Planning Strategy serves as the framework for local planning and the strategic basis for local planning schemes. Key strategic directions and strategies for biodiversity include:

- Identifying significant biodiversity assets, i.e. threatened ecological communities and ecological linkages, to ensure their protection and maintenance.
- Promoting sustainable management of water resources through appropriate land use management and development controls.
- Encouraging the preservation and revegetation of remnant vegetation to enhance landscape amenities, biodiversity, and soil and water quality.
- Identifying mechanisms to support biodiversity conservation on privately owned land, including rate relief, grants, and subdivision incentives.
- Protecting areas of biodiversity significance from inappropriate development.
- Avoiding development that negatively impacts ecological values and landscape qualities.
- Increasing the foreshore reserve along the Avon River as opportunities arise through subdivision and development.
- Integration of environmental conservation into the Shire's Planning policy.

4.0 Protecting Toodyay's Biodiversity

4.2 Local Framework for Protecting Biodiversity

Shire of Toodyay Local Planning Scheme No. 5

The Shire's statutory planning is governed by the Local Planning Scheme No. 5, which was gazetted in 2024. Key provisions for biodiversity protection include:

Building Envelopes: Allowing flexibility in building location to avoid undesirable earthworks or clearance of vegetation.

Tree Preservation/Remnant Vegetation Protection: Requiring identification of tree preservation areas and limiting the removal of indigenous trees, except for specific circumstances such as diseased trees or essential firebreaks.

Livestock Management: Ensuring sustainable livestock management practices to prevent overstocking and land degradation.

Special Control Areas: Specific provisions for biodiversity protection apply to the Avon River Valley, Wetland/River Channel areas and other significant ecological zones, to ensure that development does not adversely impact these areas.

Landscaping Requirements: Development applications, except for certain residential developments, must indicate landscaping elements, including the percentage and condition of remnant vegetation to be retained.

Visual Impact Assessments: For developments within landscape protection areas, a visual impact assessment is required, which should consider the scenic value and ecological integrity of the area, including its biodiversity.

Protection of Significant Environmental Areas: The scheme aims to protect and enhance areas identified as having significant environmental value

Compliance with Environmental Guidelines: The Shire will consider relevant policies, such as the EPA Guidance Statement No. 3, when assessing environmental factors related to development proposals.

Shire of Toodyay Environmental Management Strategy (2015)

The Environmental Management Strategy provides a framework for improving environmental management outcomes and includes the following biodiversity-related objectives:

- Protecting, conserving, and enhancing biodiversity values in Toodyay.
- Actively managing threats to biodiversity values.
- Recognizing the importance of private land conservation.
- Emphasizing collaboration with community groups and stakeholders to support conservation efforts.
- Promoting sustainable land management practices to preserve ecological health for future generations.

4.0 Protecting Toodyay's Biodiversity

4.3 Community Involvement and Past Conservational Practices

Community groups play a vital role through partnerships that support on-ground management on public and private lands and contribute valuable resources to assist with large scale projects requiring additional resources such as re-vegetation programs. Community groups assist with environmental education and play an important role in ensuring that biodiversity values within the Shire are valued by the wider community. The following community groups actively contribute to biodiversity conservation within the Shire of Toodyay:

1. Noongar Kartdijin Community

NKAC is a dedicated Aboriginal corporation in Toodyay, WA, focused on deepening connection to Country and fostering cultural awareness. Since 2018, we have shared the rich Noongar cultural heritage of this region through 'truth-telling' initiatives like the award-winning Gnulla Karnany Waangkiny project at the Shire's Museum. Our Noongar Trail further supports connection with country by offering insights into Noongar culture, knowledge, and land stewardship. Partnering with groups like Toodyay Friends of the River and Toodyay Naturalist Society, NKAC promotes biodiversity and conservation practices rooted in Noongar cultural knowledge. We work closely with the Shire on the Reconciliation Action Plan, collaborating on strategic initiatives and interpretive signage to support cultural respect across Toodyay.

2.Wheatbelt Natural Resource Management (NRM)

Wheatbelt NRM is an independent, community-based organisation that provides leadership in the management of natural resources of the Avon River Basin of WA through building partnerships with industry, government and community. Wheatbelt NRM is currently collaborating with local Shires, including Shire of Toodyay, to develop strategies and collect data on the damages caused by invasive corella populations.

3. Toodyay Naturalists' Club Inc (TNC)

The Toodyay Naturalists' Club Inc is a not-for-profit community group established in 1968. The TNC aims to preserve and promote native flora, fauna and landscape values of Toodyay and the Avon catchment by exchanging ideas, supporting research and education, publishing papers, and any other practical works that encourage the community to be aware of the natural environment and/or substantially further its preservation and restoration. Since its inception, the Toodyay Naturalist Club has been instrumental in monitoring environmental changes within the Shire.

4.0 Protecting Toodyay's Biodiversity

4.3 Community Involvement and Past Conservational Practices

3.Toodyay Naturalists' Club Inc (TNC)

Their contributions encompass a wide range of activities, including bird population surveys, tree health assessments, and native plant propagation within Shire reserves.

4.Toodyay Friends of the River (Inc)

The Toodyay Friends of the River Inc., a 'not-for-profit' organisation, consists of a group of both local and Perth-based community volunteers. Friends of the River actively strive to conserve the remnant biodiversity and natural habitats of the Avon River for present and future generations. The core group meets on a regular monthly basis to undertake tasks including tree planting, removing large weeds, collecting dumped rubbish, surveys, river monitoring and maintaining pathways.

5. Julimar Conservation and Forest Alliance (JCAFA)

The Julimar Conservation and Forest Alliance, established in 2022, is a committed community organization focused on the protection and preservation of the Julimar State Forest and surrounding natural environments within the Shire. Founded by groups with a shared dedication to the forest—such as the Toodyay Naturalists' Club, Toodyay Friends of the River, BirdLife Australia, and the Toodyay Historical Society—the Alliance aims to promote community awareness, ecosystem health, and habitat protection for native flora and fauna. JCAFA actively engages in habitat restoration, invasive species management, and educational initiatives to foster environmental stewardship.

Despite its title on some signs, the forest lacks Conservation Park status, and its current protections are limited. and JCAFA strongly advocates for National Park status to ensure the preservation and resilience of its biodiversity and ecosystem health. The Alliance's efforts align with the Shire's environmental goals, safeguarding the ecological integrity of the Julimar area and fostering a sustainable, thriving landscape for wildlife and future generations.

5.0 Action Plan

5.1 Aim

Vision

To protect, retain and enhance Local Natural Areas which are valued by the community in the Shire of Toodyay, to preserve biodiversity.

5.2 Execution, Monitoring and Assessment

Execution

The successful implementation of the Shire of Toodyay Biodiversity Strategy requires a collaborative approach involving various stakeholders, including the Shire Council, community groups, landholders, and relevant government agencies. The Shire of Toodyay will implement this strategy between 2024-2035.

Monitoring

Regular monitoring is essential to assess the effectiveness of the biodiversity strategy. Key monitoring activities include tracking biodiversity indicators, such as species richness, habitat condition, and population trends, to gauge the health of the ecosystem. Evaluating the performance of implemented projects and programs is another crucial monitoring activity. Additionally, assessing stakeholder engagement levels is vital to understanding the extent of community participation in biodiversity conservation efforts, which can influence the overall success of the strategy.

Assessment

Periodic assessment of the biodiversity strategy is crucial to ensure it remains aligned with evolving environmental conditions and priorities. Performance evaluation involves assessing the overall effectiveness of the strategy in achieving its objectives and making necessary adjustments. Annual reports to the Council will be provided on the implementation and outcomes of the strategy, ensuring transparency and accountability. Incorporating community feedback will also be a key aspect of the assessment process. By effectively executing, monitoring, and assessing the biodiversity strategy, the Shire of Toodyay can make significant progress in protecting and enhancing its valuable natural assets.

GOAL 01

Protect

Protect biodiversity in the Shire of Toodyay through planning, decision making and commitment to implementation.

Objective

- Protect and maintain the areas of high biodiversity
- Prevent local extinctions
- Retain remaining remnant vegetation
- Ensure biodiversity knowledge is adequate and current to support effective decision making.

Outcome

- Greater understanding of the current condition of biodiversity in the Shire
- Minimized impacts on biodiversity
- Increased protection for biodiversity

	Action	Timeframe
1.1	Protect and restore remnant vegetation and exising ecologically significant sites for habitat and ecological values.	On-going
1.2	Establish a systematic process to ensure biodiversity considerations are integrated into decision-making including all Council decision-making.	2025
1.3	Protect the environment and community health by enforcing environmental regulations. .	on-going
1.4	Develop and utilize a comprehensive GIS-based biodiversity mapping system to monitor changes and emerging threats.	2024-2035
1.5	Actively attract external funding for Biodiversity Protection Projects.	On-going
1.6	Protect Avon river and its tributaries though the conservation and enhancement of riparian vegetation.	2025-2028

GOAL 02

Restore

Restore the natural environment in the Shire of Toodyay by habitat rehabilitation and revegetation.

Objective

- Increased restoration to create interconnected habitat corridors and expand remnant vegetation
- Overall increase in biodiversity, ecosystems and habitats by 2027
- Encourage and facilitate sustainable land management practices

Outcome

- A net increase in biodiversity, connective habitat and specie resilience.
- Reduction in the pest specie impacts in the shire.

	Action	Timeframe
2.1	Develop a Voluntary Planning Agreement (VPA) to promote biodiversity conservation by establishing clear guidelines for native vegetation management on private and organizational lands.	2025-2030
2.2	Implement effective management programs to eradicate or control core pest species in the shire.	On-going
2.3	Undertake environmental restoration activities to safeguard and expand remnant vegetation and increase the health of existing protected areas.	2025-2028
2.4	Implement environmental actions within council strategies and policies (i.e. The Shire of Toodyay Local Planning Strategy 2018, Shire of Toodyay Local Planning Scheme, The Shire of Toodyay Local Planning Policy, Shire of Toodyay Environmental Management Strategy)	on-going
2.5	Identify and assess public land suitable for biodiversity offsetting to meet future development needs.	2025-2034

GOAL 03

Enhance

Enhance biodiversity by appropriate management, awareness, and reducing biodiversity threats.

Objective

- Enhance and conserve biodiversity through community involvement.
- Ensure that comprehensive, accurate, and actionable information is available to effectively guide and support biodiversity enhancement efforts.

Outcome

An empowered community that understands, values and actively participates in biodiversity enhancement, fostering a sense of stewardship and responsibility.

	Action	Timeframe
3.1	Encourage private land owners with significant habitat to protect, manage and enhance native flora and fauna habitat.	2025-2028
3.2	Implement financial and non-financial incentives for private landholders to protect native vegetation.	2028-2035
3.3	Review or develop key guiding documents to fill data or knowledge gaps through consultation with stakeholders.	2026-2035
3.4	Utilise local community and Traditional Owners' expertise, skills, knowledge and resources for ecological restoration.	2025-2031
3.5	Implement and promote community led citizen science programs to actively engage residents and land-owners in monitoring biodiversity and identifying emerging threats.	2026-2035
3.6	Appropriately maintain Shire managed Reserves and land.	Ongoing

GOAL 04

Collaborate

Foster collaboration among educational institutions, public, and Aboriginal owners to enhance regional biodiversity.

Objective

- Collaborate with Traditional Owners to connect culture and biodiversity.
- Stakeholder involvement for protection of biodiversity.
- Raising awareness for importance of biodiversity.

Outcome

- Collaboration with Traditional Owners in cultural land management practices for enhancing biodiversity.
- Collaboration in conservation initiatives by the community.

	Action	Timeframe
4.1	Engage with aboriginal stakeholders to understand how to improve working relationship in biodiversity management	2025-2028
4.2	Partner with environmental organisations, local farmers, educational institutes, traditional owners and neighbouring councils to restore priority biodiversity assets and reduce biodiversity threats.	On-going
4.3	Increase environmental education and activities that encourage positive biodiversity behaviour and values towards biodiversity conservation.	2029
4.4	Establish a small grants system where council can provide funding to support environmental organisations working in the shire.	2026-2030
4.5	Foster effective communication among stakeholders for biodiversity improvement.	2025

References

Australian National University. (2021, August 27). Climate change means Australia may have to abandon much of its farming. Retrieved from https://cbe.anu.edu.au/news/2021/climate-change-means-australia-may-have-abandon-much-its-farming

Avon River System Management Committee and Waterways Commission, (1993), Avon River System Management Strategy, Government of Western Australia, Perth, Western Australia.

Bureau of Meteorology. (2023). Climate change in Australia: Projections and impacts. Australian Government. Retrieved from https://www.bom.gov.au/climate/change

Chitty, W. G., & Edgecombe, J. (2013). The life and times of Wally Chitty. K. Chitty.

Cresswell, I. D., Janke, T., & Johnston, E. L. (2021). Australia state of the environment 2021: Overview. Independent report to the Australian Government Minister for the Environment, Commonwealth of Australia. https://doi.org/10.26194/f1rh-7r05

CSIRO. (2024). *Australia's changing climate*. Retrieved from https://www.csiro.au/en/research/environmental-impacts/climate-change/state-of-the-climate/australias-changing-climate

Davis, R.A. and Brooker, L. (2008). Ecological Linkages and Urban Fauna at Risk on the Swan Coastal Plain, Perth, Western Australia. Final Report. Unpublished report prepared for the Swan Catchment Council.

Davis, R.A. and Brooker, L. (2008). Ecological Linkages and Urban Fauna at Risk on the Swan Coastal Plain, Perth, Western Australia. Final Report. Unpublished report prepared for the Swan Catchment Council.

DBCA (2020). DBCA Statewide Vegetation Statistics Available from: https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics.

DBCA (2020a). Wheatbelt Wetlands Stage 1 (DBCA-021) https://catalogue.data.wa.gov.au/dataset/wheatbelt-wetlands-stage-1

DBCA (2020b). DBCA Threatened and Priority Fauna (DBCA-37) dataset Available from https://catalogue.data.wa.gov.au/dataset/threatened-and-priority-fauna

DBCA (2020c). Threatened and Priority Flora (DBCA-036) dataset Available from https://catalogue.data.wa.gov.au/dataset/threatened-and-priority-flora

DBCA (2020d). Threatened Ecological Communities (DBCA-038) Available from: https://catalogue.data.wa.gov.au/dataset/threatened-ecological-communities

Del Marco, A., Taylor, R., Clarke, K. Savage, K. Cullity, J. and Miles, C. (2004). Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region. Western Australian Local Government Association, West Perth.

Del Marco, A., Taylor, R., Clarke, K. Savage, K. Cullity, J. and Miles, C. (2004). Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region. Western Australian Local Government Association, West Perth.

Department of Biodiversity, Conservation and Attractions. (2018). *Statewide vegetation statistics* (Resource ID: 0fc225fa-b06b-4da4-b5ed-62a146842389). Data WA. Retrieved August 28, 2024, from https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics/resource/0fc225fa-b06b-4da4-b5ed-62a146842389

Department of Primary Industries and Regional Development. (2020). *Native vegetation extent (DPIRD-005)*. Data WA. Retrieved June 28, 2024, from https://catalogue.data.wa.gov.au/dataset/native-vegetation-extent

Department of Water and Environmental Regulation. (2022). *Western Australian climate projections summary*. Government of Western Australia. Retrieved from https://www.wa.gov.au/system/files/2022-01/Western_Australian_Climate_Projections_Summary.pdf

Erickson, R. (1974). *Old Toodyay and Newcastle*. Toodyay Shire Council.

McFarlane, D., Stone, R., Martens, S., Thomas, J., Silberstein, R., Ali, R., & Hodgson, G. (2012). Climate change impacts on water yields and demands in south-western Australia. *Journal of Hydrology, 475*, 488-498. https://doi.org/10.1016/j.jhydrol.2012.05.038

Molloy, S., Wood, J., Hall, S., Wallrodt, S. and Whisson, G. (2009). South West Regional Ecological Linkages Technical Report, Western Australian Local Government Association and Department of Environment and Conservation, Perth.

Shire of Chittering (2010) Shire of Chittering Local Biodiversity Strategy. Available from: https://www.chittering.wa.gov.au/documents/17/local-biodiversity-strategy

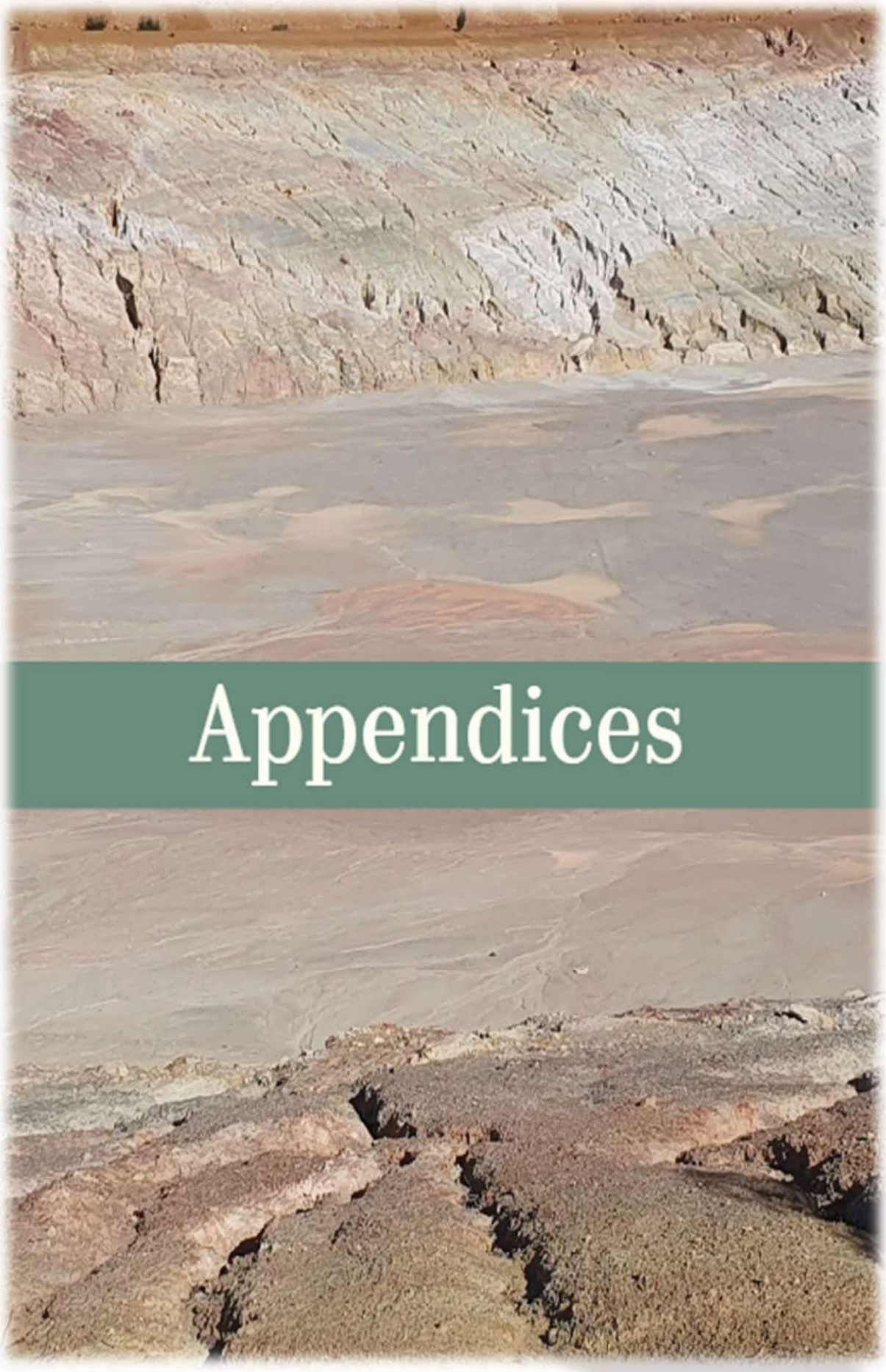
Shire of Northam. (2015). *Local Biodiversity Strategy.* Retrieved from https://www.northam.wa.gov.au/assets/documents/content/our-council/local_biodiversity_strategy.pdf

Threatened Species Hub. (2020). *The impact of cats in Australia*. Retrieved May 12, 2024, from https://invasives.org.au/wp-content/uploads/2020/08/Fact-sheet-The-impact-of-cats-in-Australia-Threatened-Species-Hub.pdf

Toodyay Naturalists' Club. (2010). *TNC newsletter no. 1 May 2010*. Retrieved from https://www.toodyaynats.org.au/newsletters/TNC%20Newsletter%20No.1%20MAY10.pdf

WALGA (2015). Shire of Northam Local Biodiversity Strategy February 2015. Available from: https://www.northam.wa.gov.au/Assets/Documents/Content/our-council/Local_Biodiversity_Strategy.pdf

Water and Rivers Commission. (1999). *Avon River management programme: Report WRM 11*. Water and Rivers Commission. Retrieved from https://www.wa.gov.au/system/files/2023-03/Avon-River-management-programme.pdf


Appendices

Appendix A – List of Priority Species

List of Threatened and Priority Fauna

Table A1- Priority List of Fauna (DBCA, 2024)

SCIENTIFIC NAME	COMMON NAME	CLASS	CONSERVATION STATUS
Ninox connivens connivens (southwest subpopulation)	barking owl (southwest subpopulation)	BIRD	Priority 3
Zanda baudinii	Baudin's cockatoo	BIRD	Endangered
Ixobrychus flavicollis australis (southwest subpopulation)	black bittern (southwest subpopulation)	BIRD	Priority 2
Petrogale lateralis lateralis	black-flanked rock-wallaby, black-footed rock-wallaby, moororong	MAMMAL	Endangered
Oxyura australis	blue-billed duck	BIRD	Priority 4
Zanda latirostris	Carnaby's cockatoo	BIRD	Endangered
Westralunio carteri	Carter's freshwater mussel	INVERTEBRATE	Vulnerable
Dasyurus geoffroii	chuditch, western quoll	MAMMAL	Vulnerable
Dasyurus geoffroii fortis	chuditch, western quoll (subsp. fortis)	MAMMAL	Vulnerable
Ctenotus delli	Dell's skink, Darling Range southwest Ctenotus	REPTILE	Priority 4
Calyptorhynchus banksii naso	forest red-tailed black cockatoo	BIRD	Vulnerable
Apus pacificus	fork-tailed swift	BIRD	Migratory
Idiosoma mcclementsorum	Julimar shield-backed trapdoor spider	INVERTEBRATE	Priority 2
Notomys longicaudatus	long-tailed hopping-mouse, koolawa	MAMMAL	Extinct
Tyto novaehollandiae novaehollandiae	masked owl (southwest)	BIRD	Priority 3
Galaxiella munda	mud minnow, western dwarf galaxias	FISH	Vulnerable

SCIENTIFIC NAME	COMMON NAME	CLASS	CONSERVATION STATUS
Cacatua pastinator pastinator	Muir's corella	BIRD	Specially protected
Myrmecobius fasciatus	numbat, walpurti	MAMMAL	Endangered
Falco peregrinus	peregrine falcon	BIRD	Other Specially Protected
Macrotis lagotis	bilby, dalgyte, ninu	MAMMAL	Vulnerable
Isoodon fusciventer	quenda, southwestern brown bandicoot	MAMMAL	Priority 4
Tringa nebularia	common greenshank	BIRD	Migratory
Leipoa ocellata	malleefowl	BIRD	Vulnerable
Calidris ruficollis	red-necked stint	BIRD	Migratory
Idiosoma nigrum	shield-backed trapdoor spider	INVERTEBRATE	Endangered
Phascogale tapoatafa wambenger	south-western brush-tailed phascogale, wambenger	MAMMAL	Specially Protected
Notamacropus eugenii derbianus	tammar wallaby	MAMMAL	Priority 4
Hydromys chrysogaster	water-rat, rakali	MAMMAL	Priority 4
Zanda sp. 'white-tailed black cockatoo'	white-tailed black cockatoo	BIRD	Endangered
Aspidites ramsayi (southwest subpopulation)	woma (southwest subpopulation)	REPTILE	Priority 1
Glacidorbis occidentalis	Jarrah forest freshwater snail	INVERTEBRATE	Priority 3
Bettongia penicillata ogilbyi	woylie, brush-tailed bettong	MAMMAL	Critically Endangered

Legend	
	Extinct
	Critically Endangered
	Endangered

List of Threatened and Priority Flora

Table A2- Priority List of Flora (DBCA, 2024)

Taxon	**Conservation Status**
Acacia browniana var. glaucescens	Priority 2
Acacia chapmanii subsp. australis	Endangered
Acacia drummondii subsp. affinis	Priority 3
Acacia trinalis	Priority 1
Androcalva fragifolia	Priority 1
Adenanthos cygnorum subsp. chamaephyton	Priority 3
Anigozanthos humilis subsp. chrysanthus	Priority 4
Asterolasia grandiflora	Priority 4
Banksia nivea subsp. Morangup (M. Pieroni 94/2)	Priority 2
Beaufortia eriocephala	Priority 3
Beaufortia purpurea	Priority 3
Boronia scabra subsp. condensata	Priority 2
Caladenia integra	Priority 4
Caladenia multiplex	Priority 2
Caladenia speciosa	Priority 4
Calothamnus pachystachyus	Priority 4
Calytrix oncophylla	Priority 2
Chordifex chaunocoleus	Priority 4
Chorizema ulotropis	Priority 4
Comesperma rhadinocarpum	Priority 3
Conostylis caricina subsp. elachys	Priority 1
Cyanicula ixioides subsp. candida	Priority 2
Cyanicula ixioides subsp. ixioides	Priority 4
Daviesia debilior subsp. sinuans	Priority 3
Drosera albonotata	Priority 2
Drosera sewelliae	Priority 2
Eleocharis keigheryi	Endangered
Eremaea blackwelliana	Priority 4
Eucalyptus loxophleba x wandoo	Priority 4
Eucalyptus x carnabyi	Priority 4
Gastrolobium nudum	Priority 2
Goodenia verreauxii	Priority 4
Grevillea bracteosa subsp. bracteosa	Endangered
Grevillea candolleana	Priority 2
Grevillea flexuosa	Endangered
Grevillea sp. Toodyay West (F. Hort et al. 3296)	Priority 2
Hemigenia platyphylla	Priority 4
Hibbertia miniata	Priority 4
Hydrocotyle lemnoides	Priority 4

Taxon	Conservation Status
Johnsonia inconspicua	Priority 3
Lasiopetalum caroliae	Priority 3
Lasiopetalum caroliae	Priority 3
Lasiopetalum decoratum	Priority 2
Lasiopetalum trichanthera	Priority 2
Lechenaultia magnifica	Priority 1
Millotia tenuifolia var. laevis	Priority 2
Oxymyrrhine coronata	Priority 4
Persoonia sulcata	Priority 4
Platysace ramosissima	Priority 3
Schoenus capillifolius	Priority 3
Schoenus natans	Priority 4
Schoenus sp. Toodyay (G.J. Keighery & N. Gibson 2918)	Priority 1
Sowerbaea multicaulis	Priority 4
Stylidium cymiferum	Priority 3
Stylidium sacculatum	Priority 3
Stylidium vinosum	Priority 1
Styphelia brevicuspis	Priority 2
Synaphea grandis	Priority 4
Synaphea panhesya	Priority 1
Tetratheca pilifera	Priority 3
Tetratheca retrorsa	Priority 3
Tetratheca spartea	Priority 2
Thelymitra stellata	Endangered
Thysanotus tenuis	Priority 3
Tricoryne sp. Wongan Hills (B.H. Smith 794)	Priority 2
Trithuria australis	Priority 4
Verticordia citrella	Priority 2
Verticordia huegelii var. tridens	Priority 3
Verticordia serrata var. linearis	Priority 3

List of Threatened Communities

Table A3- Priority List of Ecological Communities (DBCA, 2024)

Specie Name	Conservation Status
Claypans with shrubs over herbs	Priority 1
Wheatbelt Woodlands	Priority 3
Wandoo Woodland	Priority 2

Appendix B – Reserves Controlled by the Shire of Toodyay

Table B1-Vegetation Complexes and Vegetation Association in the Reserves controlled by the Shire of Toodyay

Reserve No.	Reserve Name	Reserve Class	Vegetation Association	Vegetation System	Vegetation Association	Reserve Area
R 2281		C		YORK	352	0.62
R 2286		C	Bindoon, Bi	BANNISTER, YORK	4, 352	0.72
R 2876		C	Michibin, Mi	BANNISTER	4	7.96
R 3014		C	Williams, Wi	YORK	352	5.63
R 3204	Dudley Chitty	C	Bindoon, Bi	BANNISTER	4	24.23
R 3338		C		YORK	352	3.17
R 4155		C	Williams, Wi	YORK	352	2.13
R 4668	Balgaling	C	Bindoon, Bi	YORK	352	6.49
R 4669	Snake Gully	C	Williams, Wi	YORK	352	2.32
R 5273	Dawn Atwell	C	Coolakin,Ck, Yalanbee, Y6	BANNISTER	4, 1006	63.05
R 5521		A	Williams, Wi	YORK	352	2.11
R 6338		C		YORK	352	0.83
R 6339		C	Bindoon, Bi	YORK	352	0.08
R 6605		C		BANNISTER, YORK	4, 352	1.64
R 7496		C		YORK	352	1.32
R 9829		C		YORK	352	2.02
R 9832		C	Michibin, Mi,Yalanbee, Y6	GOOMALLING	694	2.02
R 21797		C	Bindoon, Bi	YORK	352	1.09
R 22143		C		YORK	352	2.71
R 23126		C	Bindoon, Bi,Williams, Wi	YORK	352	0.18
R 24865	Weatherall	C	Bindoon, Bi	YORK	352	4.79
R 27015		C		YORK	352	1.21
R 27152		C		YORK	352	0.59
R 32752		C		YORK	352	1.04
R 33186		C	Coolakin, Ck,Michibin, Mi,Yalanbee, Y6	YORK	352	0.08
R 33789		C		EAST DARLING	4	12.83

R 33802	Wongamine	C		YORK	946	33.41
R 33821		C		YORK	352	1.34
R 34308	Malkup Brook	C	Bindoon, Bi,Williams, Wi	BANNISTER	4	39.85
R 35142		C	Bindoon, Bi,Yalanbee, Y6	YORK	352	0.84
R 35279	Balgaling	C	Bindoon, Bi	YORK	352	8.98
R 35280		C	Bindoon, Bi	YORK	352	2.27
R 35299		C	Bindoon, Bi	BANNISTER	4	2.23
R 35406	Coondle East	C	Bindoon, Bi	YORK	352	26.22
R 35542		C	Bindoon, Bi	BANNISTER	4	2.75
R 35544	Rugged Hills	C	Dwellingup, D4	BANNISTER	4	14.22
R 35789	Wallby	C	Dwellingup, D4,Murray 2, My2,Pindalup, Pn	EAST DARLING	4, 3003	70.01
R 35790	Grevillea	C	Bindoon, Bi	EAST DARLING	3003	29.03
R 35809		C	Bindoon, Bi	BANNISTER, YORK	4, 352	49.21
R 36317		C	Williams, Wi	BANNISTER	4	0.58
R 36465		C	Murray 2, My2,Pindalup, Pn	YORK	352	0.8
R 36589		C	Bindoon, Bi,Yalanbee, Y6	EAST DARLING	3003	5.07
R 36597	Sandplain	C		BANNISTER	4	21.53
R 36746		C	Murray 2, My2	YORK	352	0.1
R 37160		C	Bindoon, Bi,Yalanbee, Y6	YORK	352	0.12
R 37692		C	Bindoon, Bi,Yalanbee, Y6	BANNISTER	4	11.09
R 37786		C	Williams, Wi	BANNISTER	4	27.32
R 37845		C	Cooke, Ce,Coolakin, Ck,Dwellingup, D3,Dwellingup , D4,Pindalup, Pn,Swamp, S,Yalanbee, Y5	YORK	352	0.06
R 38988		C		YORK	352	0.09
R 39747		C	Bindoon, Bi	YORK	352	0.76
R 39997		C	Bindoon, Bi,Cooke, Ce,Yalanbee,	YORK	352	8.77

			Y6			
R 40063		C	Bindoon, Bi	BANNISTER	4	3.98
R 40068		C	Bindoon, Bi	BANNISTER	4	1.35
R 40162		C	Dwellingup, D3,Murray 2, My2	BANNISTER, YORK	4, 352	1.4
R 41288		C	Williams, Wi	EAST DARLING	968	17.24
R 41409		C	Williams, Wi	YORK	352	0.12
R 41571		C	Coolakin, Ck,Dwellingup, D3,Dwellingup , D4,Murray 2, My2,Pindalup, Pn	YORK	352	0.12
R 43042		C	Williams, Wi	YORK	352	3.56
R 43393		C	Yalanbee, Y6	YORK	352	0.14
R 43412		C	Yalanbee, Y6	YORK	352	0.48
R 43623		C	Bindoon, Bi	BANNISTER	1006	1.89
R 43625		C	Williams, Wi	YORK	352	1.81
R 43626		C	Yalanbee, Y6	YORK	352	0.59
R 43627		C	Bindoon, Bi,Yalanbee, Y6	BANNISTER	1006	3.22
R 43628		C	Bindoon, Bi	BANNISTER	4, 1006	1.85
R 43629		C	Yalanbee, Y6	BANNISTER, YORK	4, 352	3.8
R 43630		C	Williams, Wi	YORK	352	0.02
R 43631		C		YORK	352	0.12
R 43632		C	Williams, Wi	YORK	352	0.11
R 43633		C	Bindoon, Bi	YORK	352	0.13
R 43937		C	Bindoon, Bi,Williams, Wi	BANNISTER, YORK	4, 352	0.36
R 44337		C	Bindoon, Bi	BANNISTER	1006	0.25
R 44723		C	Yalanbee, Y6	BANNISTER	4, 1006	0.53
R 45347		C		YORK	352	1.2
R 45901		C		YORK	352	0.41
R 45906		C	Bindoon, Bi	YORK	352	0.38
R 46067		C		YORK	352	0.48
R 46579		C		YORK	352	0.15
R 46827	Lioyd	C		YORK	352	5.2
R 48170		C	Bindoon, Bi,Yalanbee, Y6	YORK	352	8.92
R 48171	Panorama	C	Williams, Wi	BANNISTER	4	10.49
R 48206		C	Williams, Wi	YORK	352	29.11
R 48629		C	Bindoon, Bi	YORK	352	0.34
R 48719		C		YORK	352	4.08

R 49736		C		YORK	352	8.27
R 49941		C		YORK	352	3.67
R 50062		C		YORK	352	0.02
R 51619		C		YORK	352	0.26
R 51620		C		YORK	352	0.46
R 51635	Boyagerring	C	Yalanbee, Y6	YORK	352	4.18
R 52285		C	Yalanbee, Y6	YORK	352	0.01
R 52292		C	Pindalup, Pn	BANNISTER	4	0.01
R 52460		C		EAST DARLING	3003	1.65
R 53120		C		YORK	352	6.56
R 53674		C	Bindoon, Bi,Murray 2, My2,Williams, Wi	YORK	352	0.34
R 53910		C	Williams, Wi	BANNISTER	4	24.93
Total Area		661.7 Ha				

Appendix C - List of Weeds Found in Toodyay

Table C1: List of Weeds Found in the Shire of Toodyay

Species	Common Name
Acacia iteaphylla	Finders Range Wattle
Adenocarpus complicatus	
Adonis microcarpa	Pheasant's Eye
Aira caryophyllea	Silvery Hairgrass
Aira cupaniana	Silvery Hairgrass
Amaranthus powellii	Powell's Amaranth
Arctotheca calendula	Cape Weed, African Marigold
Argemone ochroleuca subsp. ochroleuca	
Asparagus asparagoides	Bridal creeper
Atriplex prostrata	Hastate Orache
Avellinia michelii	
Avena barbata	Bearded Oat
Avena fatua	Wild Oat
Avena sativa	Common Oat
Babiana angustifolia	
Bellardia trixago	
Brachypodium distachyon	False Brome
Briza maxima	Blowfly Grass
Briza minor	Shivery Grass
Bromus diandrus	Great Brome
Bromus hordeaceus	Soft Brome
Bromus rubens	Red Brome
Campylopus introflexus	
Carduus pycnocephalus	Slender Thistle
Carthamus lanatus	Saffron Thistle
Cenchrus clandestinus	Kikuyu Grass
Centaurium erythraea	Common Centaury
Cerastium glomeratum	Mouse Ear Chickweed
Chenopodium glaucum	Glaucous Goosefoot
Chrysanthemoides monilifera subsp. monilifera	
Cicendia filiformis	Slender Cicendia
Conium maculatum	Hemlock
Consolida ajacis	
Coriandrum sativum	Coriander
Cotula coronopifolia	Waterbuttons
Crassula alata var. alata	
Crassula natans var. minus	
Cynara cardunculus	Cardoon
Cynodon dactylon	Couch

Species	Common Name
Cyperus tenellus	Tiny Flatsedge
Datura inoxia	
Digitaria ciliaris	Summer Grass
Disa bracteata	
Echium plantagineum	Paterson's Curse
Ehrharta longiflora	Annual Veldt Grass
Erodium botrys	Long Storksbill
Erodium cicutarium	Common Storksbill
Eucalyptus globulus	
Freesia alba x leichtlinii	
Galium murale	Small Goosegrass
Gladiolus caryophyllaceus	Wild Gladiolus
Gleditsia triacanthos	Honey Locust
Hesperantha falcata	
Hordeum marinum	
Hypochaeris glabra	Smooth Catsear
Juncus acutus	Spiny Rush
Juncus acutus subsp. acutus	
Juncus bufonius	Toad Rush
Juncus capitatus	Capitate Rush
Kickxia spuria	Roundleaf Toadflax
Limonium sinuatum	Perennial Sea Lavender
Lotus subbiflorus	
Lysimachia arvensis	Pimpernel
Lysimachia linum-stellatum	
Monopsis debilis	
Moraea flaccida	One-leaf Cape Tulip
Moraea lewisiae	
Orobanche minor	Lesser Broomrape
Oxalis compressa	
Oxalis glabra	
Oxalis pes-caprae	Soursob
Oxalis purpurea	Largeflower Wood Sorrel
Panicum hillmanii	
Parapholis incurva	Coast Barbgrass
Parentucellia latifolia	Common Bartsia
Pentameris airoides	False Hairgrass
Pentameris airoides subsp. airoides	
Pentameris pallida	
Phyllopodium cordatum	
Piptatherum miliaceum	Rice Millet
Plantago cretica	
Polygala myrtifolia	Myrtleleaf Milkwort
Polygonum arenastrum	Sand Wireweed
Polypogon monspeliensis	Annual Beardgrass

Species	Common Name
Puccinellia ciliata	Puccinellia
Ricinus communis	Castor Oil Plant
Romulea rosea	Guildford Grass
Romulea rosea var. australis	Guildford Grass
Rosa chinensis x moschata	
Rubus laudatus	
Rumex vesicarius	Ruby Dock
Sonchus asper	Rough Sowthistle
Sonchus oleraceus	Common Sowthistle
Tarimax parviflora	
Tamarix gallica	
Tribulus terrestris	Caltrop
Trifolium angustifolium var. angustifolium	
Trifolium arvense var. arvense	
Trifolium campestre	Hop Clover
Trifolium glomeratum	Cluster Clover
Trifolium subterraneum	Subterranean Clover
Triticum aestivum	Wheat
Ursinia anthemoides	Ursinia
Ursinia anthemoides subsp. anthemoides	
Vicia benghalensis	Purple Vetch
Vulpia bromoides	Squirrel Tail Fescue
Vulpia muralis	
Vulpia myuros forma megalura	
Vulpia myuros forma myuros	
Wahlenbergia capensis	(Cape Bluebell)