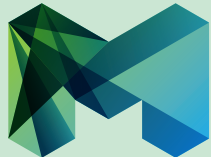


**NATURE IN THE CITY**  
**THRIVING BIODIVERSITY**  
**AND HEALTHY ECOSYSTEMS**



**CITY OF MELBOURNE**



# AN ECO CITY

We provide solid foundations for the sustainability of Melbourne's communities. We embrace the unfamiliar if it helps us achieve our ambitions. We continue to encourage our community to take positive actions and we lead by example locally, nationally and globally.

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28 April 2017

## Disclaimer

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# MESSAGE FROM THE CITY OF MELBOURNE

**Nature in the City supports and enriches all our lives. The relationship between the city's ecology and the health of our community has never been clearer: we need nature and nature needs us. This strategy provides the foundation upon which we will build, strengthen and protect the ecosystems that make up the world's most liveable city.**

The Future Melbourne 2026 plan tells us that Melburnians want a city that cares for its environment and this strategy demonstrates that we do. This strategy was developed through extensive collaboration with the community to ensure we focus on what matters and deliver what is essential.

The City of Melbourne has been internationally recognised for our leading Urban Forest Strategy and this Nature in the City Strategy serves to embed that forest, and indeed all of us, in a thriving and nourishing ecosystem. Nature in the City brings together all parts of the ecosystem - from the soil with its underground fungi to the plants and animals, including insects, birds, mammals, and frogs - and clearly sets out the actions we need to ensure the environment our children inherit is richer than it is today.

Nature in the City will also help us achieve our regional, state, national, and international commitments, ensuring we play our part in supporting a healthy planet.

We all need Nature in the City, but we can't implement this strategy alone. Residents, local businesses, academics, other governments, and international agencies all have a role to play to ensure that this ambitious urban nature strategy is realised for the benefit of generations to come.



Robert Doyle  
Lord Mayor



Cathy Oke  
Councillor  
Chair of the  
Environment Portfolio

## Acknowledgements

The City of Melbourne respectfully acknowledges the Traditional Owners of the Land.

For the Woiwurrung (Wurundjeri), Boon Wurrung, Taungurung, Dja Dja Wurrung groups who form the Kulin Nation, Melbourne has always been an important meeting place for events of social, educational, sporting, and cultural significance.

The City of Melbourne is proud that Melbourne is a significant gathering place for all Aboriginal and Torres Strait Islander people.

Many people have contributed ideas presented within this strategy including within the broader City of Melbourne community, researchers at the Australian Research Centre for Urban Ecology, RMIT University, and The University of Melbourne. The Traditional Owners of the Land were consulted in the development of this strategy.

## A note on terminology

This report uses the term 'Aboriginal' rather than 'Indigenous' to refer to the First Nation Peoples of mainland Australia as this strategy relates specifically to the area of Melbourne, Victoria. The City of Melbourne recognises that the term 'Aboriginal' refers to a number of specific individuals and communities within Melbourne, Victoria<sup>1</sup>. The term 'Indigenous' is used in instances where other individuals, literature, or institutions and their initiatives have been quoted or referred to.

# VISION

The City of Melbourne will support diverse, resilient, and healthy ecosystems that improve the environment and wellbeing of our community, providing the foundation for a liveable city.



# 1.0 EXECUTIVE SUMMARY

**This is the City of Melbourne's first strategy to create and maintain healthy ecosystems and thriving biodiversity within the city. It is the product of a collaborative process, developed with information, ideas, and advice provided by a large number of stakeholders including local academics, interest groups including Traditional Owners and Friends groups and the broader Melbourne community. It also draws on information from many expert reports and master plans and strategies prepared by the City of Melbourne.**

Nature in the City completes the City of Melbourne's portfolio of strategies that are directly focused on achieving ecological outcomes. Along with the Urban Forest Strategy and Open Space Strategy, as well as numerous other plans and initiatives, Nature in the City provides an integrated and comprehensive suite of actions to achieve thriving biodiversity, healthy ecosystems, and a society connected to nature.

In late 2016, the City of Melbourne released Future Melbourne 2026, a plan that details the community's aspirations for the city synthesised into nine key goals. Informed by contributions from thousands of people, Future Melbourne 2026 has 'A city that cares for its environment' as Goal 1, elevated from Goal 5 in 2008. The community has reaffirmed the importance of ecological sustainability by having the statement 'maintain the urban biosphere' as its first priority which is directly aligned with the underlying objectives of Nature in the City. The strategy also aligns with numerous international conventions and initiatives, such as the United Nations Convention on Biological Diversity, the Sustainable Development Goals, the Singapore Index, and the Cities and Biodiversity Outlook, whilst placing Melbourne at the forefront of urban conservation globally.

By considering our city as a wider ecosystem, there is the opportunity to actively foster connections amongst people, plants, animals and the landscape. This will create the legacy of a resilient, balanced, and healthy natural environment with a community that is connected to nature and place, is active in protecting and enhancing biodiversity, and enjoys the associated benefits to health and wellbeing.

Biodiversity is intrinsically important in its own right. As well as underpinning critical ecosystem services such as climate regulation and the provision of clean air and clean water<sup>2</sup>, biodiversity is at the heart of many cultural values. It is widely accepted that connection to nature and place is vital to community health and wellbeing. Traditional Owners attach great cultural significance to the species and landscapes that feature in their creation stories. This strategy recognises there are important and inevitable interactions that occur between people and nature in Melbourne, and that there is a notable opportunity to deliver positive outcomes for both when considered together.

Urban growth and climate change present complex challenges for Melbourne in the future. There are currently (as at 2017) 143,000 residents within the City of Melbourne and during the week, an additional 900,000 people visit the municipality for employment, education, recreation and other purposes. The population within the municipality is expected to double over the next 20 years, and the population of Greater Melbourne is expected to almost double to 8 million by 2055 from approximately 4.5 million in 2016, making it Australia's largest city<sup>3</sup>. This population growth will place increasing pressure not only on the environment, but also on the built form, open space, services, and people of the city. Concurrently, expected changes to the local environment due to climate change, including increases in storm and flood events and conversely extended dry periods and extreme heat, will have significant implications for a range of species within the municipality<sup>4</sup>.

In order for the city to support diverse, resilient, and healthy ecosystems, the following three goals and six priorities have been adopted:

## Goals

<b>1</b> Create a more diverse, connected, and resilient natural environment	<b>2</b> Connect people to nature	<b>3</b> Demonstrate leadership in urban ecology and conservation of biodiversity
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## Priorities

<b>1</b> Improve ecosystem health and biodiversity. <b>2</b> Develop a more ecologically connected urban landscape. <b>3</b> Increase the contribution of the private realm in supporting biodiversity conservation and ecosystem health.	<b>4</b> Connect more people to nature to improve social resilience, health, and wellbeing. <b>5</b> Explore opportunities to use cultural and practical 'Caring for Country' principles to integrate people with nature.	<b>6</b> Be recognised locally and globally as innovative leaders who successfully conserved biodiversity and maintained healthy ecosystems in an urban landscape.
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With 23 actions, this strategy provides new perspectives and directions in urban land management. As best practice interventions that support biodiversity have not previously been developed in the city, outcomes have been designed to allow for adaptive management as knowledge and understanding increases in this rapidly developing field. Furthermore, it is not clearly understood how challenges, such as climate change and urban development, will impact biodiversity.

The city is well placed to achieve the identified objectives. Strategies are already in place to protect and increase open space in the city<sup>5,6</sup>, to develop a diverse and resilient urban forest<sup>7</sup>, to protect and enhance waterways and catchments<sup>8</sup>, and to create a more sustainable city<sup>9</sup> that is resilient<sup>10</sup> in the face of future climate change. Initiatives arising from policies such as

the Open Space Strategy, the Urban Forest Strategy, and the Community Garden Policy in addition to projects such as Greening Your Laneways, Rooftop Gardens and the Green Our City Action Plan have helped develop an engaged community with a growing awareness of the importance of nature in the city. Preliminary research has confirmed the potential for applying 'Caring for Country' in an urban setting<sup>36</sup>. Expert reports<sup>11,12</sup> and citizen scientist initiatives<sup>13,14</sup> have revealed the extensive quantity of biodiversity in the city. The aim of this strategy is to bring this expansive body of previous work together and link this to the urban fabric to create a truly functional and celebrated ecologically healthy city.

The City of Melbourne is uniquely positioned to demonstrate responsible stewardship and prove that it is possible for urban ecosystems to exist and thrive in a highly urbanised area. By considering our city as a viable ecosystem, there is the opportunity to actively foster connections amongst people, plants, animals, and the landscape, to create the legacy of resilient, balanced, and healthy urban environments for future generations to enjoy and to nurture delight in the natural environment. This strong leadership will enable us to unleash the potential of nature and continue to maintain a liveable city in a climate-challenged future.







# 2.0 BACKGROUND AND CONTEXT

**‘A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise.’**

Aldo Leopold (1949)<sup>15</sup>

## 2.1 What are ecosystems and biodiversity?

An ecosystem is a community of living organisms interacting as a system with each other and also with the non-living components of the environment. Cities are often referred to as an ‘ecosystem’; however they typically include multiple ecosystems. The City of Melbourne is home to a number of ecosystems, including the grassy woodlands of Royal Park, the wetlands and estuarine ecosystems at Westgate Park, as well as the urban centre in downtown Melbourne. ‘Biodiversity’ is a truncation of the words ‘biological’ and ‘diversity’ and refers to the variety of nature, including all living organisms and the ecosystems they form. As well as the intrinsic value of biodiversity for its own sake, there is an increasing body of evidence to suggest that it plays a critical role in the health and liveability of cities<sup>17</sup>.

Biodiversity provides the foundation for goods and services that nature provides which are essential for the survival of humans and all living organisms. These ‘ecosystem services’ can be defined as the benefits that are obtained from the environment that contribute directly or indirectly to human wellbeing, such as clean air, clean water, and climate regulation. Urban biodiversity applies to *all species* within the municipality. Whilst locally indigenous plants and animals are frequently the focus of biodiversity conservation efforts, there are also opportunities to enhance urban biodiversity outcomes by including the plants, animals, and microorganisms that now call Melbourne home, regardless of whether their introduction was deliberate, accidental or natural. This strategy focuses on this full complement of biodiversity that occurs within the municipality, in the present and future.

## 2.2 What is urban ecology?

Urban ecology is both the *study and management* of the interactions between living organisms and their physical environment in an urban and suburban context, including interactions between humans and their environment. An understanding of the interactions amongst plants, animals, people, energy and resources within the urban environment is needed to provide a solid foundation for decisions about how we manage urban ecosystems. Urban ecology is increasing in importance globally as the number of cities and their size expand. It is estimated that within the next 40 years, two-thirds of the world’s population will be living in urban centres<sup>18</sup>. The quality of city environments – both their built and natural components – will determine the quality of life for an estimated total of five billion existing and new urban dwellers by 2050. The inclusion of urban ecology in this strategy recognises there are important and inevitable interactions that occur between people and nature in Melbourne, and that there are notable opportunities to deliver positive outcomes for both when considered together.

## 2.3 Why is this Nature in the City Strategy necessary?

The City of Melbourne municipality is home to a world renowned network of parks, gardens, and streetscapes. These green layers contribute to its status as one of the world's most liveable cities. Whilst much is heard about Melbourne's liveability, its rich biological diversity is often less celebrated.

While the City of Melbourne has a number of strategies that help provide space for people and biodiversity, this strategy explicitly defines how we will protect and enhance ecosystem health and biodiversity in the municipality. It draws together numerous existing Council documents and provides a 10 year plan to guide us towards achieving our city's vision to support diverse, resilient, and healthy ecosystems that improve the environment, health, and wellbeing of our community and provide the foundation of a liveable city. This strategy will improve the management of our urban ecosystems, with flow-on effects for other ecosystems on our planet.

Whilst Melbourne supports a surprising diversity of species there are many that are threatened and declining. Invasive pest species are common in many parts of the city and action is required to create a more resilient natural environment. This is particularly important now because Melbourne is facing two of the most complex challenges in the history of the city's development: climate change and accelerated urban growth. These will place increasing pressures on the built fabric, open space, services, people, and biodiversity of the city. The way in which the City of Melbourne responds to these challenges will fundamentally affect the nature that lives in the city, the ecosystem services that are supported, and subsequently the liveability of the city for people.

Traditional Owners attach great cultural significance to the species and landscapes that feature in their creation stories. A strategy that allows effective management of biodiversity is therefore critical to allow Traditional Owners to continue to practice their culture. As the human population in the city expands, all communities will experience less exposure to green space and become increasingly disconnected from nature. A strategy that protects biodiversity and engages people with nature will contribute to the health and well-being of all Melburnians.

This strategy draws on information provided from expert reports and citizen science initiatives and will build on Council projects that relate to green space, sustainability, and green infrastructure as seen in Figure 1. Nature in the City is one of three complementary council strategies that have a clear ecological focus, along with the Urban Forest Strategy and the Open Space Strategy. Other relevant City of Melbourne strategies and initiatives include:

- Total Watermark-City as a Catchment.
- Climate Change Adaptation Strategy.
- Greening Guides to sustainable gardening and local food production.
- Greening Your Laneway Project.
- Community Garden Policy.
- Zero Net Emissions Strategy.
- Future Melbourne 2026.
- Numerous projects promoting Water Sensitive Urban Design guidelines.

Conserving biodiversity is recognised as a regional, national, and global priority. At an international scale, there are numerous treaties, conventions, and targets, such as the United Nations Convention on Biological Diversity and the Sustainable Development Goals<sup>19</sup> that highlight the role of cities in achieving sustainability outcomes. This Nature in the City Strategy will support regional initiatives such as Resilient Melbourne, Plan Melbourne, the Regional Catchment Strategy for the Port Phillip and Western Port Region, Protecting Victoria's Environment – Biodiversity 2037, and Australian Biodiversity Conservation Strategy 2010 – 2030. It is becoming increasingly clear that cities can and must play a vital role in preserving biodiversity, not only in terms of education and advocacy but also by providing havens for some of the most vulnerable species. Responsible and efficient stewardship of urban biodiversity by local governments of city regions is critical and can greatly improve local, regional, and global sustainability<sup>20</sup>. This strategy will place City of Melbourne at the forefront of international urban conservation and solidify its title as a forward-thinking and liveable city.

'Protecting Victoria's Environment – Biodiversity 2037' is the Victorian Government's plan for managing the State's biodiversity. Two goals underpin the stated vision of 'Victoria's biodiversity is healthy, valued, and actively cared for'.

1. To encourage more Victorians to value nature.
2. To ensure that Victoria's natural environment is healthy.

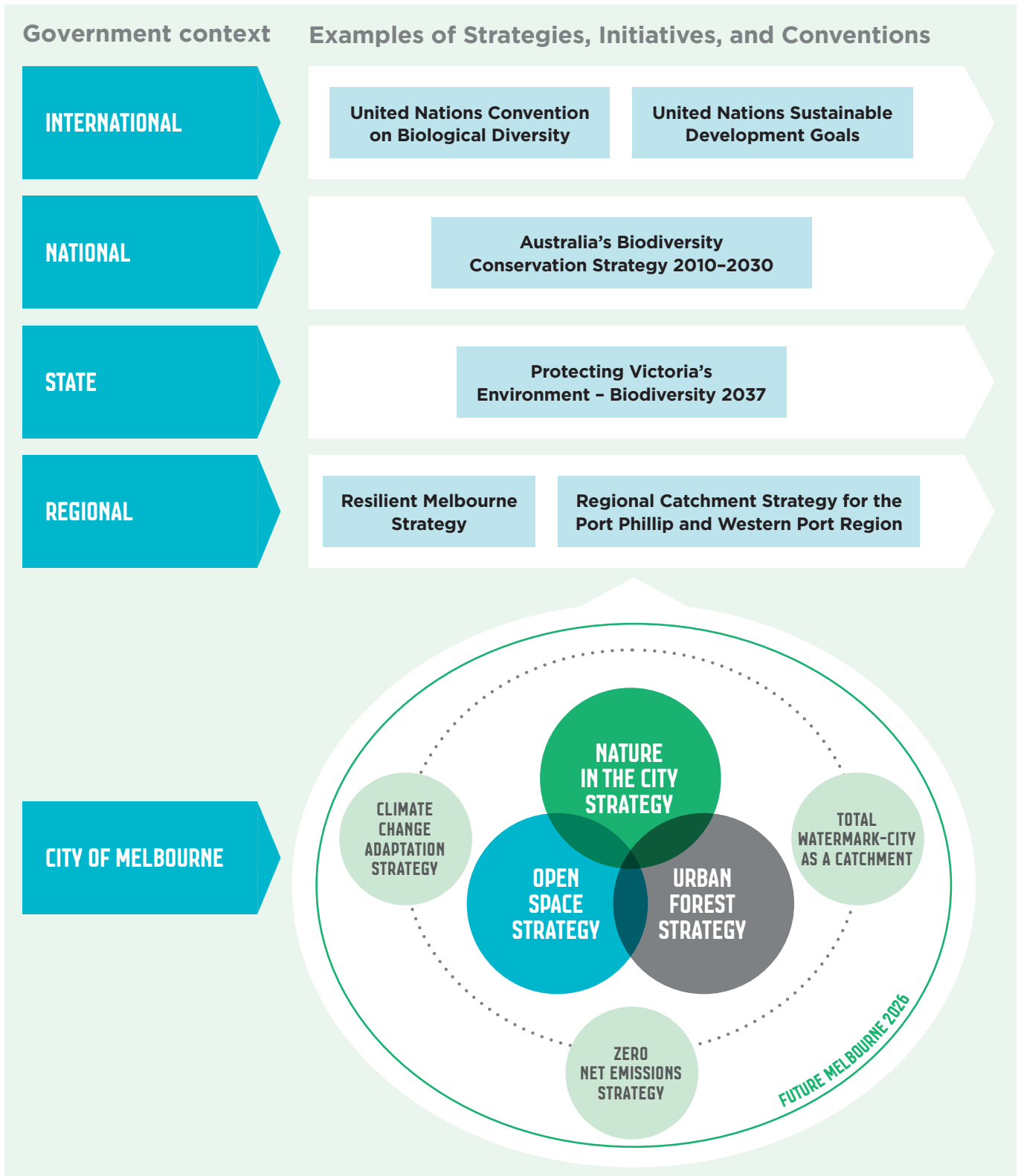


Figure 1: An overview of the existing strategies and other projects undertaken by the City of Melbourne. Nature in the City is one of the three strategies that have intentional ecological outcomes, along with the Open Space Strategy and the Urban Forest Strategy. These strategies fit within the wider context of sustainability action at the regional, state, national, and international levels.

## 2.4 Benefits of thriving biodiversity and healthy urban ecosystems

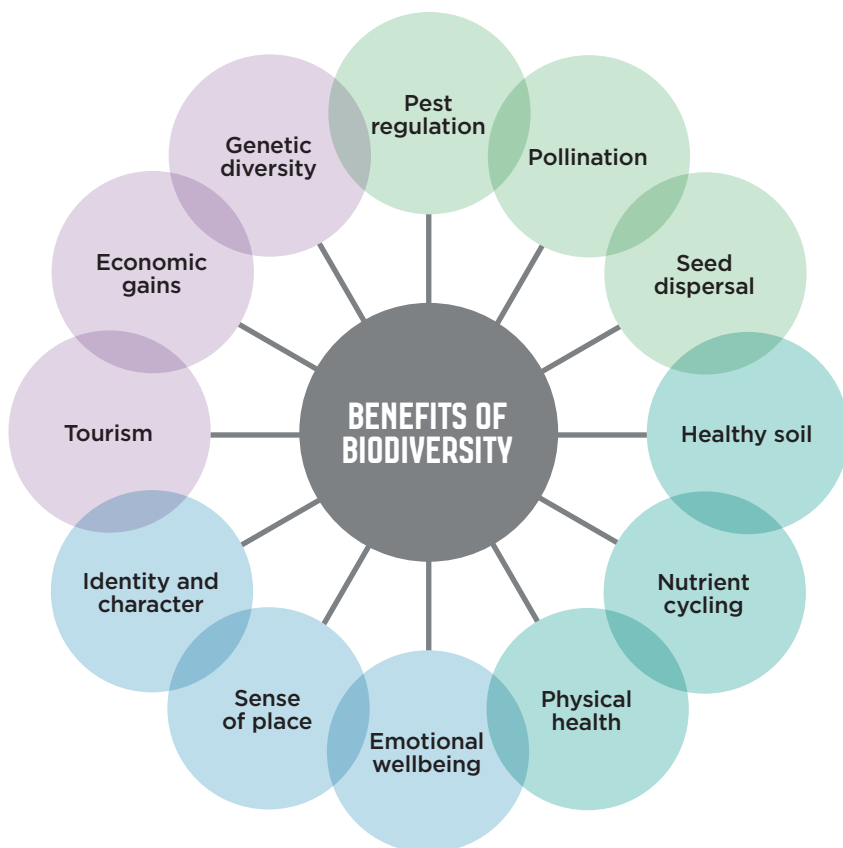
Cities are well-known for their immense buildings, large numbers of people, and extensive areas of paved surfaces. Far from being ‘concrete jungles’, cities are actually living and breathing ecosystems with intertwining networks of blue (rivers, streams, wetlands, and marine areas), green (parks, gardens, recreation reserves, remnant native vegetation, riparian zones, streetscapes, green roofs, and green walls) and grey (roads, buildings, and other impervious infrastructure).

The blue and green networks within cities are increasingly recognised for their role in supporting biodiversity, as well as their importance in sustaining happy and healthy human lives. Green and blue networks support a range of biodiversity from the indigenous plants and animals that lived in the area prior to urbanisation to the recently arrived animals and plants which may have been introduced through the deliberate and indirect actions of humans.

Extensive areas of green and blue, and the biodiversity within them, also play a crucial role in maintaining people’s health and wellbeing through providing meaningful places where they can live, work, and play, as well as healthy environments where their basic needs of clean air, water, and food are provided for.

Biodiversity underpins the delivery of critical ecosystem benefits to sustain healthy environments. For example, the diversity of green and blue networks in the city reflect the Aboriginal, European colonial, and more recent immigrant history of the City of Melbourne and provide the important service of a continuous connection to our natural heritage, identity, and sense of place. The city’s urban forest consists of 77,000 trees and many thousands of other plants which remove significant amounts of pollution to clean the air that people breathe each day. This ecosystem service is critical for ameliorating the impact of transport and other emissions in the city and supporting the health and wellbeing of those who inhabit and visit the city.

Biodiversity also underpins critical services such as pollination, climate moderation, water filtration, and pest regulation (Figure 2 and 3). These benefits of biodiversity are further outlined in Appendix 1.



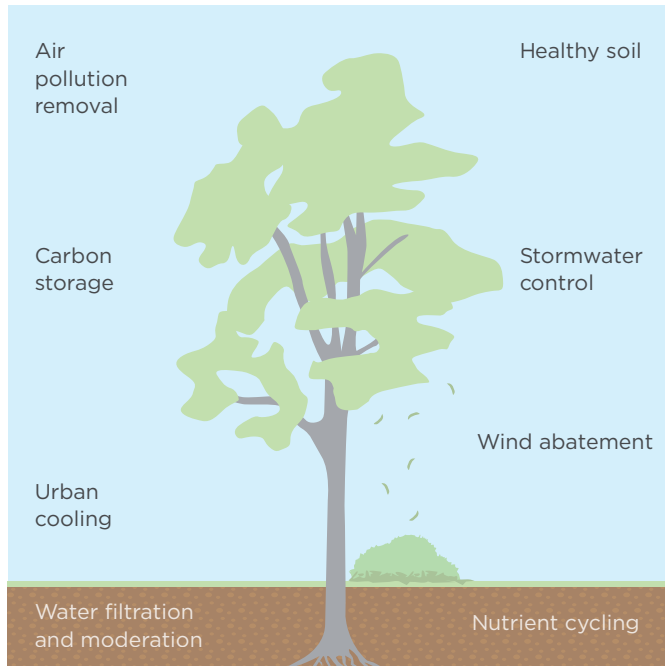
### What are ‘ecosystem services’?

Benefits that are obtained from the environment that contribute directly or indirectly to human health and wellbeing, such as clean air, clean water, and climate regulation.

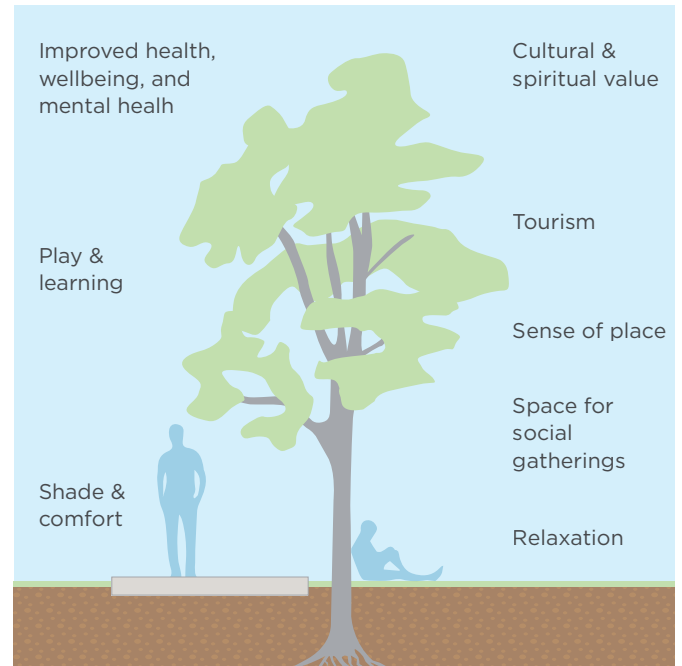
Figure 2: The various benefits of biodiversity – which are further explained in Appendix 1.

# Ecosystem services

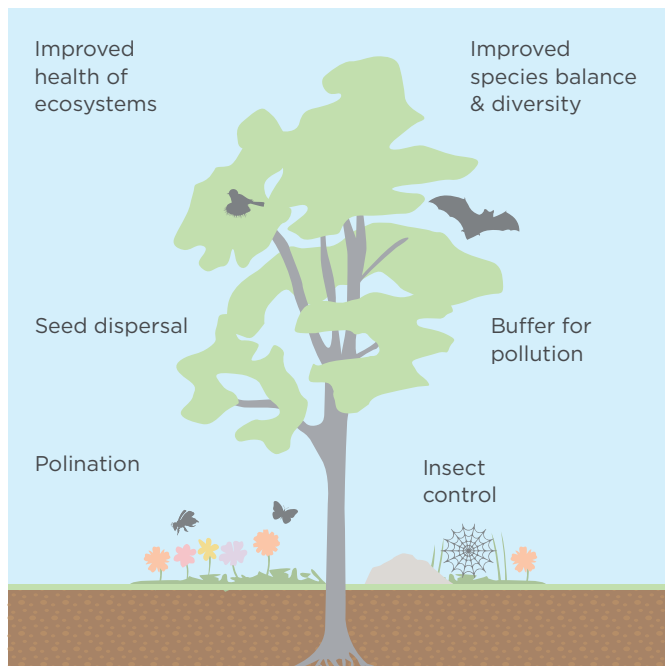
## Environmental benefits



## Human benefits



## Ecological benefits



## Economic benefits

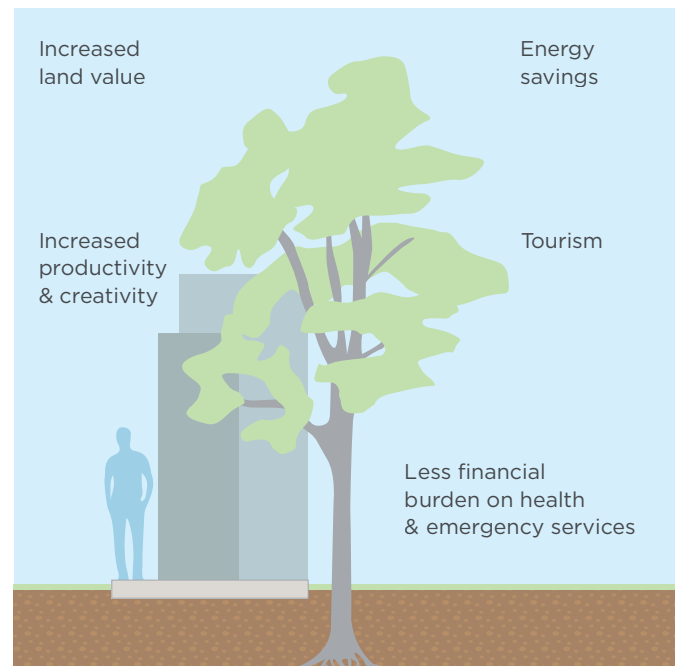


Figure 3: Some of the ecosystem services that biodiversity in the City of Melbourne can provide its inhabitants. Source: City of Melbourne.

## 2.5 Challenges and opportunities

There has been a gradual erosion of nature and ecosystem services as greater Melbourne has grown and expanded. This strategy considers how to build and shape the City of Melbourne into the future in order to maintain or increase biodiversity to create a healthy and liveable urban form whilst contending with the challenges of rapid population growth, urban densification, an increase in invasive species, and climate change.

### Population growth

Greater Melbourne is home to nearly three-quarters of all Victorians and is Australia's fastest growing city. The population within the municipality is expected to double over the next 20 years from 143,000 residents in 2017. Creating healthy and habitable urban living spaces for so many more people will be one of the defining challenges of current times.

As the population grows there is a risk that people will find it increasingly difficult to access quality green space, and consequently, become increasingly disconnected from nature with detrimental implications for physical and mental health. This will place demand on existing open spaces and in some areas create the need to provide additional open space. Rapid population growth is already occurring in areas that lack adequate open space, for example, there is currently only 4.5m<sup>2</sup> of green space per person in Southbank, compared to the municipality overall, where the average is 56m<sup>2</sup> per person. Further growth will require improvements in the quantity, diversity, and quality of open space to adequately cater to the increased population. The quality of open space will also be particularly challenging to maintain as overuse will reduce their ability to support biodiversity and health and wellbeing outcomes. Potentially competing and conflicting requirements of green space, for example, the important need to provide space for recreation and sport, will further impact biodiversity and ecosystem health.

Whilst a growing population places a large stress on the environment, cities can also provide an unprecedented opportunity for people to reconnect with nature. Cities are where most people live and work, and therefore, where they are most likely to encounter the natural environment if it is present. Enhancing biodiversity and reconnecting people to nature in cities can benefit a great number of people by improving ecosystem services and overall personal wellbeing. This reconnection with nature may also help to initiate broader support for local and international conservation efforts, as people grow more aware of the intrinsic value of biodiversity and our responsibility to look after it for future generations.

### Urban densification

Urban growth and densification leads to increased pressure on biodiversity and ecosystem processes through the destruction, fragmentation, and degradation of habitat. One of the biggest challenges that Melbourne faces is reducing the impact of urban development has on natural ecosystems. Stresses associated with development such as soil compaction, loss of access to daylight, introduction of pest species, increases in impervious surfaces, pollution, and disturbance have a detrimental effect on biodiversity and ecosystem services. Impacts associated with development, such as increases in artificial light at night, are critical stressors affecting biodiversity in urban landscapes<sup>21</sup>. Understanding how to mitigate these effects in existing developments and reducing the impact of new development on biodiversity will be critical to the success of this strategy.

Actions outlined in the Urban Forest and Open Space Strategies such as tree planting and tree diversity targets, linking urban habitats through the creation of corridors and stepping stones, and strategically purchasing or negotiating land for new open space to improve ecological services will help to mitigate some of the impacts of urban densification. Protecting and enhancing existing open space or creek corridors in addition to encouraging new developments to consider and cater for biodiversity will also play a critical role. Different avenues for enhancing biodiversity such as designing green roofs and facades to support biodiversity provide additional opportunities in the city.

Despite the challenges presented by a heavily urbanised environment, cities can play a key role in protecting biodiversity. Historically, cities developed in areas where there was ready access to a range of natural resources. These highly productive landscapes also tended to support a high diversity of locally indigenous plant and animal species<sup>22</sup>. A recent study has demonstrated that over 30 per cent of Australia's threatened species are found in 99 of the country's largest urban areas – a disproportionately high occurrence when compared to the physical extent of land these areas represent<sup>22</sup>. Perhaps surprisingly, cities can be havens for our most vulnerable species. In the City of Melbourne, there are recent records for 6 species listed as threatened under the Federal Government's Environment Protection and Biodiversity Conservation Act 1999. Conservation efforts outlined in this strategy will play a role in slowing and reversing the decline of nationally and regionally threatened species.

Somewhat surprisingly, cities can also play unexpected roles in protecting biodiversity. For example, as European honeybees have declined globally due to parasites, pesticides, and a reduction in the number of flowers available<sup>23</sup>, they have been sustained in many urban environments. The lack of extensive broad-scale pesticide use in cities and the abundance of flowers throughout the year are likely to have helped sustain pollinators in cities and towns.



Cities require much larger areas of land than they physically cover to provide all the resources needed to sustain the city's inhabitants and remove the resultant waste produced. Known as the 'ecological footprint'<sup>24</sup>, recent studies have calculated that each resident within the City of Melbourne requires 9.75 hectares of land to support their lifestyles<sup>25</sup>. Urban growth will place an increasing demand on resources and generate larger amounts of waste and emissions, thereby increasing the city's footprint and significantly contributing to biodiversity loss both locally and globally. The footprint concept is an excellent tool to engage with the community on the far-reaching positive ecological impacts of increasing more sustainable forms of consumption and reducing waste production<sup>26</sup>.

### Climate change

The global climate is changing. Some of the risks and stressors that the municipality will be subjected to under climate change include reduced rainfall and more frequent periods of drought, extreme heatwaves and bushfires, intense rainfall events, wind storms, and sea level rise. In urban areas, many of these changes have been accelerated through the urban heat island effect and changes to moisture availability due to hard infrastructure as well as shifting local rainfall patterns.

Temperature differences of up to 7°C have been recorded between the urban centre and Greater Melbourne's surrounding rural landscape, with the heat island centred on the municipality. By 2070, the average temperature is predicted to increase by 3.4°C due to global climate change based on business-as-usual scenarios. It is also unknown how climate change will impact upon the traditional seasons. As the city continues to develop, increasing impervious surface cover may further amplify the effect of these urban stresses. Managing these urban stressors will enable a broader range of species to persist within the municipality.

The city's urban forest and open spaces play an important role in mitigating these impacts, as outlined in the Urban Forest and Open Space Strategies. One of the major targets of the Urban Forest Strategy is to double canopy cover, thereby decreasing municipal summertime temperatures. Importantly, this target can be supported by measures to also specifically improve biodiversity and ecosystem health, such as understorey planting.

### Historical mismanagement

Many conflicting uses of green space and the lack of a strategic plan to guide management practice to achieve biodiversity outcomes has contributed to an overall decline in biodiversity and ecosystem health. Opportunities exist to further adapt management to support biodiversity through reviewing questionable management practices such as channelising waterways, overshadowing of creeks, overuse of pesticides, and the removal of fallen logs and dead trees.



## 2.6 Nature in the city today

Prior to European colonisation, the land where the city now sits was comprised of low lying floodplains filled with saltmarshes, swamps, wetlands, and the meandering Yarra River, rising gently to areas of grassy woodlands dominated by the graceful figures of mature river red gums, sheoaks, and wattles.

A small creek wound down what is now Elizabeth Street and a small rocky waterfall marked the transition from fresh to salt water in the Port Phillip Bay. The people of the Kulin Nation had lived within the landscape for thousands of years, farming the land through sustainable management practices such as firestick burns that were controlled and mosaic in pattern. This mosaic fire regime prevented the growth of dense vegetation and thereby supported important tubers, such as the yam daisy, which formed a staple food item and promoted the growth of new grass for grazing by kangaroos. The people of the Kulin Nation also witnessed many changes, including the retreat of ocean levels during the last ice age, and the re-establishment of Port Phillip Bay in the form apparent today.

At the present time, Melbourne is home to many different landscapes and characters that reflect its Aboriginal, European colonial, and immigrant history. The central city, comprising the Hoddle Grid and concentrated development of skyscrapers interspersed with laneways, acts as a hub of human activity, drawing in large numbers of people. Small parks, roof-top gardens, green facades, streetscapes, and pop up planters provide green encounters in the heart of the city. Large landscaped parks just outside the central city such as Flagstaff Gardens, Treasury Gardens, Fitzroy Gardens, Fawkner Park, and the Royal Botanic Gardens provide quiet places for recreation and relaxation.

Established residential neighbourhoods around Parkville, North Melbourne, and Kensington with their mixture of house styles and personal gardens reflect the diversity of local residents. The waterways flowing through the city include the iconic Yarra River, the Maribyrnong River, and the Moonee Ponds Creek. Iconic streetscapes such as St Kilda Road and Royal Parade showcase the city's colonial European history while the open spaces of Royal Park, Westgate Park, and sections of Moonee Ponds Creek reflect its pre-European Aboriginal landscapes and provide access to the 'wilder' parts of nature. Collectively, these landscapes chart the history of the city's development and the ongoing relationship it has had with innovative urban design.



The BioBlitz Program provides a snapshot into the range of biodiversity within the city such as insects and amphibians.  
Source: Jodi Jackson BioBlitz 2014.



The diversity of open spaces within the City of Melbourne; clockwise from top-left: pop-up planters in City Square, Fitzroy Gardens, green roofs, and Westgate Park.  
Source: Vicki Barmby, Gail Hall.

### Existing habitat in the City of Melbourne

The City of Melbourne encompasses a wide range of different habitats including waterways, marine and estuarine habitats, green infrastructure (street trees, green roofs, parks, and median strips), residential gardens, formal parks (Fawkner Park and Fitzroy Gardens), native ecosystems with substantial remnant vegetation (Royal Park) and those which have been restored (Westgate Park).

An important first step in managing our urban biodiversity and ecosystems is to accurately map the extent and condition of our native and introduced species, habitats, and ecosystems. This is one of the priority actions for the first year of this strategy (see Section 3.1.1).

The open space network in the city totals around 555 hectares, representing almost 15 per cent of the total area of the municipality. Whilst urbanisation has had a substantial effect on much of the biodiversity that was present in the municipality before European settlement, a significant amount of diversity still remains. This is due in part to the variety of existing landscapes, the protection of waterway corridors, and the diverse species palettes that have been used in plantings over many years. Regionally significant populations of White's Skink exist in Royal Park and regionally threatened species such as the Powerful Owl and Eastern Great Egret can still be found in the heart of the city. Microbats roost in the tree hollows of larger trees, seals occasionally venture into the Yarra River from the Port Phillip Bay, and pipe-fish reside under the Westgate Bridge. Flocks of Yellow-tailed Black Cockatoos venture through the city, Grey-headed Flying-foxes feed throughout the city, and the Spotted Marsh Frog call from many of our ponds. It is these unexpected encounters with nature in a dense urban environment that contribute to shaping Melbourne's unique identity and character. Recent initiatives, including the Melbourne BioBlitz, have successfully helped engage people with nature in the city, and along with expert surveys<sup>16</sup>, have helped to develop a baseline for biodiversity using the power of citizen science.

Most of the species diversity in the city is centred around larger parks, particularly Royal Park, Westgate Park, and the Royal Botanic Gardens. Moonee Ponds Creek provides a haven for threatened and rare bird species and Fitzroy and Carlton Gardens provide surprising levels of diversity despite such close proximity to the city centre (see Figure 4). Protecting and enhancing existing habitat and exploring ways to better connect various habitats, for instance through the creation of wildlife corridors, will be critical to the success of this strategy. Exploring innovative options for introducing wildlife habitat into the built form, such as green roofs, floating vegetation platforms and green laneways, will also encourage increased biodiversity in the city. Engaging the private realm in these initiatives and supporting work on public land across the entire municipality will also be essential for the Nature in the City Strategy.

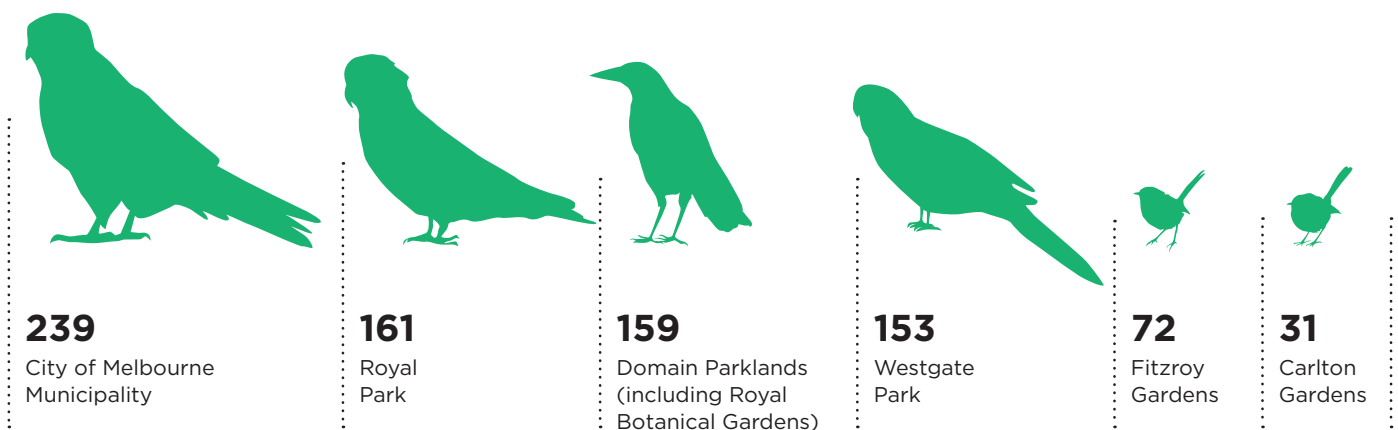


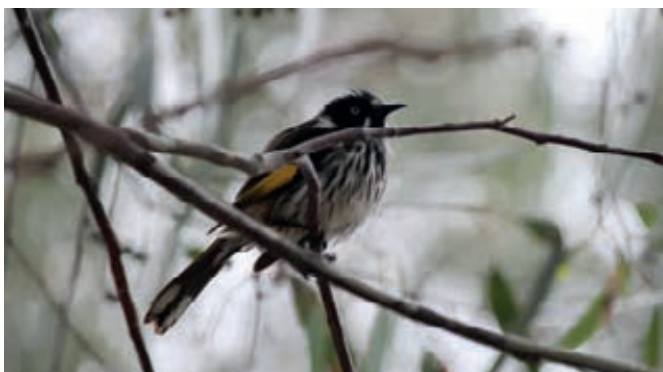
Figure 4: The number of species of birds recorded in open space biodiversity hotspots in the City of Melbourne municipality in the last 20 years. Source: City of Melbourne Master Biodiversity Dataset; Atlas of Living Australia.

Whilst the City of Melbourne currently contains surprising levels of biodiversity, many of these species are rare and declining. For example, small birds such as fairy wrens, pardalotes, and eastern spinebills play a critical role in supporting and maintaining a healthy ecosystem, but are declining in distribution and abundance in some areas. From past BioBlitzes it has been determined that small insect-eating birds comprise approximately 12 per cent of the bird species in the city, but outside our boundary they comprise closer to 40 per cent of the bird population. In a recent study of insects in the municipality, a high proportion of the 1000+ species that were identified were single individuals of a species, demonstrating that many exist in limited numbers in the city. The causes of these

declines are many and varied, and may relate to the presence of invasive species that out-compete and exclude other biodiversity, habitat loss, or climate change among other reasons.

Fortunately, there are numerous opportunities within the city to create and manage habitats for biodiversity and ecosystem health. Westgate Park, located in the Fishermans Bend Urban Renewal area, provides a particularly striking example of what can be achieved in an urban setting. Apart from a small fragment of remnant vegetation, Westgate Park is a constructed landscape that now consists primarily of indigenous vegetation. Over the last 15 years it has been transformed into a biodiversity haven, primarily through the efforts of volunteers in the community. Sharing lessons learned

in the transformation of Westgate Park will help to determine the best management practices in other areas of open space. Smaller scale interventions can also have vast positive outcomes for biodiversity. Recent research on Melbourne's insects showed that temporary ornamental planters placed outside the State Library of Victoria on Swanston Street supported 66 different insect species over the 6 weeks they were in place in 2014. The greatest improvements in biodiversity will be seen with the combination of both small and large scale interventions in the City of Melbourne.



Westgate Park, in the municipality's south-west, is a prime example of how open space can be restored and reinvigorated in the city to support a large quantity of biodiversity. Source: Luis Mata.



Temporary grasslands installation at the State Library of Victoria on Swanston Street. Source: Matthew Stanton.

### **Species in the City of Melbourne:**

Melbourne is a biodiverse region with 239 species of birds, 12 species of reptiles, 18 species of mammals, seven species of frogs, over 1500 species of insects, and 31 species of fish recorded in the last 20 years in the municipality.

There are recent records for at least six nationally threatened species, protected by the Environment Protection and Biodiversity Conservation Act 1999; the Australasian Bittern, Swift Parrot, Grey-Headed Flying-Fox, Australian Painted Snipe, Swamp Everlasting, and Anglesea Grevillea.

The city is also home to a number of species protected by the state's Fauna and Flora Guarantee Act 1988. This includes birds such as the Great Egret, Intermediate Egret, Powerful Owl, and Grey Goshawk and around 11 plant species including Salt Lawrence and the Woolly Water Lily.

### **Bioregions in the municipality and the greater Melbourne region:**

The municipality is situated on the boundary of the Victorian Volcanic Plain and Gippsland Plain bioregions. The Victorian Volcanic Plain comprises an extensive flat to undulating volcanic plain covering 2.3 million hectares between Portland and Craigieburn. Across the entire bioregion, 11 species are thought to be extinct and 171 are considered rare or threatened including 90 plants, 54 birds, four reptiles, one amphibian, nine fish, and four invertebrates.

The Gippsland Plain, located in the south east of Victoria, includes low lying coastal and alluvial plains with a gently undulating terrain dominated by floodplains and swampy flats. For the Gippsland Plain bioregion as a whole, approximately 18 per cent of the native vegetation cover remains with 8.2 per cent in conservation reserves. In the Gippsland Plain region, six species are thought to be extinct and 184 are considered rare or threatened. This includes 77 plants, 12 mammals, 66 birds, six reptiles, two amphibians, 11 fish, and eight invertebrates.

## 2.7 Indigenous, native, or introduced species?

Historically, most urban biodiversity initiatives have focused on remnant vegetation or indigenous biota. However, all biodiversity can potentially contribute to healthy and resilient urban ecosystems. Whilst the conservation and restoration of locally indigenous plants, animals and communities is a priority in this strategy, there are many opportunities to improve ecosystem health by including many of the plants, animals, and microorganisms that now call Melbourne home, irrespective of whether they are native or introduced.

The reality is that urban environments have conditions and microclimates that can be too harsh and extreme for locally indigenous species to survive, for example, rooftop gardens, green facades, and laneways. Introduced species, or species that originated elsewhere in Australia with a different

suite of tolerances may enhance ecosystem outcomes by allowing increased biodiversity in such challenging areas. For example, some introduced species are more tolerant of climate change than indigenous species<sup>27,28</sup>. However, many non-indigenous species such as foxes, elm leaf beetles, and invasive weeds can have devastating impacts on biodiversity and ecosystem health, and will therefore require careful management. The complexity of interactions among many urban species – both indigenous and introduced – remains largely unknown and requires further research and understanding.

Increasing the diversity of both native and introduced species will increase the resilience of the city system in the face of an unknown future. Heritage landscapes comprising introduced and exotic species may be of cultural significance, and are therefore, also important to conserve. For these reasons, this strategy will encompass

the full complement of biodiversity within the municipality, in the past, present, and future. Whilst efforts will be made to protect remnant and restored indigenous vegetation and increase indigenous biota, the return to a 'pre-European' environment is unrealistic for a suite of reasons and unlikely to be the most effective strategy in the face of climate change. However, opportunities to reintroduce species that have become locally extinct will be identified and explored.



**‘In every walk with nature, one receives far more than he seeks.’**

John Muir (1915)<sup>16</sup>

## 2.8 Connecting people to nature

Access to healthy, biodiversity-rich green spaces have been linked with the improved health and wellbeing of individuals and communities. There is a large and increasing body of evidence to show that time spent in natural spaces is linked to positive short and long-term health benefits<sup>29</sup> including faster illness recovery, strengthened immunity<sup>30</sup>, stress reduction, and treating depression<sup>31</sup>. Numerous studies have demonstrated the importance of nature play for children<sup>32</sup> and recent research suggests this is not simply access to green space, but in fact, the more biodiverse the space the greater the benefits<sup>33</sup>.

Social resilience, which describes the ability of groups or communities to cope with external stressors and disturbances as a result of social, political, and environmental change, is also linked to healthy and biodiverse ecosystems<sup>34</sup>. People that are healthy and happy in a thriving, tight-knit community with a strong ‘sense of place’ are more likely to be able to cope and adapt in the face of challenges. Programs that facilitate positive interactions with nature foster the development of community identity, bring people from different backgrounds together, increase social inclusion, and build stronger communities. Particular benefits can be gained through connecting vulnerable and disadvantaged members of society to nature.

It is widely accepted that humans are hard-wired to need connection with nature and other forms of life. Biophilia is the term coined by Harvard University scientist E.O. Wilson to explain the integral relationship that has evolved between all humans and nature<sup>35</sup>. By designing the city with opportunities for people to interact with nature in their daily lives and promote Biophilia, a deep set need will be met. In Melbourne, promoting the cultural and land management practices of Traditional Owner ‘Caring for Country’ principles provides another layer of depth to becoming a biophilic city. Thereby, Melbourne will become a viable urban ecosystem that seamlessly integrates nature into its urban landscape and a city where its people deeply care for country.





## 2.9 Applying ‘Caring for Country’ in the city

Country is the term used by Aboriginal people to describe their home – the land, water, air, natural systems, living things, and stories that make up a place. The word Country cannot be replaced by landscape or environment because Country also refers to people in the past, present, and future, as well as culture and heritage. Many Aboriginal Australians often speak of the land and sea that makes up Country as a relative, such as a mother or brother. In a contemporary context, Country includes the built form within the city.

The area known today as Melbourne is the Country of the people of the Kulin Nation. Unlike western notions of land ownership, Country is not ‘owned’ but rather it is cared for by its people. In fact, people belong to Country, the same way one belongs to a family. Humans are seen as a part of nature, as opposed to the traditional Western view of nature being separate from humans.

The relationship between people and country is one of symbiosis, where it is understood that if people care for country, country will in turn care for them. This notion refers in part to the idea that human physical and spiritual health and wellbeing is directly linked to the health of the environment. In a practical sense, ‘Caring for Country’, recognises that natural resources are finite and must be managed sustainably; but in a cultural and spiritual sense, it’s about respecting and valuing natural systems as the source of all life. In this context, ‘Caring for Country’ encompasses more than just ecology and biodiversity.

There is a common misconception that Aboriginal Australians live predominantly in remote places. As such, the application of ‘Caring for Country’ principles has largely been restricted to remote or rural Australia. However, 33 per cent of Aboriginal Australians and Torres Strait Islanders live in cities and there is a great opportunity for Melbourne to demonstrate leadership in the urban context. At a time when the city is experiencing the impacts of climate change and urban growth pressure, combining traditional knowledge with contemporary understanding can provide a holistic framework for meeting these challenges. Some opportunities are detailed below and a more comprehensive examination of the opportunities is given in the report ‘Caring for Country’: an Urban Application<sup>36</sup>.

### Applying ‘Caring for Country’ in Melbourne

A fundamental premise of applying ‘Caring for Country’ is to recognise that humans not only rely on the abundance of nature to survive, but also to be happy and healthy. Consequently, the impact of actions on natural systems will be considered as important as any other factor in decision-making. In many ways, the modern sustainability movement operates on the same principles and seeks to achieve the same objectives that are embodied in ‘Caring for Country’. Aboriginal people have been meeting the needs of the present whilst ensuring future generations can also meet their own needs for thousands of years<sup>36</sup>. Exploring ways to reinterpret sustainability through the lens of ‘Caring for Country’ may strengthen sustainability outcomes whilst also strengthening the community’s connection with nature.

Local knowledge passed down through generations of Aboriginal people can provide great insight into the way land is managed, even in today’s urban context. For example, recognising Melbourne’s true seasons could help fine tune irrigation regimes, annual pruning, or species selection. There are also traditional maintenance techniques, such as the use of fire or soil aeration which could be integrated into current approaches to achieve better outcomes. Healthy Country can be created by investing in programs, projects, and initiatives that help restore natural systems in the city. This includes greening the city, reducing pollution, and improving open space. Multi-layered planting and allowing ‘wild’ spaces to flourish can significantly increase biodiversity, as well as creating a more interesting landscape.

The city should be designed to create opportunities for people to interact with nature in their everyday lives so that experiencing the city is to experience nature. The cultural and practical land management implications of ‘Caring for Country’ provide Melbourne with a unique angle and richer meaning of becoming a ‘biophilic city’ (Section 2.8).

Ongoing partnership and collaboration with the Kulin Nation will be essential for truly integrating ‘Caring for Country’. It is a philosophy that can benefit the whole community, provided it is shared and celebrated with respect and the full involvement of Aboriginal people.

## 2.10 Community consultation

This strategy has been developed with the broader community in a highly collaborative and transparent way. In early 2015, the City of Melbourne released the discussion paper 'Unleashing the Potential of Nature'<sup>37</sup> and 200 members of the public attended a facilitated public forum and a further 3,323 people contributed to the online forum via the Participate Melbourne website (<http://participate.melbourne.vic.gov.au/nature>). Five external stakeholder meetings including with the Elders of Wurundjeri Tribe Land Council were held, as well as 18 internal stakeholder meetings. A Facebook campaign reached a total audience of 45,677 people. The feedback from this consultation has been summarised in the 'Unleashing the Potential of Nature in Melbourne Community Consultation Report'<sup>38</sup>.

A draft Urban Ecology and Biodiversity Strategy was released for public consultation in mid-2016 after being endorsed by council, with 76 online submissions and 16 written submissions received. At approximately the same time (February – June 2016), the City of Melbourne engaged extensively with the community on creating the Future Melbourne 2026 Plan. The feedback from each of these phases has been used to inform and refine the 'Nature in the City Strategy'.

## 2.11 Looking towards the future

Three goals have been identified to achieve the vision of the city as supporting diverse, resilient, and healthy ecosystems that improve the health and wellbeing of our community and provide the foundation for a liveable city. The three goals and six priorities identified in the strategy have been developed after consultation and include outcomes from workshops, community engagement, research partnerships, and the 'Unleashing the Potential of Nature' discussion paper.

### Goals, priorities, and targets

Our vision is for the City of Melbourne to support diverse, resilient, and healthy ecosystems that improve the environment and wellbeing of our community, providing the foundation for a liveable city. This strategy has three goals and six priorities that will guide the next 10 years of planning, development, and management of the city's biodiversity and ecosystems. It also details a set of actions and targets to evaluate the success of implementation.



Community discussion forum about nature in the city.

# VISION

The City of Melbourne will support diverse, resilient, and healthy ecosystems that improve the environment and wellbeing of our community, providing the foundation for a liveable city.

## Goals

<p><b>1</b> Create a more diverse, connected, and resilient natural environment</p>	<p><b>2</b> Connect people to nature</p>	<p><b>3</b> Demonstrate leadership in urban ecology and conservation of biodiversity</p>
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## Priorities

<p><b>1</b> Improve ecosystem health and biodiversity.</p> <p><b>Target:</b></p> <p>There is a net increase in biodiversity, habitats, and ecosystem health within the City of Melbourne by 2027.</p>	<p><b>4</b> Connect more people to nature to improve social resilience, health, and wellbeing.</p> <p><b>Target:</b></p> <p>By 2027, more residents, workers, and visitors encounter, value, and understand nature in the city more than they did in 2017.</p>	<p><b>6</b> Demonstrate local and global leadership in conserving biodiversity and creating and sustaining healthy urban ecosystems.</p> <p><b>Target:</b></p> <p>Deliver flagship biodiversity and urban ecology projects that are recognised locally and internationally as innovative and outstanding examples of enhancing nature in the city.</p>
<p><b>2</b> Develop a more ecologically connected urban landscape.</p> <p><b>Target:</b></p> <p>By 2027, City of Melbourne will be a more ecologically-connected city than in 2017.</p>	<p><b>5</b> Explore opportunities to use cultural and practical 'Caring for Country' principles to integrate people with nature.</p> <p><b>Target:</b></p> <p>By 2027, the City of Melbourne will, in collaboration with Traditional Owners and the local Aboriginal community, have integrated, celebrated, and promoted 'Caring for Country' approaches.</p>	
<p><b>3</b> Increase the contribution of the private realm in supporting biodiversity conservation and ecosystem health within the municipality.</p> <p><b>Target:</b></p> <p>By 2027, the private realm is playing a significant role in supporting nature in the city.</p>		



# 3.0 GOALS AND PRIORITIES

## 3.1 Goal 1 – Create a more diverse, connected, and resilient natural environment

### 3.1.1 Priority 1 – Improve ecosystem health and biodiversity

**The City of Melbourne will implement actions to enhance biodiversity and ecosystem health on City of Melbourne managed land.**

#### Target:

There is a net increase in biodiversity, habitats, and ecosystem health within the City of Melbourne by 2027.

#### Context

Healthy ecosystems and thriving biodiversity lie at the heart of this strategy. To achieve this goal, there are two equally important parts to this challenge – land managed by the City of Melbourne and other government agencies, as well as land within the private realm. Engaging with the private realm is comprehensively addressed in Priority 3.

#### Mapping and baselines

Some of the first actions of this priority are to quantify the extent of biodiversity and habitats within the municipality. While some progress has been made to develop a baseline for monitoring of biodiversity within the city through targeted surveys and BioBlitzes, more work is required to ensure we have a comprehensive picture of biodiversity, vegetation, habitat and other key resources. In addition to assessing the extent and quality of biodiversity, identifying and mapping threats is also important to inform the prioritisation of actions.

#### Research and monitoring

A commitment to evidenced-based decision-making and scientifically robust research and monitoring underpins this strategy. Because ecosystems in the city are complex, ever-changing and imperfectly understood, an adaptive management approach will be applied. Adaptive management allows impacts to be evaluated and management practices and targets adjusted in response to new information.

In order to increase biodiversity, urban stressors and threats that undermine the quality or extent of nature in the city will be identified and reduced. For example, some of these threats include artificial light at night which affects both biodiversity and human health and wellbeing<sup>39</sup>. The City of Melbourne will partner with a range of stakeholders to further explore the impact of artificial light at night and other disturbances on City of Melbourne's ecosystems and mitigate these impacts.

#### Habitat and species management

Our target for this priority is to achieve a net increase in biodiversity, habitats, ecosystem health and resilience within the municipality. To achieve this, the City of Melbourne will commit to actively protecting, enhancing, and creating habitat to support biodiversity and ecosystem health. As part of this, we will where feasible, reintroduce locally-extinct species and accept that both native and introduced species, particularly those that are benign or beneficial, play an important role in supporting ecosystem health (see Section 2.7). Pockets of native remnant vegetation and the flora and fauna they support will be afforded the highest priority. Management plans for remnant and restored native vegetation will be reviewed and implemented. This could include actions such as creating buffer zones around remnant and restored vegetation, differential mowing regimes and exploring ways to link sites.

Advice and knowledge will be sought from Traditional Owners and the Aboriginal community to help inform appropriate management of remnant vegetation and to promote the cultural importance of these sites. National and state action plans relating to threatened species will be reviewed and implemented, in order to help secure the future of some of our most vulnerable species in the municipality.

Appropriate habitat enhancements for a site will vary depending on factors such as the habitat type, historical and current biodiversity supported characteristics of neighbouring green spaces and physical and environmental constraints such as existing land use, water availability, and soil profile.

A key enhancement to habitat is by increasing understorey plants on land managed by the City of Melbourne by 20 per cent by 2027. Understorey plants live below the tree canopy and include small trees, shrubs, vines and grasses. This layer of plants is a key contributor to a healthy ecosystem and provides particularly important habitat for small birds and insects. For example, a recent study of insects in Melbourne found species richness was four times higher in under-storey habitat than in lawn. By increasing the area of resilient and low maintenance native shrubs and grasses, habitat availability will be increased, higher levels of biodiversity supported, and a more interesting landscape for humans created. Further research will be conducted to identify suitable and diverse species palettes for understorey planting, including a diversity of heights to support a more diverse range of fauna species. Planting will be carried out with consideration of water availability and soil profile in addition to public safety and maintenance costs. Guidelines will also be developed to encourage complementary understorey planting in other publically owned land and the private realm.

One of the highly visible actions will be to create and establish an iconic combination of understorey plant species to both reflect and define the unique character of Melbourne, similar to the defining role of bluestone pitchers and stainless steel street furniture in parts of the municipality.

Additional natural and artificial resources will be provided to increase the suitability of habitat for specific species. For example, dead trees and decaying logs may be retained or added to green spaces to provide a wide variety of resources to insects, fungi, mosses, and lichen and in turn, birds, reptiles, and frogs. Natural and artificially created hollows in trees provide important roosting sites for microbats, possums, native birds, reptiles and many invertebrates. Artificial hollows can be particularly useful as they can be designed to specifically suit target species whilst excluding pest or invasive species. Other novel artificial habitats include bee-hotels, floating islands, and rock groynes or oyster beds in marine habitats as well as habitats that are 'remodelled and repurposed' by the animals themselves. New approaches will be monitored and evaluated to assess their effectiveness.

Soil health is key to supporting biodiversity and ecosystem health. Challenges such as underground infrastructure, soil compaction and chemical use reduce the capacity of soil to allow the movement of water and soil biota (fungi and invertebrates) and gaseous exchange. The City of Melbourne will explore options to improve soil health on both land managed by the City of Melbourne and within the private realm.

Regular reviews of existing land management practices will assist in identifying practices that may have a negative effect on biodiversity and ecosystem health. For example, some fertilisers, herbicides and insecticides may have unintended impacts on non-target species. Whilst in some cases chemical management is necessary and warranted, such as to control elm leaf beetle, finding ways to reduce and mitigate secondary impacts of chemicals will help to support a broad range of biodiversity in the city. The City of Melbourne will review chemical use and other management procedures to ensure that best practice guidelines to protect biodiversity and ecosystem health are in place and are considered alongside other priorities for land management.

## Planning and guidance

The development of best-practice guidelines that direct how green space can be optimally managed to support biodiversity will be fundamental in affording better protection to biodiversity. These guidelines will be informed by research and will be developed in partnership with researchers and practitioners. Once developed, they will support further integration of biodiversity and urban ecology principles into the planning of parks, green spaces, precincts and waterways through relevant plans and strategies.

A key requirement of best practice guidelines will be to provide detailed species choices for plantings. Development of novel species palettes will need to consider which species can provide habitat and also be well suited to existing and expected conditions, including the future climate. Increasing the diversity of species used in planting palettes will help build resilience in the system. Sourcing of infrequently used species may be challenging at first, but increased demand created by the City of Melbourne will, over time, increase the commercial availability of such species. Similar work is already being undertaken for our urban forest and can be extended to include other plant species in the municipality. Target species for reintroduction will similarly be identified.



Both the Gould's Wattled Bat and the Rainbow Lorikeet are examples of species that utilise natural hollows in open spaces in the city such as the Fitzroy Gardens.  
Source: Tracy Lee; Museum Victoria.

## 3.1.2 Priority 2 – Develop a more ecologically connected urban landscape

**By creating habitat and developing wildlife corridors we will support the movement and dispersal of biodiversity within and beyond the municipality and enhance ecosystem service provision and resilience.**

### Target:

By 2027, City of Melbourne will be a more ecologically-connected city than in 2017.

### Context

Landscape connectivity is an important concept in ecology, and relates to how easily plants, animals, nutrients, water and energy can move across a landscape. All wildlife need to move in order to find shelter and mates, disperse away from parents and siblings or migrate to new environments. Without adequate levels of connectivity, populations can decline and become extinct, and vacant habitats may remain unoccupied if animals are unable to reach it to enable recolonisation.

Movements can occur across a range of spatial and temporal scales – from daily foraging to once-in-a-lifetime dispersal or annual migrations, and from local to global distances. Movement may be undertaken by genes, individuals, or communities. Depending on the species, these movements can be facilitated by a range of landscape elements, such as waterway corridors, tree or understorey plantings along roads, by stepping stones of vegetation within private backyards or artificial structures spanning barriers, such as rope bridges between tree canopies.

### Mapping and baselines, planning, and guidance

The first action in this priority focuses on mapping and evaluating existing conditions, and planning and implementing actions to enhance ecological connectivity over the next 10 years. The second action is to develop a framework against which all projects in the City of Melbourne can consider their impacts to ecological connectivity and implement enhancements.

The City of Melbourne is already committed to providing functioning corridors and a network of green spaces through actions in the Open Space Strategy and the Urban Forest Strategy. Nature in the City will build on these strategies by systematically and comprehensively assessing levels of ecological connectivity within and across the municipality and enhancing it wherever possible. There are opportunities to explore how the City of Melbourne can work with other stakeholders including VicTrack, Melbourne Water, Parks Victoria, Port of Melbourne, adjacent Local Government Areas, and the Victorian Government to develop a functioning network of linkages connecting important urban habitats within the metropolitan area of Melbourne. Where feasible, habitat created under Priority 1 will be implemented strategically to simultaneously develop a more functionally-connected landscape.

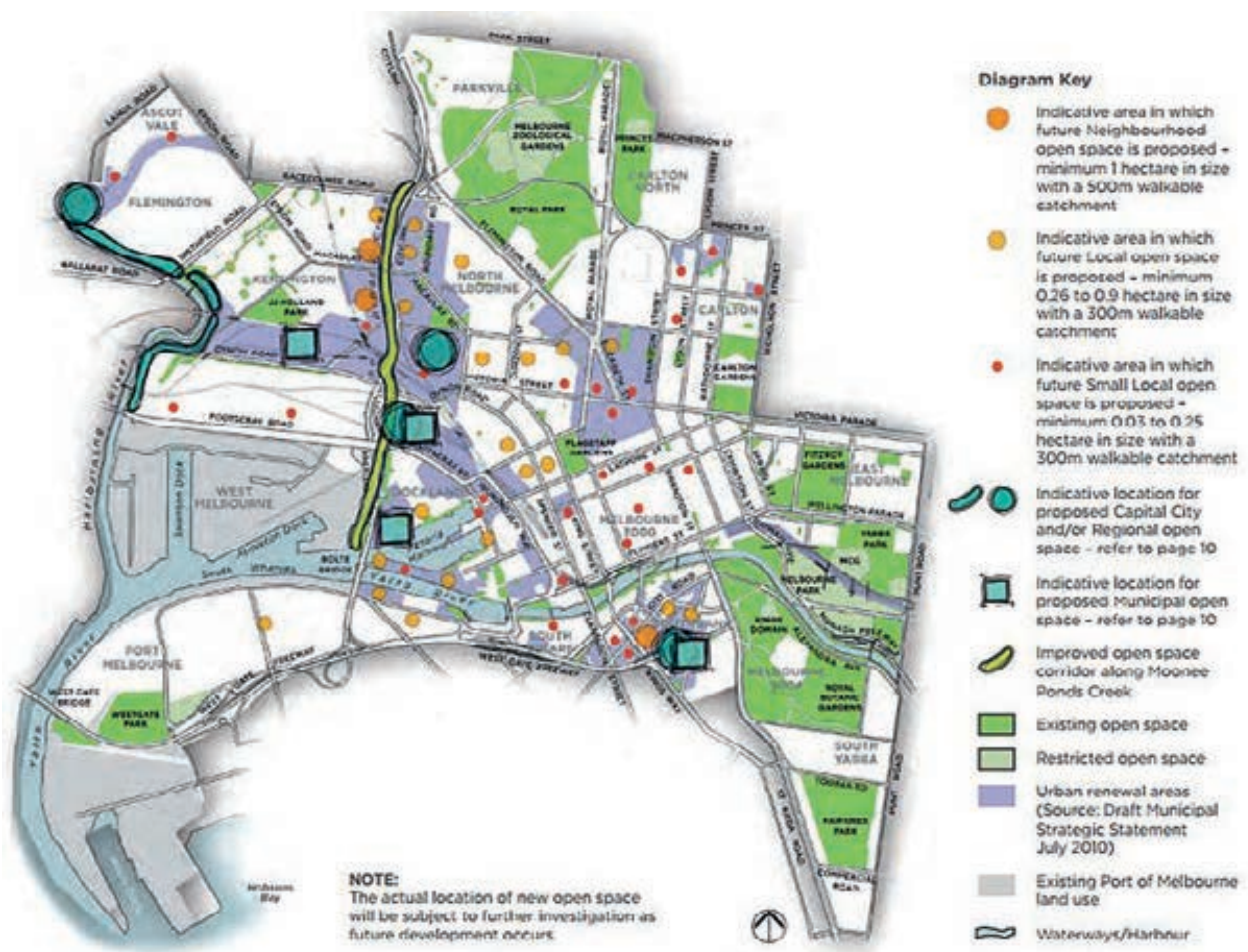


Green infrastructure, such as green walls, provides an example of how we can connect habitats through vegetation corridors in the more dense urban areas of the municipality.

Small and fragmented patches of habitat are often considered lower value than larger or continuous patches; however their potential value as both habitat and to facilitate the movement of wildlife should not be overlooked. For example, swales instead of storm water drains can provide habitat links for certain species. Gardens and green spaces in schools, city roads and laneways, businesses and residential homes can make a significant contribution to creating a habitat network, particularly if the plant species complements planting in local parks, green spaces and nearby corridors.

Waterways in the municipality currently act as critical biodiversity corridors for water and land based species, particularly birds, reptiles and frogs. The City of Melbourne sits in a unique location with the convergence of three important waterways in metropolitan Melbourne - the Yarra River, Moonee Ponds Creek and the Maribyrnong River. As such, it will be essential to co-ordinate with other relevant strategies and plans to ensure a comprehensive approach is adopted. The Port Phillip and Westernport Catchment Management Authority has developed a Regional Catchment Strategy<sup>40</sup> setting out

potential nature links through the region. As this strategy crosses multiple council jurisdictions, the City of Melbourne has the ability to link into targets set by other councils and landholders to meet broader regional goals.



Location of proposed corridors and new small green spaces detailed in the City of Melbourne Open Space Strategy. The actions contained within the Nature in the City Strategy will strengthen the ecological role of these spaces.



### 3.1.3 Priority 3 – Increase the contribution of the private realm in supporting biodiversity conservation and ecosystem health within the municipality

Habitat creation on City of Melbourne land must be strengthened through green governance initiatives that support integrated actions by other major landholders, including the private realm, to increase habitat and create connected networks of habitat.

**Target:**

By 2027, the private realm is playing a significant role in supporting biodiversity and ecosystem health.

**Context**

The private realm is all land and property within the municipality which is not owned or managed by the City of Melbourne. Currently, only 27 per cent of the land (such as parks, roads, property, and waterbodies) in the municipality is owned or managed by the City of Melbourne, with the remaining land owned or managed by other government agencies (45 per cent) and by the private sector or public/private partnerships (28 per cent) as seen in Figure 5 .

Engaging the private realm in the protection and enhancement of our urban environment is critical to achieving a healthy ecosystem and thriving biodiversity. The consultation workshops undertaken during the development of this strategy highlighted a clear desire from the

community for the private realm to play its part in upholding the liveability and productivity of our city. Workshop participants noted that there are significant amounts of space available on private property and that this space could make a substantial contribution to supporting healthy ecosystems<sup>41</sup>.

**Education and engagement**

Over the next 20 years, the population within the municipality is expected to nearly double, from the 143,000 residents in 2017. Over the next 10 years, an estimated 42,800 new residential dwellings and 111 hectares of additional commercial office space<sup>42</sup> is forecasted to be constructed. In order to plan for this growth and successfully integrate with the private realm, we must create a model for effective engagement through a range of innovative partnerships, initiatives and schemes.

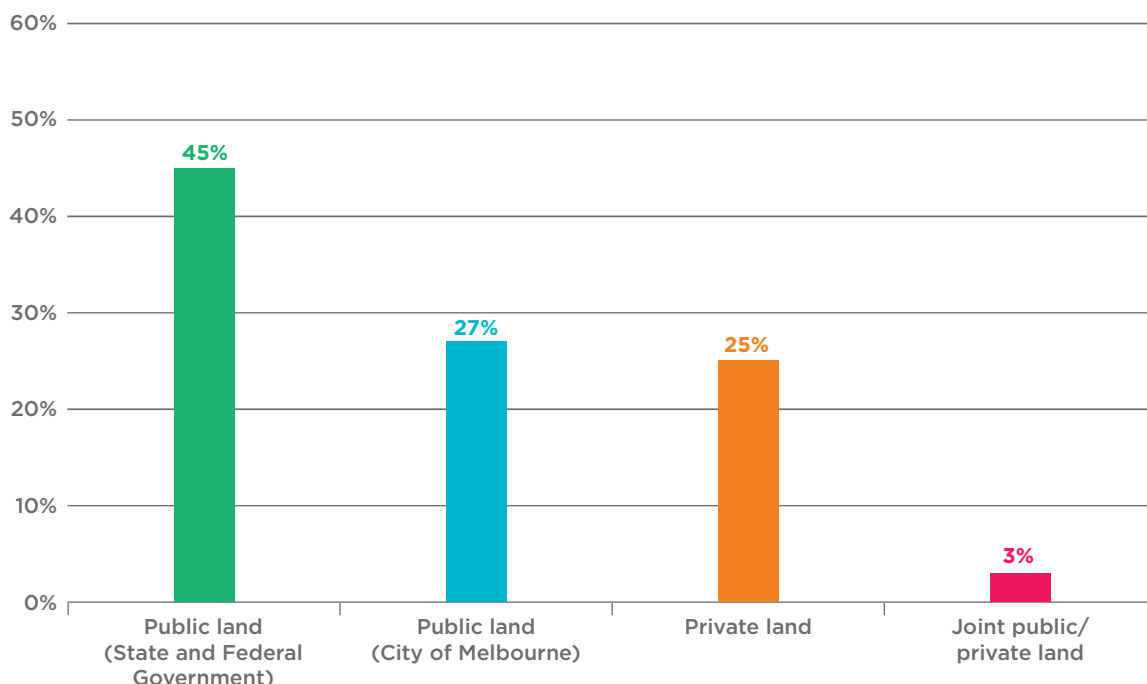


Figure 5: Chart of land ownership within the City of Melbourne. Source: City of Melbourne Property Service 2015.

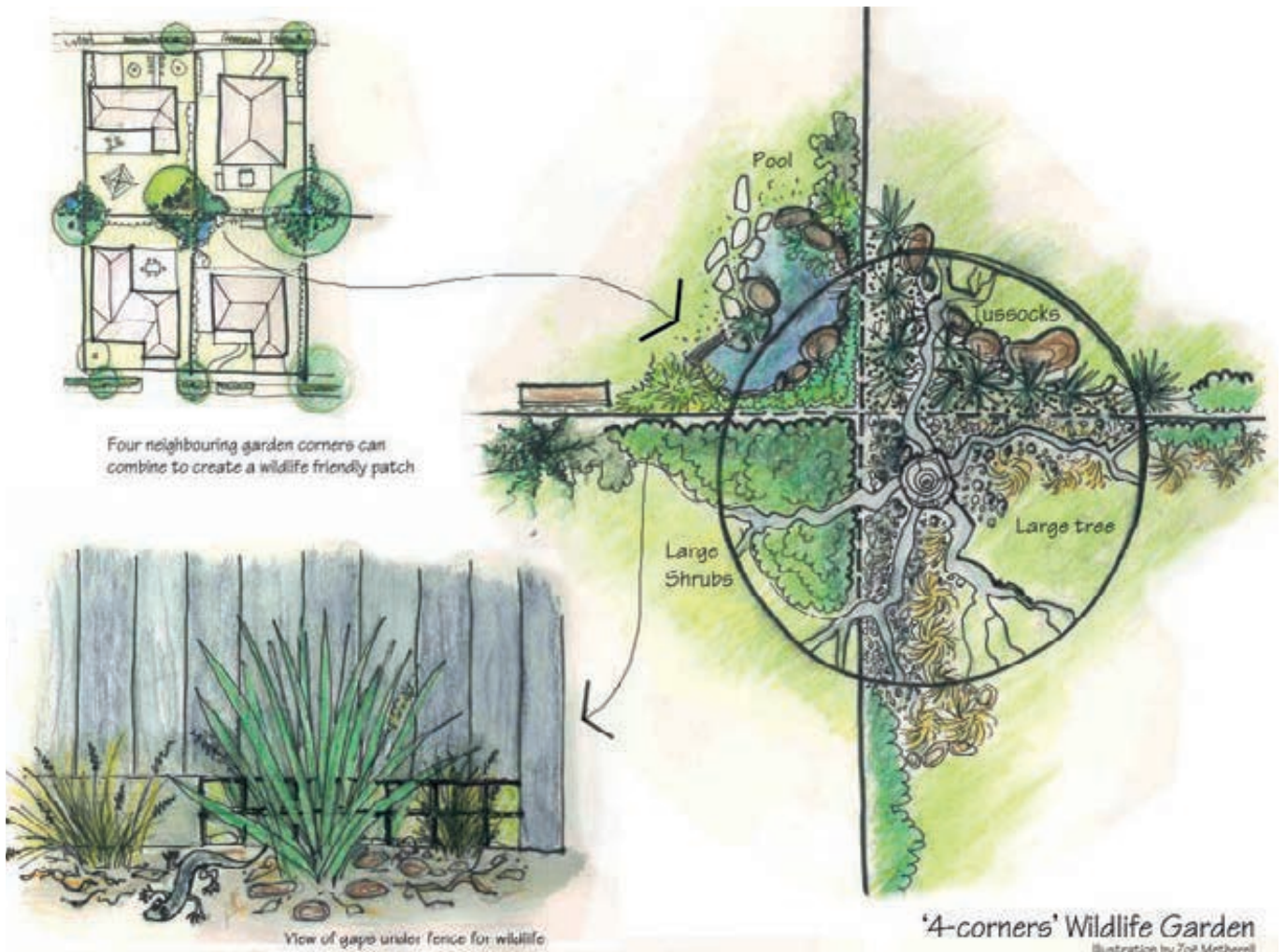
**Research and monitoring**

The predicted growth in population and new development within the City of Melbourne is both a significant challenge and an incredible opportunity. Whilst development could pose a threat to existing biodiversity, there is potential to establish new habitats and create healthier buildings to live and work in.

In addition to new development, existing property also presents an opportunity to enhance and establish nature in the city. This could be in the form of protecting native vegetation, establishing a green roof or completing

a garden makeover with neighbours to create habitat for wildlife or a movement corridor. Whilst significant potential exists within established areas, there are also many barriers that can limit successful outcomes. In the residential sector alone, there is notable variation in resident's obstacles to urban greening among dwelling types and tenure arrangements. Owner-occupiers and those living in terrace or stand-alone housing face property suitability and a lack of knowledge as major barriers. Those living in apartments and rental properties face these same barriers with the additional challenge of landlord and/or body corporate approval<sup>43</sup>.

Consequently, there is a need to establish different policy tools to overcome the barriers faced by different stakeholders in not only the residential sector, but the commercial and industrial sectors as well. The OECD's Green Growth in Cities report advocates a combination of regulatory and incentives based measures<sup>44</sup> whilst the City of Melbourne's Green Roofs, Walls, and Facades Policy Options Background Paper concludes that "in most cases, more than one policy option should be implemented at once, and policies should be supportive and reinforcing of each other"<sup>45</sup>.



Possible options for how neighbours can work together to achieve common green infrastructure targets. Source: Zoe Metherell.

A report by GHD<sup>46</sup> found that many cities around the world have used a multi-faceted, reinforcing approach to increase urban habitat. In Chicago, USA, a suite of mandatory requirements, government grants and planning scheme incentives have been used to encourage green roofs in the private sector. This has resulted in 51 hectares of green roof being added to the city since 2004. In Basel, Switzerland, a combination of building regulation and financial incentives were used to engage the private realm in creating the highest per capita area of green roof area in the world. Similar multi-faceted approaches have also been used in Berlin and Washington D.C.

To determine which incentives and education options will be most effective, the City of Melbourne will explore the barriers to enhancing urban nature across different building types and tenures, including landlords, owner's corporations and developers in the residential, commercial and industrial sectors. This comprehensive understanding of the various barriers will be used to develop effective targeted incentive and educational programs.

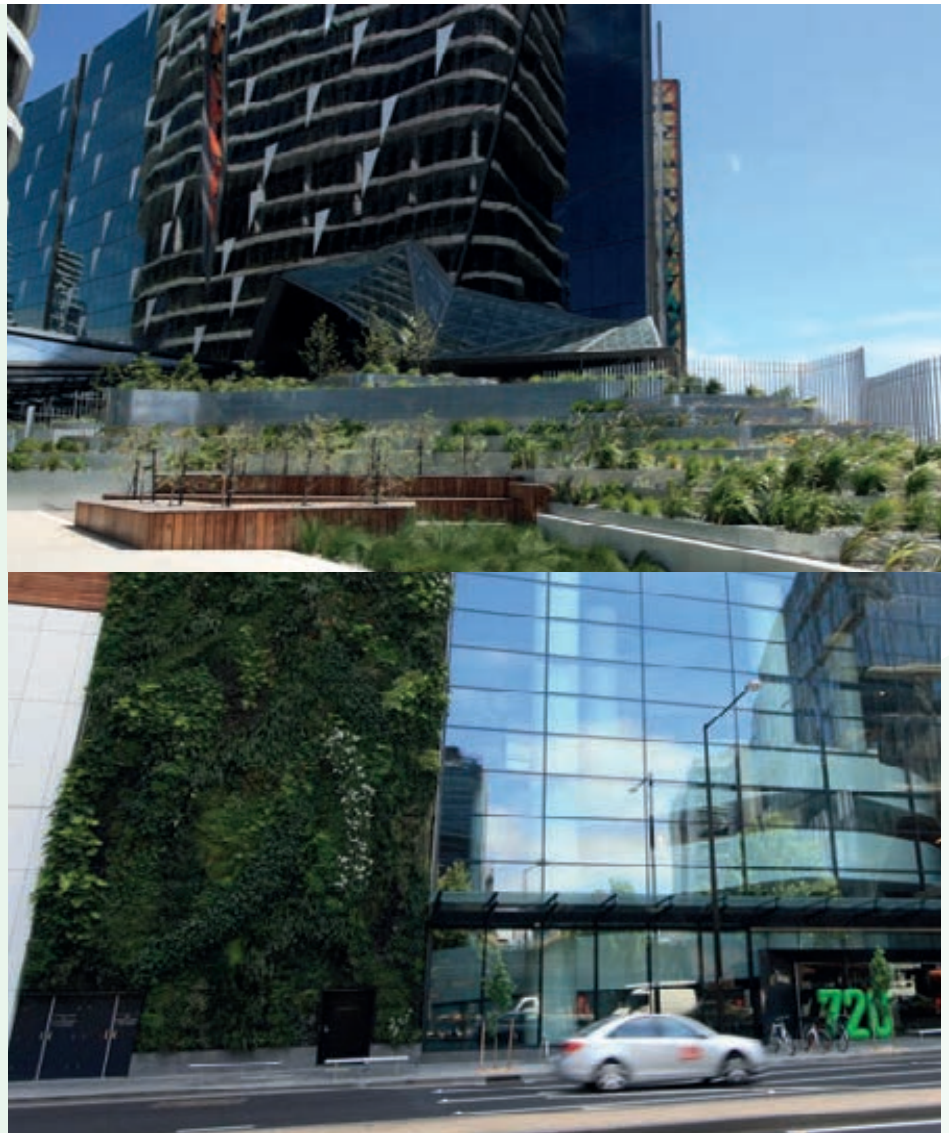
## Planning and guidance

The City of Melbourne will develop numerous resources to support nature-friendly projects in the private realm, including biodiversity-specific guidelines for green infrastructure that will complement the Growing Green Guide. A priority will be to develop guidelines to enhance the biodiversity and ecosystem service outcomes in hard to grow places, such as in laneways, under bridges or in compacted or polluted soils.

### Medibank Building

720 Bourke Street, Docklands

Constructed in 2014, the 18-storey Medibank building in Docklands is important to the city's health and ecological wellbeing. Approximately 10 per cent of the building's surface area is greened, including 16 green terraces, dozens of green facades and two green walls with a total of 11,600 plants from 72 plant species. The property also includes 1500m<sup>2</sup> of publically accessible green space<sup>47</sup>. These spaces make the building a healthy place to work whilst providing habitat for the city's biodiversity.



## 3.2 Goal 2 – Connect people to nature

### 3.2.1 Priority 4 – Connect more people to nature to improve social resilience, health, and wellbeing

**Human health, wellbeing, and social resilience are linked to the condition of the environment in which people find themselves; healthy ecosystems and biodiversity provide the greatest opportunities to deliver positive outcomes to the people who live, work and play here.**

#### Target:

By 2027, more residents, workers and visitors encounter, value and understand nature in the city more than they did in 2017.

#### Context

Connecting people to nature and ‘Country’ will improve health and wellbeing, build social resilience and foster a sense of stewardship over the natural environment, which is fundamental to the successful implementation of this strategy. To improve biodiversity and ecosystem health across the city, the support and participation of all Melburnians is crucial. The City of Melbourne will be calling on individuals, ‘Friends of’ groups, Urban Landcare, communities, schools and businesses to play an active role in protecting, enhancing and monitoring biodiversity and understanding how their actions and decisions can help reduce the ecological footprint of the city.

An informed community that is connected to nature and deeply values biodiversity will help us together achieve our vision of the city that supports a diverse, resilient and healthy ecosystem.

#### Research and monitoring

This strategy sets out to reinforce and re-inject nature into the fabric of the city, making interaction with nature an ‘every-day’ and enjoyable experience for people in the city. Whether it is exploring a network of small green spaces and laneways, or hearing the sounds of native birds, to experience Melbourne will be to experience nature. By increasing exposure to green space and biodiversity through projects such as Green Your Laneway and actions within the Open Space and Urban Forest Strategies, City of Melbourne will build on the integral relationship between people and nature to increase the connection people feel to nature. A key first step is to identify opportunities to create habitat corridors along commuter cycle tracks, develop biophilic design principles and create more green spaces in our most urban areas. By providing daily opportunities for all people to interact with nature we will contribute effectively to improving the health and wellbeing of communities and encourage people to value nature more highly.

#### Citizen Forester Program

The Citizen Forester Program allows volunteers to engage with and contribute to the City of Melbourne’s work managing the urban forest. Citizen Foresters receive training and can choose to participate in a series of activities.

Activities have included genetic sampling of elm trees to evaluate resilience to pests and disease and mapping of understory vegetation across Melbourne. Volunteering as a Citizen Forester is a valuable opportunity to establish a deeper connection and understanding of the city’s biodiversity and the community’s role in protecting it.



Source: Shannon Reddaway.

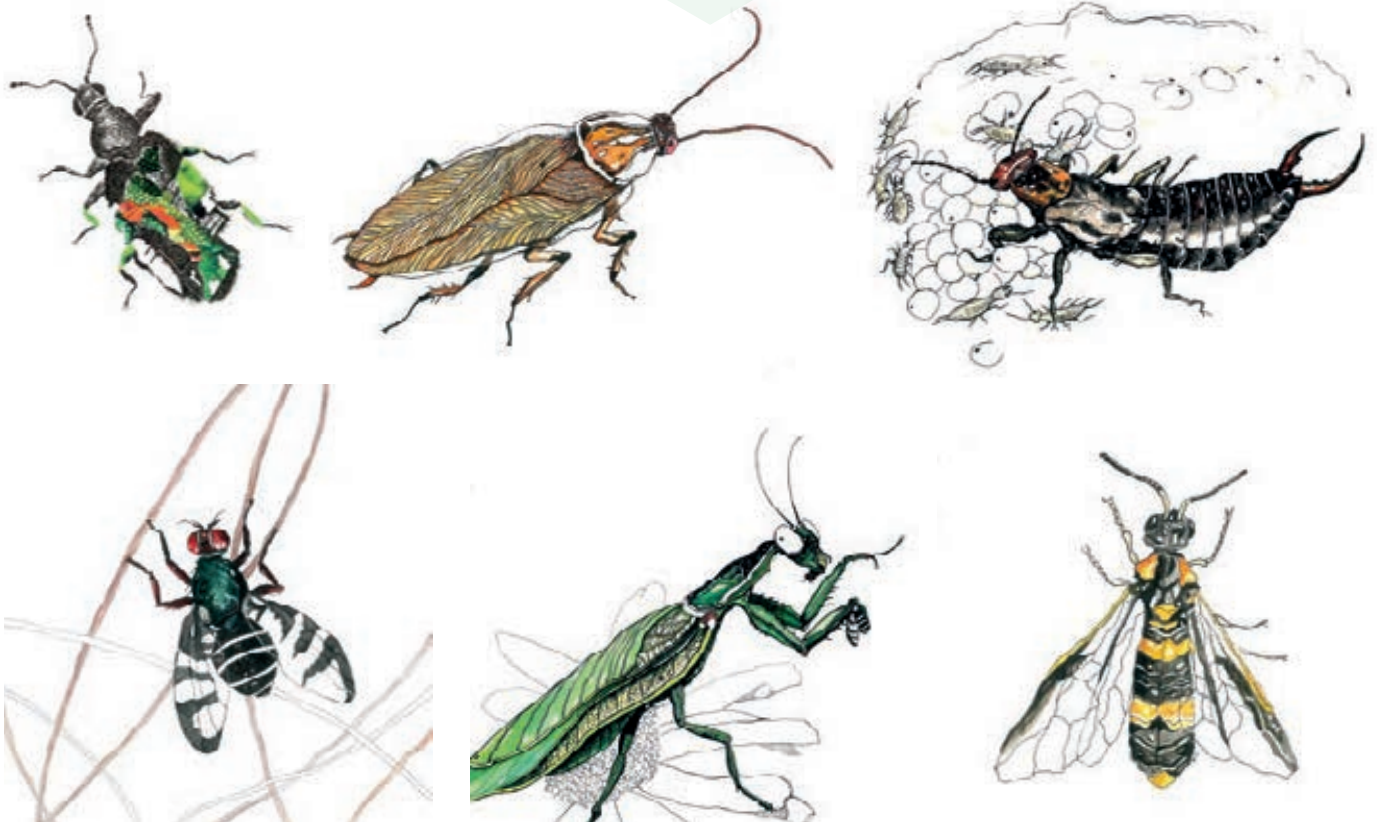
It is important to measure success and we will evaluate the extent to which the community feels connected to nature and if possible, the degree to which social resilience, health and wellbeing has changed over time. These are often difficult parameters to measure and City of Melbourne will partner with relevant global experts to rigorously monitor our progress in this area.

### Education and engagement

The award-winning Nature Play at Royal Park playground is widely acclaimed as one of the best examples of a nature playground in Australia, connecting a multitude of inner city and visiting children to nature. Other nature-based education and engagement activities include the City of Melbourne Park Ranger program, the Junior Ranger program, and the Citizen Forester program. Further opportunities to educate and advocate for biodiversity will be explored, particularly with schools and existing community networks.

Examples of initiatives that could be developed include:

- Education and advocacy of 'Caring for Country' principles
- Gardening for Wildlife program
- Audio biodiversity trails through the city
- Art installations and workshops
- 'Nature Play' opportunities
- Guides to local biodiversity hotspots
- Public lecture series
- Species identification workshops
- Interpretive signage to explain native plantings and biodiversity initiatives.



Artwork and drawings which feature insects, such as flies and mantids, found in the City of Melbourne municipality, are a great way to engage people and communities with nature.  
Source: Kate Cranney.

Citizen Science initiatives that involve members of the community collecting data to help monitor biodiversity, will be supported and further developed as part of a biodiversity monitoring framework. These initiatives will help build our understanding of biodiversity in the city, create a more engaged community and foster stewardship. A digital platform will be developed, hosted on the corporate website, to provide information about biodiversity initiatives, promote networking opportunities and further engage the community with urban nature.

### Knox City Council – Gardens for Wildlife

Knox City Council has developed a program that encourages local residents to modify their gardens to be more suitable for wildlife. Residents who register to be part of the Gardens for Wildlife program receive a home visit from an assessor, who provides tailored advice on the types of plants that will attract different wildlife species. Improved habitat quality in even these small patches leads to increased patch size and connectivity, enhancing the available habitat for a range of native fauna species.

### Planning and guidance

Community gardens can connect people with nature through a deeper understanding of plant lifecycles, food knowledge and environmental awareness. Community gardens are also an opportunity to improve biodiversity and ecosystem health by increasing plant diversity and adopting wildlife-friendly gardening practices. These actions provide food for beneficial pollinator insect species, which in turn are a food source for larger species of wildlife, such as mammals and birds. City of Melbourne will further support community gardens through production of wildlife friendly gardening guides and other initiatives.

### BioBlitz: Connecting citizens to nature

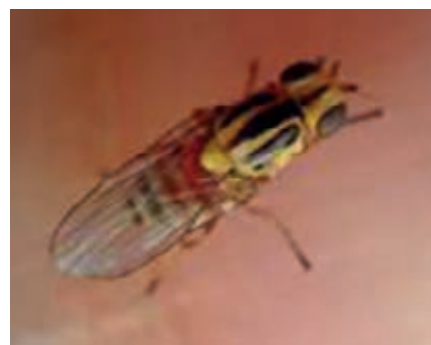
Melbourne BioBlitz is a unique opportunity for citizen scientists to engage with the city’s wildlife. As part of the 2014 and 2016 BioBlitzes, participants uploaded photos of nature in the city with the dedicated Instagram and Twitter hashtag #bioblitzmelb. A wide variety of species were photographed, with contributors often adding engaging anecdotes as captions. A few of the submissions included:



Hello! Here’s a superb fairy wren, a male, one of the local residents of Westgate Park **#bioblitzmelb @cityofmelbourne**.



I’m loving all of these native bees! Who’d have thought that we had so many! We think this is a **#Lasioglossum** - if anyone can help ID let us know! **#bioblitzmelb #bee**.



Surprisingly, since I took part in **#bioblitzmelb** I have a newfound respect for flies. I can’t wait to load this one up on **#bowerbird** and learn more about who it is and how it fits into our ecosystem.

### Nature Play Week - Melbourne, Victoria

Nature Play Week (NPW) is a signature annual event that was developed to raise the profile of nature play and reconnect children with nature and the outdoors. NPW was developed collaboratively by individuals and organisations involved in the Kids in Nature Network, including the Royal Botanic Gardens Victoria and Playgroups Victoria. The inaugural Nature Play Week ran from 1-6 April 2014. The week was filled with over 40 nature play activities, events and workshops facilitated by local organisations, parents and schools across Victoria and two in NSW. It is estimated that around 2000 children and parents participated. In 2016, over 170 events took place around Australia. The rapid expansion of the program demonstrates the increasing need people feel to connect to nature and the increasing value people are placing on nature.



### Green Your Laneway Program

Through the Green Your Laneway Program, The City of Melbourne is transforming existing laneways into green spaces, using a combination of trees, planter boxes, climbing plants and green walls. The program will include comprehensive monitoring to evaluate effectiveness.



### Personal connections to trees

The City of Melbourne's Urban Forest Visual allows members of the public to send an email to individual trees. Initially intended as a source of information and data about trees, the Urban Forest Visual and tree emails have captured the attention of people across the world. Emails expressing appreciation for trees and the wildlife they support are frequently received. The gratitude and love for the trees often shines through, especially for local residents with a personal connection to particular trees. One such email was received from a family in North Melbourne:

*To dear Elm Tree #1015114,*

*We often look at you, not only because you are a beautiful tree, but because you also have an incredible Bee colony living in one of your hollows. Lucien my 4 y/o son has named the park 'Bee Park' where you live, because of your life giving trunk. Thank you lovely Elm tree!*

*Bridget, Piers, and Lucien.*





### 3.2.2 Priority 5 – Explore the ways in which cultural and practical ‘Caring for Country’ principles can assist in integrating people with nature

The City of Melbourne has collaborated with representatives of the Wurundjeri in the spirit of reconciliation and in recognition of our shared future on the content of this priority. The City of Melbourne pays deep respect to the Kulin Nation elders, past and present, who have nurtured this country for many thousands of years and generously share their traditional knowledge.

By supporting and embracing a ‘Caring for Country’ approach, the City of Melbourne will be more effective in nurturing, sharing and communicating the important relationship between people and nature.

#### Target:

By 2027, the City of Melbourne will have, in collaboration with Traditional Owners and the local Aboriginal community, integrated, celebrated, and promoted ‘Caring for Country’ approaches.

#### Context

The City of Melbourne has a long and proud natural and cultural history. This began with the Woiwurrung (Wurundjeri), Boon Wurrung, Taungurung, Dja Djawurrung, and Wauthaurong people of the Kulin Nation, who inhabited a landscape that was rich in wetlands and open scattered forest. For the people of the Kulin Nation, Bunjil (an eaglehawk) is the creator spirit of the land, the lore and its people. As First Nations people, the Kulin Nation had, and continue to have, an intimate understanding of, and a deep connection with the land.

As described earlier, ‘Caring for Country’ is a belief system and land management practice that seeks to retain natural balance and abundance, and is broader than the ecology of a place. In a contemporary context, ‘Country’ includes the built form within the city, as well the land, water, air, natural systems, living things, and stories that make up a place. Unlike western notions of land ownership, Country is not ‘owned’ but rather it is cared for by its people. If people care for Country, Country will in turn care for them. This notion refers in part to the understanding that human physical and spiritual health and wellbeing is directly linked to the health of the environment. In a practical sense, ‘Caring for Country’ recognises that natural resources are finite and managing them sustainably, but in a cultural and spiritual sense, is about respecting and valuing natural systems as the source of all life.

#### Research and monitoring, and partnerships

An important first step in successfully integrating ‘Caring for Country’ in Melbourne is to investigate and develop appropriate and effective partnership models. To date, traditional ecological knowledge and philosophy has only rarely been applied to tackle urban sustainability challenges and many examples are of localised projects and initiatives. Consequently, there is much work required to collaboratively explore and develop effective models that integrate ‘Caring for Country’ in partnership with Aboriginal people of Melbourne.

The City of Melbourne is keen to continue to build and strengthen our existing relationships with the Aboriginal community. We recognise that much open and honest dialogue will be required to develop the overall partnership framework as well as the many specific actions and projects that are implemented. We believe that one action that the City of Melbourne can implement is to create a new public space where ceremonies and traditional practices can be carried out.

The City of Melbourne will continue to engage with local Aboriginal people and others to ensure all projects under this priority are culturally sensitive and appropriate. We will engage and support research that further advances our knowledge and practice of ‘Caring for Country’ in urban landscapes.

### Education and engagement

'Caring for Country' is an incredible opportunity to educate and engage with both Aboriginal and non-Aboriginal people to achieve a sustained connection to Country. Creating spaces and resources for Aboriginal people to apply 'Caring for Country' actions and celebrate customs enables community elders to pass on traditions and beliefs. These opportunities will similarly enable non-Aboriginal people to interact with indigenous culture and deepen the level of understanding and respect.

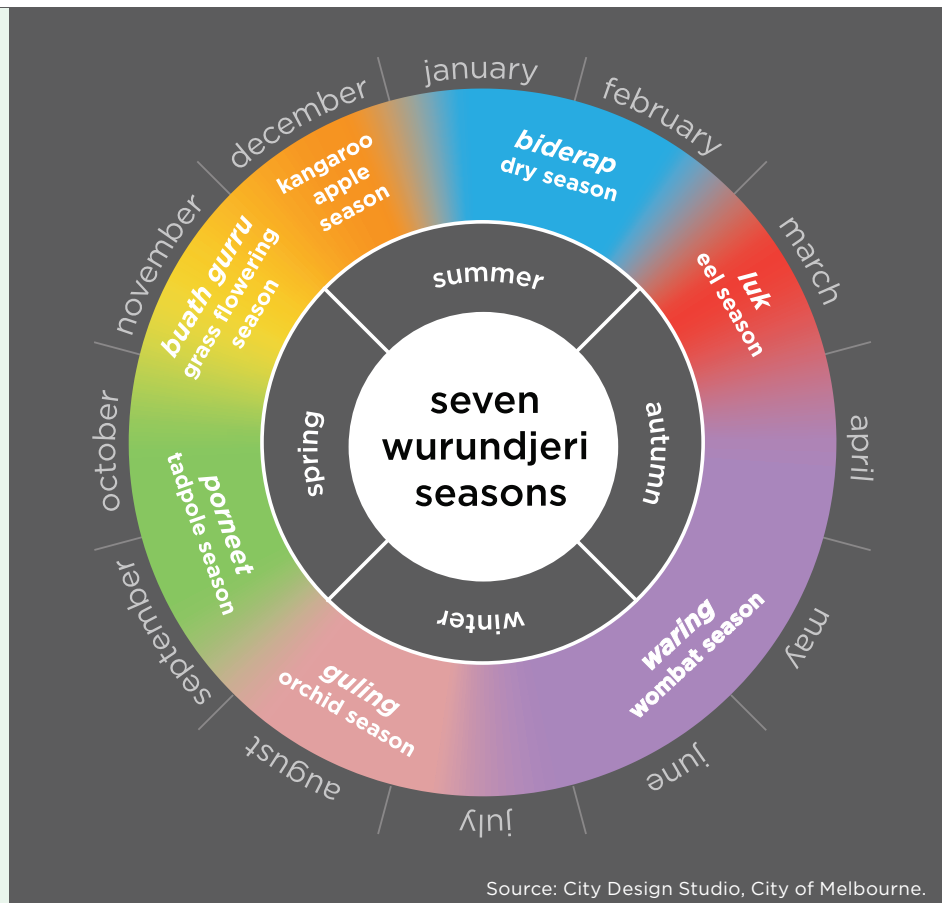
One example of this is the Nature Play playground at Royal Park where children are immersed in Aboriginal culture through the exploration of the seven Wurundjeri seasons. The Yarra River and other sites across Melbourne have cultural and environmental significance to Aboriginal people and we will identify and implement initiatives that celebrate these places.

### Habitat and species management

A central philosophy in applying 'Caring for Country' principles and adopting traditional ecological practices is the desire or requirement to protect and enhance native vegetation and wildlife, necessitating a focus on the management and restoration of indigenous biodiversity. This action supports the overarching priority of this strategy to focus on native vegetation and habitats where possible. One reason for this focus is the provision of plant materials and other resources for traditional uses, such as for tools and ceremonies. A significant challenge will be to identify, adopt and adapt practises to recognise the numerous constraints of a capital city context.

### Seasons in Melbourne

'Caring for Country' requires a deep understanding of natural systems and processes, which Aboriginal people have developed through more than 40,000 years of connection and experience. An example of this local knowledge is their understanding of seasons. Unlike the European notion of four seasons, the Wurundjeri people identified six seasons in Melbourne. Although, there are variations in the number of seasons depending on unique local environment and cultural practices - the Nature Play playground at Royal Park highlights seven seasons as seen in the image on the right. Seasons were defined not only by temperature and the amount of rainfall, but also by more subtle distinctions related to patterns of rainfall and the types of events. Reading this seasonal rhythm helped maximise the availability of food and shelter. When food was plentiful there were opportunities to carry out ritual responsibilities and ceremonial gatherings.



Source: City Design Studio, City of Melbourne.

## Creation Story - Melbourne

Bunjil, the Eagle Hawk, was a very powerful man and a spirit creator. He was the headman of the Kulin. Bunjil had two wives and a son whose name was Binbeal, the Rainbow, whose wife was the second bow, sometimes seen showing fairer than the first. Bunjil had also six other 'Young Men', who went together in pairs, looking after the people for him, and carrying out his orders.



After Bunjil had made the mountains and the rivers, and man and all the animals, he taught men how to make weapons, how to fight with them, and how to behave with one another. When he had finished he became tired of staying upon the earth.



The six young men were: Djurt-djurt, the Nankeen Kestrel, Thara, the Quail Hawk, Yukope, the Green Parakeet, Dantum, the Blue Mountain Parrot, Tadjeri, the Brush-tail Possum, and Turnung, the Glider Possum, both of whom lived on the trees; and all these young men were powerful wizards.



So he gathered about him his wives and sons, and told Bellin-bellin, the Musk Crow, who had charge of the winds: 'Open your bags and let out some wind.' So Bellin-bellin opened one of the bags in which he kept the whirlwinds and let out a blast that blew great trees into the air, roots and all. Bunjil said, 'That is not enough, let out more wind'. Bellin-bellin opened all his bags at once, and a terrific whirlwind came out, and blew Bunjil and all his people to the sky where they live in plenty, and look down on the world as stars.

## Nature Play, Royal Park

Working with the Wurundjeri Tribe Land and Compensation Cultural Heritage Council, the City of Melbourne created a new park that encourages people to read the ecological landscape through a cultural lens as detailed in section 3.2.1.

The park design celebrates seven Wurundjeri seasons – Luk, Waring, Guling, Poorneet, Buath Gurru, Kangaroo Apple, and Biderap – each represented by unique landscape features in different areas, such as the tunnels of wombats in the cooler hibernation season or the swirling shapes of eel trap structures that double as play equipment.

The park includes information about many animals including the eagle, wombat and eel, and plants such as grasses, orchids, and the murnong (yam daisy). As several ecosystems exist across the Melbourne region, these have been represented as forests, grasslands, shrubby-woodlands, and riparian areas. Water is also featured with water play areas and river species planted in swales for future harvesting for weaving and basket making. Astronomy and interpreting the stars is also an important part of seasons in Wurundjeri culture. The park paths show constellations of stars representing different animals.



## 3.3 Goal 3 – Demonstrate local and global leadership

### 3.3.1 Priority 6 – Demonstrate local and global leadership in conserving biodiversity and creating and sustaining healthy urban ecosystems

The City of Melbourne will demonstrate local and global leadership through its approach and commitment to promoting and enhancing the quality and extent of nature in the city.

#### Target:

Deliver flagship biodiversity and urban ecology projects that are recognised locally and internationally as innovative and outstanding examples of enhancing nature in the city.

#### Context

The City of Melbourne is a hub of information and innovation and is uniquely positioned to demonstrate how responsible stewardship of biodiversity and ecosystems can be achieved within a highly urbanised environment; and that these actions also contribute to the health and wellbeing of Melburnians.

#### Habitat and species management

The success of this strategy will be evidenced by improvements in the level of biodiversity and ecosystem health across the city and how these in turn influence conservation actions in other cities and towns across Australia and internationally.

#### Leadership and partnerships

Through the City of Melbourne's involvement with global projects such as the C40 Cities program<sup>48</sup>, the 100 Resilient Cities Challenge<sup>49</sup>, the International Council for Local Environmental Initiatives, as well as local involvement with the Inner Melbourne Action Plan<sup>50</sup>, Growing Green Guide<sup>51</sup>, Greening the West<sup>52</sup>, and the 2020 Vision, a commitment has been demonstrated to local and international leadership. As biodiversity and healthy ecosystems are integral to the aim of becoming an ecologically resilient city, the City of Melbourne is committed to addressing the challenge of identifying, developing, and implementing best practice and innovative examples of good governance and management of biodiversity across the public and private realm. With this Strategy, the City of Melbourne will strive towards international biodiversity targets including the United Nations Convention on Biological Diversity, the Singapore Index, and the Cities and Biodiversity Outlook.

The City of Melbourne will continue to demonstrate leadership by working closely with experts, engaging with the community and inviting the public to participate in the decision-making and stewardship related to biodiversity and ecosystem health in the city. Through the use of evidence-based decision-making and adaptive experimental management, the City of Melbourne will show global leadership in taking a rigorous scientific approach to achieving its vision for nature in the city. This participatory governance will be further expanded by working towards closer collaborations with the Victorian Aboriginal community, to ensure they have opportunities to Care for Country.

#### Research and monitoring, education and engagement

Targeted research and monitoring will be undertaken to quantify changes to biodiversity and ecosystem health due to large scale factors, such as climate change, as well as specific management interventions. Research and monitoring programs will likely involve ecologists, other experts, trained citizen scientists and where relevant, other management agencies. Citizen science programs such as the Citizen Forester program and Melbourne BioBlitz, could be adapted to supplement information gathered from professional surveys and provide an opportunity to develop increased community stewardship over green spaces.

#### Planning and guidance

The City of Melbourne has an opportunity to influence and assist other cities and towns globally in conserving biodiversity and maintaining healthy urban ecosystems. One of the ways to achieve this is through the development and publication of plans and guidance documents that target specific actions as well as ensuring all our strategies are in line with international conventions, treaties, and targets.



# 4.0 IMPLEMENTATION FRAMEWORK

**The Nature in the City Strategy has six priorities that will guide the long-term planning, development, and management of the city's biodiversity and ecosystems. It also details a set of actions and targets to evaluate the success of implementation.**

This strategy has a 10 year timeline because research and practice in urban ecology and biodiversity conservation are rapidly evolving and many innovations and developments are likely over the next decade. 10 years is also sufficient time to allow for the delivery of longer-term strategic planning, whilst also implementing some shorter-term and project focused planning. Importantly, many of the research actions will occur in the first five years and the findings will guide actions in subsequent years.

## 4.1 Green governance

The Urban Forest Strategy articulated the importance of green governance in shaping the plans and decisions that influence the development of urban forestry. This green governance approach is equally important in relation to ecosystem management and biodiversity conservation. The success of this Nature in the City Strategy similarly requires collaboration and partnership with a diverse and numerous set of stakeholders for cohesive policy and management of decisions that affect nature in the city. As with the Urban Forest Strategy, integrated planning, knowledge sharing, and communication are critical components for successful green governance and '...they need to occur on a range of levels and work across administrative boundaries and disciplines within the municipality and beyond'.

The following points list the various levels of collaboration needed to achieve effective green governance:

- Internal council collaboration – recognises that many work areas within City of Melbourne can support this strategy and extensive co-operation and partnerships are required. Key players include planners, landscape architects, engineers, park services officers, urban foresters, and green infrastructure practitioners.
- Community and professional collaboration – highlights the important and influential role of the community and private industry in both raising public and bi-partisan political awareness and providing expertise and knowledge.
- Inter-agency collaboration – involves the need for policy makers and practitioners from across government and relevant statutory authorities to link together for a more cohesive and holistic perspective of ecosystems and biodiversity that spans arbitrary political boundaries.
- International cooperation – There is a need to network globally to drive uptake of the principles of urban ecology, to share research, methodologies, and technical knowledge, and to achieve better outcomes for the world's cities as the urban environment continues to expand.

**'...more than one policy option should be implemented at once and policies should be supportive and reinforcing of each other'.**

Growing Green Guide  
(<http://www.growinggreenguide.org/>)

## 4.2 Targets

The targets resulting from the implementation actions are as follows:

- There is a net increase in biodiversity, habitats, and ecosystem health within the City of Melbourne by 2027.
- By 2027, City of Melbourne will be more ecologically connected city than in 2017.
- By 2027, the private realm is playing a significant role in supporting nature in the city.
- By 2027, more residents, workers and visitors encounter, value, and understand nature in the city more than they did in 2017.
- By 2027, City of Melbourne will have, in collaboration with Traditional Owners and the local Aboriginal community, integrated, celebrated, and promoted 'Caring for Country' approaches.
- Deliver flagship biodiversity and urban ecology projects that are recognised locally and internationally as innovative and outstanding examples of enhancing nature in the city.

## 4.3 Priority implementation actions

This strategy will be implemented by influencing existing City of Melbourne programs and projects and will be largely funded through existing budgets that are subject to the annual budget cycle process and service delivery priorities. The business impact of each proposed action is outlined below in Section 4.5.

Urban ecology and the conservation of biodiversity in urban areas is a new and rapidly expanding field of research and practice. The idea that a large city can support meaningful biodiversity is still a relatively new concept. Currently, there is a limited understanding of the status of biodiversity in the city, particularly on land that is not managed by the City of Melbourne and of biodiversity in neighbouring municipalities. For these reasons, many priority implementation actions that have been identified within this strategy are research based and will need to be revisited in five years to ensure the findings continue to represent best-practise in the field.

The actions in this strategy will contribute to shaping and defining Melbourne into the future. Some of the iconic actions include:

- Establish a comprehensive baseline of species, vegetation communities, and habitats to inform decision-making, guide management actions, and evaluate success.
- Identify and mitigate threats that reduce the quality or extent of nature in the city, including of significant species, vegetation communities and habitats.
- Create and establish an iconic combination of understorey plant species that reflects and defines Melbourne's unique character and supports biodiversity.
- Improve ecological connectivity across the municipality in a systematic, comprehensive, and co-ordinated manner taking into account biodiversity corridors and actions identified in the Urban Forest and Open Space Strategies.
- Create a range of effective models to engage the private realm in conserving biodiversity and enhancing ecosystem health.
- Enhance Melbourne's reputation as a 'Creative City' by initiating and supporting regular 'art and urban nature' and other engagement projects to encourage a diversity of interactions with nature.
- Become an exemplar of the adoption of 'Caring for Country' principles and practise in an urban context through an appropriate and effective partnership model and support further research.

Further enhance Melbourne's international reputation as a 'Knowledge City' by partnering with researchers and leading city biodiversity networks and data platforms, to create a hub for creative and pioneering urban ecology practice, research and experimentation.

## 4.4 Measurement, monitoring, and review

A robust, ongoing monitoring program will be fundamental to understanding the success of implementation programs, informing targets, and guiding future decisions. The monitoring will include assessments as part of the adaptive management approach to decision-making, the evaluation of experiments, and general monitoring of biodiversity. The development of this monitoring framework is one of the first critical tasks we will undertake as part of this strategy. The monitoring framework will be developed in collaboration with scientists and other experts and implemented with City of Melbourne staff, specialists, and citizen scientists. A range of criteria will be assessed, including:

- The distribution, abundance, and role of selected species, habitats, and ecosystems.
- The ecosystem services and social surveys of the community.
- Habitat quality and quantity.
- Biodiversity corridors and ecological connectivity.
- The community's attitude towards nature and their perception and understanding of urban biodiversity.
- The frequency and quality of people's connection to nature.
- Community understanding of 'Caring for Country' principles and actions.



## 4.5 Goals, priorities, actions, timeframes, collaborators, and business impact

### Goal 1: Create a more diverse, connected, and resilient natural environment

PRIORITIES AND ACTIONS	THEME	TIMEFRAME	POTENTIAL COLLABORATIONS	BUSINESS IMPACT	
<b>Priority 1: Improve ecosystem health and biodiversity</b>					
1	Establish a comprehensive baseline of species, vegetation communities, and habitats to inform decision-making, guide management actions, and evaluate success.	Mapping and baselines.	Year 1 – 2.	Museum Victoria, universities, Royal Botanic Gardens Victoria, conservation groups, community groups.	Year 1 existing budget allocation, Year 2 subject to annual plan and budget.
2	Identify and mitigate threats that reduce the quality or extent of nature in the city, including of significant species, vegetation communities and habitats.	Research and monitoring, habitat and species management.	Year 3 – 10.	Universities, Victorian Government, conservation groups, community groups.	Business as usual budgets and processes.
3	Undertake plantings to increase understorey habitat on City of Melbourne managed land by 20 per cent.	Habitat and species management.	Year 1 – 10.	Conservation groups, community groups, other major land owners.	Business as usual budgets and processes.
4	Create and establish an iconic combination of understorey plant species that reflects and defines Melbourne's unique character and supports biodiversity.	Habitat and species management.	Year 4.	Universities, Royal Botanic Gardens Victoria, conservation groups, community groups, Horticultural groups.	Subject to annual plan and budget and business case.
5	Improve land management by improving soil health and reducing reliance on chemicals.	Habitat and species management.	Year 1 – 10.	Universities, conservation groups, Victorian Government.	Business as usual budgets and processes.
6	Develop and implement guidelines which focus on enhancing biodiversity and ecosystem health across the municipality and support implementation of the Green Our City Action Plan.	Habitat and species management, planning and guidance.	Year 2 – 10.	Museum Victoria, universities, Royal Botanic Gardens Victoria, conservation groups, community groups.	Subject to annual plan and budget and business case.

## Goal 1: Create a more diverse, connected, and resilient natural environment (continued)

PRIORITIES AND ACTIONS	THEME	TIMEFRAME	POTENTIAL COLLABORATIONS	BUSINESS IMPACT
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### Priority 2: Develop a more ecologically-connected urban landscape

7	Improve ecological connectivity across the municipality in a systematic, comprehensive and co-ordinated manner, taking into account biodiversity corridors and actions identified in the Urban Forest and Open Space Strategies.	Mapping and baselines, planning and guidance.	Year 1 - 10.	Universities, Inner Melbourne Action Plan, other councils, community groups, Museum Victoria, Non-Governmental Organisations, Victorian Government, Melbourne Water, Parks Victoria.	Year 1 existing budget allocation  Year 2 - 10 Business as usual budgets and processes and business cases.
8	Develop a framework within which all projects in the City of Melbourne can consider impacts to ecological connectivity, with a view to enhancement wherever possible.	Mapping and baselines, planning and guidance.	Year 3.	Victorian Government, developers, industry groups, community groups, other councils.	Business as usual budgets and processes.

## Goal 1: Create a more diverse, connected, and resilient natural environment (continued)

PRIORITIES AND ACTIONS	THEME	TIMEFRAME	POTENTIAL COLLABORATIONS	BUSINESS IMPACT	
<b>Priority 3: Increase the contribution of the private realm in supporting biodiversity conservation and ecosystem health within the municipality</b>					
9	Create a range of effective models to engage the private realm in conserving biodiversity and enhancing ecosystem health.	Education and engagement.	Year 3 - 5.	Developers and industry groups, general community.	Subject to annual plan and budget and business case.
10	Support implementation of the Urban Forest Fund with advice and actions to support biodiversity-specific outcomes.	Research and monitoring, planning and guidance.	Year 1 - 10.	Developers and industry groups, general community.	Business as usual budgets and processes.
11	Complement research being undertaken in the energy efficiency, renewable energy, and climate resilience sectors at City of Melbourne to fully understand the barriers to enhancing urban nature outcomes across different building types, development styles and land tenure.	Research and monitoring.	Year 2 - 10.	Developers and industry groups, general community.	Business as usual budgets and processes.

## Goal 2: Connect people to nature

PRIORITIES AND ACTIONS	THEME	TIMEFRAME	POTENTIAL COLLABORATIONS	BUSINESS IMPACT
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### Priority 4: Connect more people to nature to improve social resilience, health, and wellbeing

12	Enhance Melbourne's reputation as a 'Creative City' by initiating and supporting regular 'art and urban nature' and other engagement projects to encourage a diversity of interactions with nature.	Education and engagement.	Year 2 - 10.	Volunteers, not-for-profit and community groups, philanthropic groups.	Business as usual budgets and processes.
13	Provide opportunities for community involvement in the strategy through citizen science and supporting the creation and work of community groups.	Education and engagement.	Year 1 - 10.	Volunteers, not-for-profit and community groups, universities, Museum Victoria, Royal Botanic Gardens Victoria.	Business as usual budgets and processes.
14	Promote urban horticulture by supporting 'wildlife gardening' programs in community, school, home, and rooftop gardens.	Planning and guidance.	Year 1 - 10.	Volunteers, not-for-profit and community groups.	Subject to annual plan and budget and business case.
15	Identify and implement opportunities to improve, create and connect small green spaces throughout Melbourne's most urbanised areas.	Research and monitoring.	Year 1 - 10.	Victorian Government, volunteers, not-for-profit and community groups, private landholders, philanthropic groups.	Subject to annual plan and budget and business case.
16	Implement a monitoring program to assess people's connection to nature in the city.	Research and monitoring.	Year 2 and 7.	Universities, the Victorian Government, and other Local Government Areas.	Subject to annual plan and budget and business case.

## Goal 2: Connect people to nature (continued)

PRIORITIES AND ACTIONS	THEME	TIMEFRAME	POTENTIAL COLLABORATIONS	BUSINESS IMPACT	
<b>Priority 5: Explore the ways in which cultural and practical ‘Caring for Country’ principles can assist in integrating people with nature.</b>					
17	Become an exemplar of the adoption of ‘Caring for Country’ principles and practise in an urban context through an appropriate and effective partnership model and support further research.	Research and monitoring, partnerships.	Year 1 – 10.	Traditional Owner Groups, the local Aboriginal community, philanthropic groups	Business as usual budgets and processes
18	Work with Traditional Owners and the local Aboriginal community to explore opportunities to create a new public space where ceremonies and traditional practices can be carried out.	Research and monitoring, partnerships.	Year 3 – 5.	Traditional Owner Groups, the local Aboriginal community, philanthropic groups, and potentially other land managers.	Subject to annual plan and budget and business case.
19	Identify and implement initiatives that celebrate the cultural and environmental significance of the Yarra River and other sites within the municipality.	Education and engagement.	Year 1 – 10.	Traditional Owner Groups, the local Aboriginal community, water organisations and authorities including Melbourne Water, Yarra River keepers, and community groups.	Subject to annual plan and budget and business case.
20	Protect and enhance native vegetation and habitats by increasing the use of indigenous species and ‘Caring for Country’ management practices.	Habitat and species management.	Year 1 – 10.	Traditional Owner Groups, the local Aboriginal community, community groups, Victorian Government, Melbourne Water, and non-council land owners and managers.	Business as usual budgets and processes.

### Goal 3: Demonstrate local and global leadership

PRIORITIES AND ACTIONS	THEME	TIMEFRAME	POTENTIAL COLLABORATIONS	BUSINESS IMPACT	
<p><b>Priority 6: Demonstrate local and global leadership in conserving biodiversity and creating and sustaining healthy urban ecosystems.</b></p>					
21	Develop and deliver flagship urban nature projects within the City of Melbourne, whilst reaching biodiversity targets set by international conventions and initiatives.	Habitat and species management.	Year 2 - 10.	Universities, community groups, other government agencies, and international partners such as the International Council for Local Environmental Initiatives, C40 cities, and Resilient Melbourne.	Subject to annual plan and budget and business case.
22	Select emblematic species to represent the City of Melbourne and promote awareness of nature in the city.	Research and monitoring, education and engagement.	Year 2 - 10.	Universities, community groups, other government agencies, and international partners such as the International Council for Local Environmental Initiatives, C40 cities, and Resilient Melbourne.	Business as usual budgets and processes.
23	Further enhance Melbourne's international reputation as a 'Knowledge City' by partnering with researchers and leading city biodiversity networks and data platforms, to create a hub for creative and pioneering urban ecology practice, research, and experimentation.	Research and monitoring, leadership, partnerships.	Year 1 - 10.	Universities, community groups, other government agencies, and international partners such as the International Council for Local Environmental Initiatives, C40 cities, and Resilient Melbourne.	Business as usual budgets and processes.

# GLOSSARY

**Biodiversity:** Biodiversity is the variety of all life forms on earth; different plants, animals, and microorganisms; their genes; and the terrestrial, marine, and freshwater ecosystems of which they are a part<sup>53</sup>. Biodiversity exists at three levels; genes, species, and ecosystems.

**Ecology:** Ecology is the study of plants and animals, and their interaction with the environment. Urban ecology is the study of the relationship between living organisms and their environment in an urbanised context. Living organisms and the ecosystems they form are commonly termed 'biodiversity', a truncation of the words 'biological' and 'diversity'.

**Ecological resilience:** Ecological resilience is the capacity of an ecosystem to respond to a disturbance by resisting damage and recovering quickly. Resilience is dependent on components functioning.

**Ecosystems:** Ecosystems are comprised of natural components, such as plants, animals, water, soil, air, and their interactions. Cities are urban ecosystems which include both nature and humans, in a predominantly human-built environment. Functioning ecosystems are the foundation of human wellbeing and most economic activity.

**Ecosystem services:** Ecosystem services are the benefits that are obtained from nature that contribute directly or indirectly to human wellbeing<sup>54</sup>. They include clean air, noise reduction, climate regulation, water filtration, recreation, nature education, natural heritage, among others. In cities, ecosystem services can come from green infrastructure such as parks, gardens, and forests as well as street trees, pop-up parks, wetlands, and lakes. These services can be valued in several ways such as economic, ecological, socio-cultural, health, or insurance contribution. Ecosystem services can be considered in four categories:

1. Provisioning services such as food and fresh water.
2. Regulating services such as climate amelioration.
3. Supporting services such as pollination.
4. Cultural services such as aesthetic contributions and spiritual connections.

**Green infrastructure:** There are various definitions of green infrastructure. At City of Melbourne we use the term to describe the layers and infrastructures in the city that directly provide multiple ecosystem services or support the provision of those services. Examples of green infrastructure in Melbourne include; all vegetation, parks, gardens, reserves, greenways, living green roofs and walls, storm water and rainwater harvesting interventions, permeable surfaces, waterways, and wetlands.

**Private realm:** This is land that is privately managed. The City of Melbourne currently manages public land under Council control; however, much of the land in the city is under private tenure.

**Social Resilience:** Social resilience is the capacity of individuals, communities, businesses, and systems within a city to survive, adapt, and grow not just as a response to shocks (such as heat, fires, and floods) – but also to the stresses that weaken the fabric of a city on a day-to-day or cyclical basis. Examples of shocks and stressors include high unemployment, an over-stretched or inefficient public transportation system, endemic violence, and chronic energy or water shortages.

# APPENDIX 1

## Detailed Benefits of Biodiversity

### Pollination

Flowers are the plant world's mating cues. They come in many different colours, forms and sizes, with the shared goal of attracting pollinators so the plant life cycle can continue. The pollinators vary from the well-recognised: bees, birds, bats, and butterflies, to the less obvious: bugs, beetles, moths, flies, and small mammals. When these pollinators visit the flowers, they help move pollen between different individuals and populations of plants- thereby maintaining genetic diversity, as well as being an essential step in producing many of the fruits, vegetables, and other crop plants that we eat. Without a diversity of pollinators, we would risk a contraction in both the diversity and abundance of these food sources and other plants.

### Pest Regulation

The role of ladybugs in reducing aphid populations, and spiders catching flies, are well known examples of the role that biodiversity can play in regulating pest species. Other examples include the role of small insectivorous birds, bats, and frogs in controlling the number of adult mosquitoes and other insects, while fish and tadpoles can reduce the larval stages of mosquito populations. Blue-tongued lizards munch on both snails and dandelion flowers making them a gardener's best friend. Throughout the animal world, there are many examples of how biodiversity can contribute to reducing the number of pest species.

### Safeguarding our Future

The Millennium Seed Bank<sup>55</sup> and the heirloom seed movement are examples of major initiatives that have arisen in recognition of the link between biodiversity and the future of humanity. Whether we are talking about flower or vegetable gardens, parks or streets, a diverse array of plants will support a diverse array of other species. By maximising this diversity, we retain more options for responding to changing conditions in the future.

### Seed Dispersal

In natural ecosystems, many plants rely on birds, reptiles, mammals and other animals to move their seeds to new locations. This allows the seeds to be moved to suitable 'safe sites' away from the parent plant, where the seeds have the best chance to germinate and grow. In some cases, the seeds need to pass through the animals' digestive system before they are able to germinate. In urban areas, seed dispersal continues to be important as it is a sign of a healthy, self-sustaining ecosystem.

### Nutrient Cycling

Below the soil surface, there are an abundance of microbes, invertebrates, and fungi that work to decompose organic material back into forms that can be used by plants. Above the soil surface, they are assisted by the ants, slaters, millipedes, and other decomposers which help to shred and chew the leaves and other dead organic material, into smaller fragments that are more easily accessed by the microbes and invertebrates below the soil surface. The biodiversity associated with decomposition is not only important because they help complete the natural recycling process, reducing the reliance on artificial and supplemental fertilisers, but they also ensure the planet's surface isn't overrun by the build-up of dead organic matter and animal waste.

### Healthy Soils

Healthy soils are the foundation for a well-functioning urban ecosystem. The organisms living in the soil and on the soil surface are critical to the development of healthy soils. Their movement under the soil surface helps to create soil profiles that allow water to easily infiltrate, and their role in decomposition of leaves and other organic material helps with nutrient cycling and ensure the soils contain the organic matter and nutrients required to support healthy plants.

### Soil Stabilisation and Water Filtration

Plant root systems come in many different forms, ranging from fibrous mats, to large tap roots, tubers, and other underground storage organs. This diversity of forms is one of the reasons why plants can be found in so many different environments. In urban areas, we can work with this natural diversity of root systems to contribute to a healthy urban ecosystem by selecting plants for specific purposes.

### Resilient Ecological Systems

Resilience is the capacity of a system to cope with change. In human-made systems, resilience can be achieved through duplication (e.g. backing up files) and multiple pathways (e.g. capacity to divert electricity through other routes). In natural systems, biodiversity contributes to resilience. When multiple species can play a similar role (e.g. pollination or pest regulation), then the temporary or permanent loss of one species can have a smaller impact on the system, as other species can move in to fill that role.



## Identity and Character

Australia's unique wildlife is one of the attractions for overseas visitors. Similarly, the avenues of elm trees along St Kilda Road, the Plane Trees in Lygon Street, and the River Red Gums at the Melbourne Cricket Ground all contribute to the identity and character of the city – as demonstrated during the precinct planning process undertaken for the Urban Forest Strategy. The eels and turtles in the Ornamental Lake at the Royal Botanic Gardens, the cicadas in the summer, and the seagulls circling the Art Centre spire are additional examples of how biodiversity contributes to the identity and character of Melbourne.

## Sense of Place

Sense of place is related to the emotions experienced in response to the identity and character of a landscape. Whether it is the scent of a wattle tree in full bloom, the silhouette of a grey-headed flying fox at dusk, the croak of a tree frog or the experience of being in your favourite park, biodiversity can trigger memories that transport you back in time or make you mindful of being on an adventurous journey.

## Physical Health

Interesting green spaces and opportunities to interact with nature contribute to peoples' physical health by enticing them to spend time reconnecting with nature and being active outdoors, away from sedentary indoor entertainments. Exposure to a diversity of flowering plant species can also help reduce disposition to allergies<sup>56</sup>.

## Emotional Health and Wellbeing

For many people, specific animals or plants can convey a particular meaning that aligns with their feeling of emotional health and wellbeing. This relationship may be based on culture, such as the connection that the people of the Kulin Nations have with Bunjil, the Eaglehawk, or it may be an informal and personal connection, such as the joy of watching how the plants or animals in your garden shift with the changing seasons.

## Nature Tourism

In 2013-14, tourism was worth an estimated \$20.6 billion to the Victorian economy, with nature-based tourism visitors representing 70 per cent of all international overnight visitors. Increasing the quantity and quality of biodiversity in the city – particularly initiating flagship projects – could result in an increased number of visitors spending time in Melbourne, boosting local economy.

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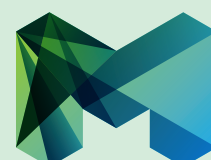
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