Biodiversity Conservation Plan

Prepared by
Ecology Australia

ECOLOGY AUSTRALIA

MORNINGTON PENINSULA
Shire

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Summary

The Mornington Peninsula Biodiversity Conservation Plan has been developed to assist Mornington Peninsula Shire with its ongoing commitment to managing biodiversity within the municipality, providing guidance and direction on biodiversity management and allocation of resources by Council. The Biodiversity Conservation Plan has been guided by federal, state and local government legislation and policy and associated management plans, and has been developed with Mornington Peninsula Shire Council, and input from land management agencies, industry stakeholders and the local community.

The Mornington Peninsula's natural environment has undergone significant modification since European settlement, including extensive habitat fragmentation, degradation of ecosystems, and subsequent declines and extinction of species. Although nearly one third of the original extent of native vegetation cover on the Mornington Peninsula remains, stresses associated with urban, agricultural, industrial, transport and infrastructure development, challenge natural processes and threaten the resilience of indigenous flora and fauna on the Peninsula. Ongoing vegetation clearing, environmental weeds and pest animals, climate change, altered fire and hydrological regimes, and lack of awareness of remaining environmental values and their role in supporting ecosystems services, are all factors continuing to reduce the extent and quality of biodiversity.

What remains is worth protecting and is detailed in the Mornington Peninsula State of Biodiversity Report, prepared to assist in the development of this plan. The natural assets of the Mornington Peninsula, include: 65 Ecological Vegetation Classes over a varied geology and topography; 18 creek catchments with 440 km of waterways; significant wetland habitats, including the internationally significant Western Port Ramsar site, and Tootgarook Swamp — one of the largest groundwater — dependent wetland systems in the region; 698 indigenous plant taxa; and 402 native vertebrate fauna species including 36 mammal, 301 bird, 25 reptile, 11 amphibian and 29 fish species.

A Vision for the Future

The Biodiversity Conservation Plan identifies the long-term goals for conserving the natural capital of the Mornington Peninsula. The Plan seeks to protect and improve the resilience of the Mornington Peninsula's natural landscapes, ecosystems and biodiversity.

This will be achieved by implementing best-practice management across all of Council's operation, engaging with the community and encouraging greater participation, linking in with research and working in partnership with other government and non-government land management agencies and community groups. The vision for the Mornington Peninsula is that:

"The Mornington Peninsula's biodiversity is healthy, valued and protected"

Strategic Directions, Objectives and Actions

The Biodiversity Conservation Plan identifies six strategic directions aimed at achieving the Vision. Strategic directions have been developed in the context of recent biodiversity reviews at the regional, state and federal level, including the release of *Victoria's Biodiversity 2037*, and review of the first five years of Australia's Biodiversity Conservation Strategy. The policy direction has been guided by the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999, Victorian Flora and Fauna Guarantee Act 1988, Planning and Environment Act 1987, and Catchment and Land Protection Act 1994.*

The six strategic directions for the Biodiversity Conservation Plan are:

- Engaging with the community and building stewardship
- Facilitating biodiversity conservation on private land
- Protecting biodiversity through planning and policy
- Building a strong knowledge base
- Demonstrating and leading best-practice management
- Building ecosystem resilience in a changing climate

The Plan identifies a number of objectives and actions under each of the Strategic Directions, including opportunities to develop and implement long-term planning policies for the protection of biodiversity that will persist beyond the initial five-year implementation period of the plan.

The objectives and actions aligned with each strategic direction have been reviewed with local land owners and community environment groups to ensure they will be the most effective to move from the current conditions toward the vision and underpin long term protection and enhancement of biodiversity.

The full detail of strategic directions, objectives and actions is presented in Section 5 of this plan.

Implementation and Review

The actions outlined in the Biodiversity Conservation Plan are intended to be delivered over an initial five-year period, the timeframe in which Council seeks to achieve significant progress in biodiversity conservation. The monitoring and evaluation of progress in relation to actions will be a key mechanism for adaptive management.

An Implementation Plan will be developed for internal use, which will outline indicative costs, responsibilities within Council, timeframes and performance measures or indicators for each of the actions.

Acknowledgment of Traditional Owners

Mornington Peninsula Shire acknowledges and pays respect to the Boon Wurrung/Bunurong people, the traditional custodians of these lands and waters that are the subjects of this Biodiversity Conservation Plan.

The Mornington Peninsula was part of the territory occupied by the Boon Wurrung/Bunurong people, whose land stretched along the coast roughly from the Werribee River on the western shore of Port Phillip Bay, east to Anderson Inlet in south Gippsland, and north to the Dandenong Ranges.

The 2017 appointment of the Bunurong Land Council Aboriginal Corporation as the Registered Aboriginal Party (RAP) for an area which includes the whole of the Mornington Peninsula (and extends to south Gippsland) highlights an increasing level of recognition and respect for traditional owners on the Mornington Peninsula. It provides an opportunity for further work with the State government and the RAP to recognise and protect aboriginal cultural heritage.

The Biodiversity Conservation Plan will be implemented in the spirit of: '*Recognition, Relationships, Respect and Opportunities'* highlighted in the Mornington Peninsula Shire Reconciliation Policy and Action Plan.

1 Introduction

The Mornington Peninsula is an iconic region of Victoria, valued for its scenic landscapes and beaches, biodiversity, sites of cultural heritage and historic importance, geomorphological significance and productive rural land. Located approximately 50 km south-east of Melbourne, at the urban-rural interface, the Mornington Peninsula separates Port Philip and Western Port bays and supports a unique mixture of urban, agricultural and industrial areas and natural environments. It supports a diverse agricultural sector, industry of State significance, and is one of the most visited areas for informal recreation in Victoria.

The natural environments of the Mornington Peninsula contribute much to the local character so highly valued by residents and visitors to the Peninsula, and are vital for sustaining biodiversity within its many parks and reserves, as well as on private land across the Shire.

The Mornington Peninsula Shire manages nearly 2000 ha of public land for biodiversity conservation across the Mornington Peninsula, in its local bushland, coastal and foreshore reserves and in roadside reserves (referred to collectively here as local reserves). The Shire is also responsible for the implementation of planning scheme controls, and many other day-to-day planning and management decisions that have the potential to affect biodiversity, across multiple land tenures.

The Mornington Peninsula Shire has long-recognised the value and importance of conserving biodiversity and protecting natural areas on the peninsula. Over the past decade, Council has: commissioned numerous ecological surveys of Shire-managed reserves, funded vegetation mapping and condition assessments on public and private land, contributed to conservation and research programs, and has collaborated with partner land management agencies, to improve our understanding and management of biodiversity values across the Peninsula.

At a time of increasing environmental challenges, this Biodiversity Conservation Plan will assist the Shire with the protection and enhancement of biodiversity on the Peninsula. This Plan outlines a more strategic approach to biodiversity management and allocation of funding and non-financial resources at the municipal-scale and provides the basis for discussion on future management and decision making.

1.1 Purpose of the Biodiversity Conservation Plan

The overall purpose of the Biodiversity Conservation Plan is to:

- Establish a strategic approach to the management and enhancement of biodiversity within the Shire, which will help to allocate and prioritise resources;
- Assist the Shire and it's community in achieving best-practice management for the protection and enhancement of biodiversity values;
- Increase awareness amongst the local community of the value and importance of biodiversity and involvement in biodiversity conservation;
- Facilitate biodiversity conservation on private land and promote sustainable land management practices; and
- Foster partnerships between the community, public land managers, and other agencies.

1.2 Development and Consultation

This Biodiversity Conservation Plan has been developed in consultation with the local community, industry stakeholders, Mornington Peninsula Shire Council and staff, and partner land management agencies. The community consultation process and outcomes are detailed in Ecology Australia (2016a). It also draws upon research including the collection and analysis of information from a range of sources, including biological databases, biodiversity models and mapping, technical reports, research articles and unpublished reports.

The development of the Biodiversity Conservation Plan has been undertaken in three parts:

- Part A — State of Biodiversity on the Mornington Peninsula:

  An analysis of the current state of biodiversity on the Mornington Peninsula was undertaken to provide an overview of the ecological values of the Peninsula and their current condition to help inform the development of the Biodiversity Conservation Plan. Biodiversity values and threats were identified through consultation with the community, including environment groups, industry bodies and partner government agencies and a review of ecological databases, the published and grey literatures and studies commissioned by the Mornington Peninsula Shire (Ecology Australia 2016b).

- Part B — Future Directions Background Paper:

  A Future Directions Background Paper was prepared, which set out the underlying principles and a strategic approach to biodiversity management on the Mornington Peninsula, as technical background to the Biodiversity Conservation Plan. The Paper drew upon the outcomes of consultation with the community and stakeholders, and the review of the current state of biodiversity on the Mornington Peninsula, to identify potential strategies and initiatives to address the key biodiversity management issues. In doing so, it reviewed the conservation initiatives and management processes currently implemented by the Shire and identified opportunities for improvement.

  The Future Directions Paper proposed a draft 'Vision for Biodiversity on the Mornington Peninsula', developed from the community consultation sessions, and an overarching framework to assist with the development of the Biodiversity Conservation Plan (Ecology Australia 2017).

- Part C — Biodiversity Conservation Plan:

  The Biodiversity Conservation Plan provides a synthesis of information regarding the biodiversity values on the Mornington Peninsula, the key threats to local biodiversity values and highlights the areas of biodiversity significance.

  The Plan articulates the 'Vision for biodiversity on the Mornington Peninsula', refined through a series of stakeholder workshops, and outlines management objectives and a set of actions under the six strategic directions aimed at achieving the Vision, which have been developed with Mornington Peninsula Shire Council.

Figure 1 outlines the development process for the Biodiversity Conservation Plan.

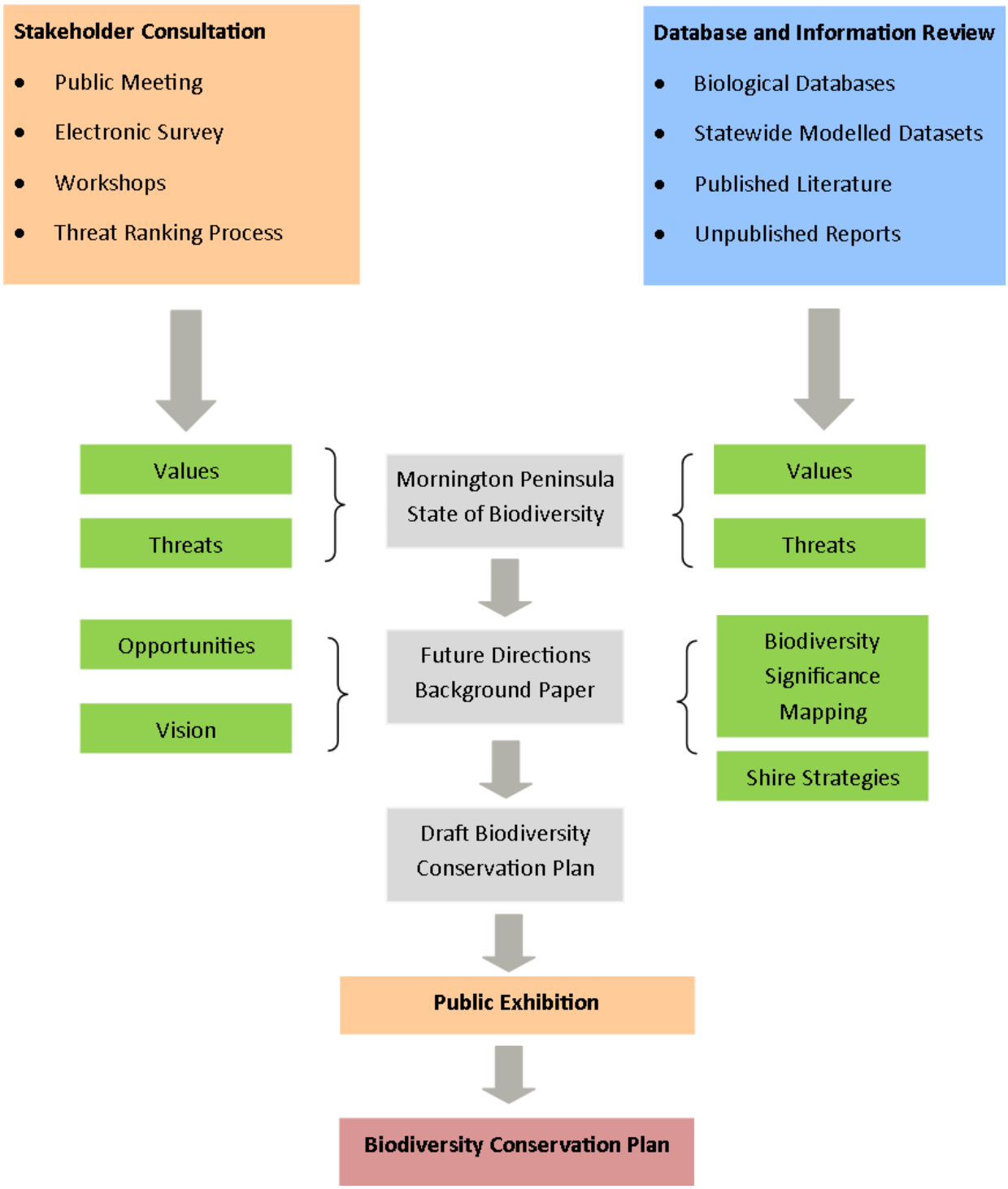


Figure 1 Development process of the Biodiversity Conservation Plan

1.3 Implementation and Review

To facilitate the delivery of the Biodiversity Conservation Plan, an Implementation Plan will be developed for internal use, which will outline indicative costs, responsibilities within Council, timeframes and performance measures or indicators for each of the actions.

The actions are intended to be delivered over an initial five-year period, the timeframe in which Council seeks to achieve significant progress in biodiversity conservation. The monitoring and evaluation of progress in relation to actions will be a key mechanism for adaptive management. In this context, it is intended to report on the implementation of actions every two years. In addition, a full review of the Plan will occur at the end of the five-year period. A communication plan will also be developed, enabling the incorporation of community input and feedback into delivery of the actions.

The funding and timing of all projects will be subject to approval through Council's annual budget review process. Changes to the Planning Scheme will also be subject to the statutory process for Planning Scheme amendments, including public consultation, as provided in Part 3 of the *Planning and Environment Act 1987.*

2 Why Conserve Biodiversity?

2.1 What is Biodiversity?

Biodiversity describes the biological diversity that exists on Earth, across its land, rivers, coasts and oceans. The term encompasses the number and variety of all forms of life, including plants, animals, fungi, protists and bacteria, their encoded genes, and the ecosystems of which they form a part. Biodiversity can be measured at three levels:

1. The diversity of **genetic** information in all living organisms, within and between populations of a species;
2. The diversity of **species** and sub-species on Earth; and
3. The diversity of **ecosystems**, the connections between the lifeforms within ecosystems and the ecological processes they sustain.

Biodiversity across Australia is in a state of ongoing decline, because of a legacy of widespread land clearing, and the impacts of a range of threats, including the introduction of exotic plants and animals, disease and changes to natural processes, such as fire and water flow regimes, which have led to population declines in species, and eventually, extinctions. Victoria is the most cleared and intensively settled state in Australia, and between one quarter to a third of all terrestrial plants, animals and ecological communities are now considered to be threatened with extinction (DELWP 2017). On the Mornington Peninsula, 6% of indigenous plants and 20% of fauna are threatened (Section 3.1).

2.2 The importance of Biodiversity

Biodiversity is an essential component of ecosystem health, vital for sustaining the processes that make all life possible. Biodiversity underpins much of our economic wealth, including agriculture and tourism and provides numerous social and cultural benefits. All human activities and land uses ultimately rely on diverse and functioning ecosystems, and all human activity, in-turn, has an impact on the environment, such that, the status of biodiversity and ecosystem health is determined by the actions of everyone.

Biodiversity provides a good indicator of ecosystem health. Biodiverse ecosystems are more resilient to disturbance and can sustain the complex interactions and processes that support ecosystem services. The more interactions between ecosystem elements, species or processes, the more resilient the ecosystem is to disturbance (DEWHA 2010).

Ecosystem services can be classed into four broad categories (DEWHA 2010):

- Provisioning — e.g. production of food and water;
- Regulating — e.g. control of climate and disease;
- Supporting — e.g. nutrient cycling and pollination; and
- Cultural — e.g. recreational, spiritual.

They are the result of the complex interactions and processes of biodiversity (i.e. genes, species and ecosystems), all working together. Many of these functions and services are irreplaceable, providing us with food, water and clean air, as well as climate regulation, organic waste decomposition, soil stabilisation, plant pollination, and providing for our health and wellbeing (see Table 1).

Table 1 Ecosystem services provided by the natural environment on the Mornington Peninsula

Ecosystem service	Description
Water	Wetlands and water catchments filter and purify the water we drink. Conservation areas are essential for protecting water resources in times of drought, and are especially important with the ongoing pressures of climate change.
Air	Forests and other vegetation filter and oxygenate the air we breathe. The forest and woodland communities on the Mornington Peninsula are important for providing clear air close to metropolitan Melbourne and regulating microclimates.
Agriculture	Biodiversity supports soil production and nutrient cycling, while native vegetation supports pollinating insects (e.g. blue-banded bees *Amegilla* sp.) and birds and bats which control pest species, essential for productive horticulture and pastoralism. Small and large scale agricultural production is a feature of the Mornington Peninsula.
Carbon Storage	Much of our stored carbon is located in protected areas, including National and State Parks and local reserves, as well as coastal and marine parks. Forest and woodland communities on the Mornington Peninsula are well-recognised as being important for carbon storage, above and below ground. However, vegetated coastal habitats, such as saltmarsh, mangroves and seagrass beds are also important (Plate 1), and sequester nearly equivalent quantities of organic carbon as terrestrial environments, known as Blue Carbon. The seagrass beds of Western Port Bay (including the area from Cribb Point to Yaringa) are considered to be particularly important (Carnell et al. 2015). Retaining and enhancing carbon sinks is important to all ecosystem services.
Health and Wellbeing	Natural environments have been shown to provide significant benefits to human health and wellbeing. Research has shown that natural environments have a restorative effect, assisting with recovery from mental fatigue and helping to generate a positive outlook on life. Interacting with nature has been shown to enhance the ability to cope with and recover from stress, illness and injury.
Tourism	Natural environments provide popular areas for tourism and recreation. Tourism is an important driver of economic activity on the Mornington Peninsula. In 2015-16, tourism was estimated to be worth $700 million to the region's economy (DEDJTR 2017). The most frequently visited areas on the Mornington Peninsula are coastal areas, particularly beaches, followed by National Parks and local bushland and foreshore reserves. Most visit these areas for relaxation and to experience nature (Ecology Australia 2016a).

What is Ecosystem Resilience?

The 'Australia State of the Environment 2016' report describes resilience as the capacity of a system to absorb shocks or disturbances, particularly those that cannot be easily controlled or are already occurring (Jackson et al. 2017). These may be either natural or human-induced disturbances, such as flood, fire or pollution. Invasions by pest organisms are also major threats to ecosystems, capable of effecting structural and compositional changes that result in the simplification of habitats and loss of biodiversity.

Building resilience relies on reducing stressors to support healthy and viable ecosystems, and their ability to recover from disturbance. Resilient systems are better able to continue functioning in a stable state, and continue to provide ecosystem services, in the face of disturbance (Australian Government 2012). Loss of resilience results in a regime shift, often to a state of the ecosystem that is undesirable or irreversible. Retaining and improving ecosystem resilience is therefore, essential for ecosystem health and biodiversity conservation (Thompson et al. 2009), and will become increasingly important with the ongoing impacts of climate change.

How can we build Ecosystem Resilience on the Mornington Peninsula?

On the Mornington Peninsula, ecosystem resilience can be maintained and improved by reducing key stressors (threats), most of which are anthropogenic, although some of these may be outside the ability of species or ecosystems to adapt (Jackson et al. 2017). At a landscape level, measures to build and support resilient ecosystems include increasing the area of protected land and improving the connectivity of habitats.

Plate 1 Coastal vegetation at Yaringa important for carbon storage

2.3 Biodiversity conservation and the Mornington Peninsula Shire

Biodiversity conservation is a key theme of Mornington Peninsula Shire Council's principal strategic document '*Our Peninsula 2021 – Mornington Peninsula Shire Council Plan 2017-2021*' (MPS 2017a). The Council Plan sets out the Vision and Mission for the Mornington Peninsula Shire and its community, and outlines the objectives and strategies aimed at achieving these.

Development of the Council Plan involved extensive community engagement, which generated responses from over 3,000 community members (MPS 2017). Preservation of the Mornington Peninsula's natural and built environment was given the highest importance ratings by the community, and elicited the largest number of comments and submissions. In particular, protection of the Peninsula's coastline and beaches, keeping waterways free from pollution, and management of natural bushland and foreshore reserves were ranked as the highest importance.

Consequently, two key strategic themes within the Council Plan 2017-2021 focus on biodiversity and the natural environment.

- ***Our Place:*** the development of a Biodiversity Conservation Plan is identified as a major initiative to achieve the community outcomes of 'protection and enhancement of the unique natural and built characteristics of the Mornington Peninsula' and 'strong resilience and adaptation to climate change'.
- ***Our Wellbeing:*** the Municipal Public Health and Wellbeing Plan – *'Our Health and Wellbeing 2021'* (MPS 2017b) clearly articulates the value of the natural environment in mental and physical health reflecting the high value the community places on the natural environment.

The Shire has a long history of working with the community to protect and enhance local biodiversity, but has not previously developed a Biodiversity Conservation Plan. This Biodiversity Conservation Plan provides an opportunity to promote and further support the work of the Mornington Peninsula Shire community and ensure that efforts to protect biodiversity into the future are well focused.

3 Biodiversity of the Mornington Peninsula

The natural environments of the Mornington Peninsula encompass a diverse range of landforms and ecosystems, from coastal areas supporting sandy beaches and dunes, intertidal mudflats and rocky shores, to ridges and escarpments with woodlands and forests, waterways and coastal and freshwater wetlands. The varied environments of the Mornington Peninsula support a correspondingly diverse suite of flora and fauna species, many of which are considered rare or threatened or have disappeared from other parts of the Port Phillip and Western Port region.

Many areas on the Mornington Peninsula are considered ecologically significant for the number and diversity of species they support, their rarity, or as representative examples of formerly widespread ecosystems. Some sites are protected as State Parks, National Parks or are designated as a Wetland of International Importance, contributing to the protection of biodiversity in the greater region and nationally. However, many remain within private land ownership.

The natural environments of the Mornington Peninsula are also considered vital by many, to the liveability and sustainability of the wider metropolitan area and provide much of the appeal for residents and visitors to the Mornington Peninsula. The diversity of natural environments, with easy accessibility from Melbourne, provides a range of recreation opportunities, which underpin much of the tourism industry on the Peninsula. However, the Peninsula's proximity to Melbourne's expanding metropolitan area, growing population and climate change, are also placing increasing pressures and demands on the environment.

3.1 The Current Condition of Biodiversity

The Mornington Peninsula has undergone significant change and environmental modification since European Settlement, primarily as a result of widespread vegetation clearance, land use change, and intensification. Less than one third of the original extent of native vegetation cover on the Mornington Peninsula remains, of which, 27% occurs within parks and reserves, and 57% of which is on private land, the remainder being on other land types. Human requirements associated with urban, agricultural and industrial development have also led to the alteration of natural processes such as fire and flood regimes, while competition and predation by introduced plants and animals have added to the pressures facing biodiversity. Collectively, these have resulted in extensive habitat fragmentation, degradation of ecosystems, and subsequent declines and extinction of species.

At least 11 flora and fauna species have become locally extinct on the peninsula, most of which are ground-dwelling woodland or grassland birds. Many more are declining, and may already be locally extinct or close to extinct. Species which were previously widespread and common are now rare, or have a restricted distribution. In contrast, urban development has favoured a small number of adaptable species which have become problematic in some areas, such as the Common Ringtail Possum *Pseudocheirus peregrinus*.

Despite significant loss and alteration of natural environments since European settlement, many areas on the Mornington Peninsula are of international or national conservation significance, and support a high diversity of species, or species which no longer occur in other parts of Greater Melbourne.

The current status of biodiversity on the Mornington Peninsula is summarised in Table 2, below. The most significant threats to biodiversity are discussed in Section 3.2.

Table 2 Summary of natural assets on the Mornington Peninsula and their current condition

Natural Asset	Current Status
Native Vegetation	Approximately 70% of the original native vegetation on the Mornington Peninsula has been cleared. The remaining 30% (c. 22,000 ha) is mostly of medium quality, according to state-wide modelling of vegetation condition. A total of 65 Ecological Vegetation Classes (EVCs) have been mapped and/or modelled for the Mornington Peninsula Shire. Forest and woodland vegetation types, followed closely by heathlands and scrubs, are the most extensive and considered to be in the best condition on the Mornington Peninsula, while grasslands are the most severely depleted and in poorest condition (Figure 2). There are five vegetation communities on the Mornington Peninsula listed as threatened nationally or in Victoria, the most extensive of which is the nationally vulnerable Subtropical and Temperate Coastal Saltmarsh (Ecology Australia 2016b).
Waterways and Wetlands	There are 18 creek catchments on the Mornington Peninsula, and an extensive network of waterways, totally approximately 440 km. The waterways of the Mornington Peninsula reflect an urban and agricultural catchment. Nine of the Peninsula's waterways were assessed as part of the latest Index of Stream Condition, two of which were rated as Very Poor, two as Poor, and three as Moderate, with only one stream in Good condition (DEPI 2010). Waterways on the Mornington Peninsula are affected by poor water quality and modified hydrology; however, most rate well for physical form and stream side zone indices, which reflect the quality and extent of riparian vegetation and degree of physical modification. There are few naturally occurring inland wetlands on the Mornington Peninsula. The largest naturally occurring wetland is Tootgarook Swamp, a groundwater-dependent wetland system estimated to cover 380 ha. Coastal wetlands are extensive along the western port coastline and form part of the Western Port Ramsar site.
Flora	The flora of the Mornington Peninsula is diverse, representing almost one fifth of Victoria's indigenous plants; the composition reflects a flora adapted to dry coastal conditions. There are 698 indigenous taxa recorded for the Peninsula, 6% of which are threatened. They include six nationally-threatened species which have a highly restricted distribution on the Peninsula (one of which is locally extinct), and 38 species that are considered rare or threatened in Victoria, nine of which are listed as threatened under state legislation.
Fauna	The diversity and composition of the vertebrate fauna on the Mornington Peninsula reflect the broad habitat types and their remaining extent on the Peninsula. There are 402 native vertebrate fauna species recorded for the Mornington Peninsula, including 36 mammal, 301 bird, 25 reptile, 11 amphibian and 29 fish species. Ten species are now considered to be locally extinct, most of which are bird species, and 81 species are threatened nationally, or in Victoria (primarily bird and mammal species). There is the potential that many more species may be close to extinction, or have already been lost from the Peninsula. Those species which have suffered the greatest declines are ground-dwelling grassland and woodland birds and small mammals.
Conservation Estate	The Mornington Peninsula's parks and reserve system covers approximately 10% of the Shire's land mass and 85% of public land. It includes 3156 ha of National Park, 2380 ha of State parks and reserves, and 1947 ha of land under local government management. The Mornington Peninsula is also part of the UNESCO Mornington Peninsula and Western Port Biosphere Reserve, and the Western Port coastline is covered by the Western Port Ramsar Site, designated under the Convention of Wetlands of International Importance and recognised for supporting a high diversity and large numbers of waterbirds. Currently, 15 private properties, covering c. 350 ha, are registered under a conservation covenant, which comprise the private conservation estate.

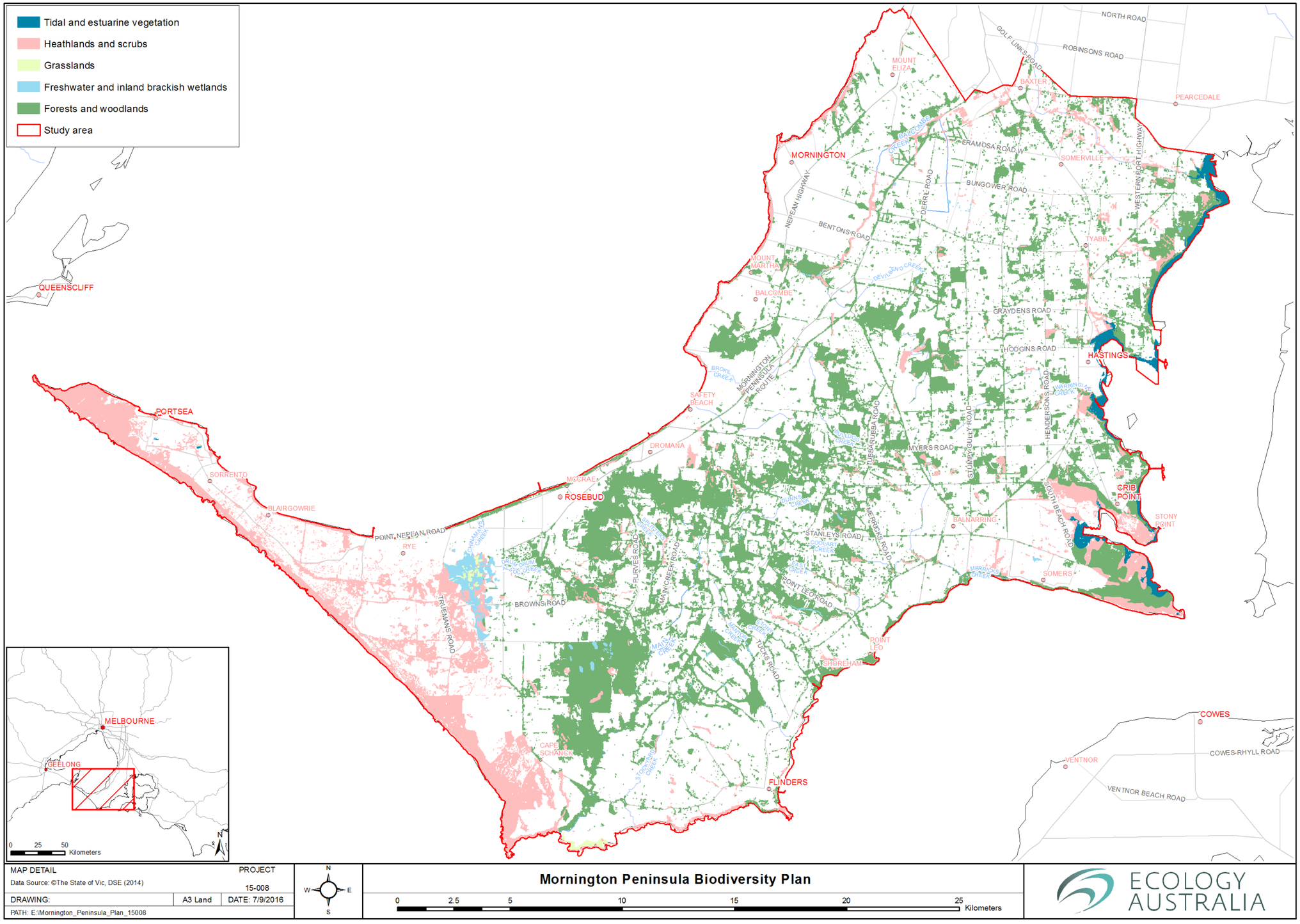


Figure 2 Major vegetation types on the Mornington Peninsula

3.2 Biodiversity Threats

The loss of biodiversity on the Mornington Peninsula since European settlement is a result of the cumulative impacts of significant landscape-scale changes resulting from urban, agricultural and industrial development. Large areas of vegetation on the Mornington Peninsula were heavily cleared for agriculture during early European settlement, while coastal areas have provided attractive locations for township development and growth. As a result, natural environmental processes on the Peninsula, particularly fire, and water flow and flooding regimes, have been suppressed or significantly altered to enable agricultural production or protect people and property. Exotic plants and animals have been either deliberately or inadvertently introduced, threatening indigenous plants and animals. Climate change, and it's interaction with other threats is likely to exacerbate these pressures and brings additional challenges for management.

The major threats to biodiversity on the Mornington Peninsula were identified from the published and unpublished literature and in consultation with the community and Mornington Peninsula Shire. The incremental clearing of remnant native vegetation associated with development and land use change was overwhelmingly identified as the most significant threat to local biodiversity by the community, followed closely by environmental weeds and pest animals. Other highly ranked threats included a general lack of public awareness about biodiversity, and altered disturbance regimes such as flooding cycles and fire frequency, while climate change was identified as the most significant emerging threat.

3.2.1 Vegetation Clearance and Land Use Change

Historic clearing of native vegetation on the Mornington Peninsula for agricultural land uses and urban development has led to extensive loss and fragmentation of vegetation and habitats. Most remaining pockets of vegetation are relatively small, isolated and more prone to degradation, and hence, have reduced resilience. Vegetation clearance has also resulted in the loss of habitat for native fauna, including sheltering, feeding and breeding habitat; habitat loss is considered to be the primary driver of decline in numerous fauna species. Habitat fragmentation also isolates populations by limiting the dispersal and movement of fauna, affecting gene flow and the long-term viability of populations.

Although the rate of vegetation clearing has slowed, the pressures on biodiversity, resulting from the legacy of broad-scale vegetation clearance remain. Residential, commercial, agricultural and industrial development, within existing land use planning provisions, will result in incremental vegetation losses, leading to further fragmentation of vegetation remnants. With Victoria's increasing population and large developments such as expansion of the Port of Hastings, growth on the Peninsula is expected to continue, increasing the importance and need for remnant native vegetation protection. On public land the construction and maintenance of utility corridors and fuel hazard reduction, also results in simplification and degradation of remnant native vegetation. Vegetation loss therefore, remains the primary threat to biodiversity on the Mornington Peninsula.

3.2.2 Invasive Species and Pathogens

Invasive species, including environmental weeds and pest animals, radically alter ecosystem composition and function and threaten the survival of indigenous plants and animals. These can include exotic species, as well as native species which have established outside of their natural range, or have become invasive or overabundant.

Environmental Weeds

Environmental weed invasion is considered one of the greatest threats to terrestrial ecosystems and biodiversity values on the Mornington Peninsula. They displace indigenous species, thereby reducing biodiversity and altering habitat composition and structure. There are 369 exotic and/or naturalised non-indigenous plant species on the Mornington Peninsula, 21 of which are listed as noxious under the *Catchment and Land Protection Act 1994*. Approximately one third have a high to very high risk of causing degradation to remnant native vegetation and associated ecosystems on the Mornington Peninsula (e.g. see Plate 2), with grassland, grassy woodland and riparian vegetation types most susceptible to the impacts of weeds (see Ecology Australia 2016).

Without appropriate management to limit their spread, and measures to prevent new invasions, environmental weeds will continue to degrade the natural values of the Mornington Peninsula. Environmental weed control will therefore, remain a primary concern for Mornington Peninsula Shire in the management of public land and reserves. The control of environmental weeds on private land will also be crucial in providing a co-ordinated response; the Mornington Peninsula Shire also has an important role in supporting the efforts of private land holders in managing environmental weed infestations.

Plate 2 Invasion of Coast Banksia Woodland with the 'very high risk' environmental weed Common Dipogon *Dipogon lignosus*

Pest Animals

Pest animals, including the Red Fox *Vulpes vulpes*, Cat *Felis cattus* and European Rabbit *Oryctolagus cuniculus*, are one of the most frequently identified threats to native fauna and their habitat (Cresswell and Murphy 2017). Predation by introduced predators, combined with habitat degradation caused by rabbits, are likely to have led to the decline and local extinction of many small mammal and ground-dwelling bird species on the Mornington Peninsula. Pest animal control within Shire-owned land is a key responsibility for the Mornington Peninsula Shire. Several areas on the Peninsula support species that are highly susceptible to the impacts of pest animals; ongoing investment in strategic, best-practice control, and collaboration with other land management agencies, will be required to protect these species and more effectively manage introduced pests.

Pathogens

Invasive pathogens (disease-causing organisms) have the potential to negatively impact many of Australia's native plants and animals, as well as agricultural crops. The pathogens of greatest concern on the Mornington Peninsula, and Australia, are Amphibian Chytrid Fungus *Batrachochytrium dendrobatidis* and Cinnamon Fungus *Phytophthora cinnamomi*. Diseases caused by these organisms affect health, reproduction and survival of plants, animals and ecological communities; threatened species and communities with reduced and restricted populations are most at risk. Cinnamon Fungus has been identified on public land at a number of locations across the Mornington Peninsula. The spread of these diseases typically occurs through the movement of contaminated soil or plant material (including landscaping materials) from infested to non-infested areas. Best-practice environmental hygiene protocols during on-ground works will help to limit the introduction and/or spread of pathogens within Mornington Peninsula Shire, particularly when working in or around known contaminated sites.

3.2.3 Pollution

There are numerous potential sources of pollution on the Peninsula, including urban and agricultural run-off, industrial wastes, and stormwater and sewage, which can impact waterway health, coastal habitats, and areas of remnant native vegetation which receive run-off. The Mornington Peninsula also faces major challenges with regard to sewerage and drainage infrastructure, particularly in relation to development in un-sewered areas. Other forms of pollution include the dumping of rubbish and garden wastes in parks and reserves or other public land. The dumping of garden wastes, in particular, poses a serious risk to remnant vegetation, with the potential to spread or introduce new weed species, which become known as garden escapes.

3.2.4 Recreation

The Mornington Peninsula is one of Victoria's premier tourism destinations, and is often described as 'Melbourne's Playground', because of its popularity for nature-based recreation. While nature-based recreation is important for improving the engagement with the environment, a number of recreational activities have the potential to adversely affect biodiversity.

Active (high-intensity) recreational pursuits, including horse-riding and mountain bike riding, are popular on the Mornington Peninsula. Horse riding activities are generally focused around Moorooduc to Red Hill, Main Ridge and Boneo, while the central hills of the Mornington Peninsula are popular for mountain bike riding. The rise in popularity of mountain bike riding, and resultant demand for, and use

of, the formal and informal track network is likely to increase the impact on biodiversity in key areas, such as Arthur's Seat Sate Park. Passive (low-intensity) recreation includes activities such as bushwalking, camping and bird watching. The impacts of passive recreational activities are generally considered to be low, although this depends on the extent that facilities are required; for example, the extensive formal and informal track network across Parks and reserves throughout the Peninsula contributes further to the fragmentation and degradation of habitat. Some passive recreational activities are known to have a detrimental effect on biodiversity values in particular areas; the most notable of these being impacts of disturbance caused by beach-goers and dog-walkers on the breeding success of the EPBC Act-listed Hooded Plover *Thinornis rubricollis*, during their breeding season (Weston and Elgar 2005, 2007, see Plate 3).

Plate 3 Interpretive signage at St Andrews Beach, Mornington Peninsula National Park, alerting beachgoers to nesting Hooded Plovers

3.2.5 Altered Disturbance Regimes

Certain types of disturbance to vegetation are natural and an important process in a number of ecosystems on the Peninsula. The exclusion of fire in fire-dependent vegetation due to conflicts with residential or agricultural land use has the potential to significantly alter remnant native vegetation. Fire is required for the recruitment of many plant species and is an important factor which determines vegetation composition, particularly in dry vegetation types. Most indigenous plant species on the Mornington Peninsula have an evolutionary relationship with fire. Other natural disturbances include flooding (e.g. seasonal wetlands) and hydrological regimes. Many waterways on the Mornington Peninsula, as well as Tootgarook Swamp suffer from altered hydrology, due to surrounding urban and agricultural development, and the pressures on these systems are likely to increase with the impacts of climate change (see Section 3.2.7).

3.2.6 Lack of Public Awareness

A lack of public awareness has been identified as a threat to numerous values on the Mornington Peninsula (Ecology Australia 2016a). Many human-based threats on the Peninsula stem from behaviours that include illegal dumping of rubbish and garden wastes, clearing of remnant native vegetation, and recreational pursuits, such as dog-walking or trail-bike riding in environmentally sensitive areas. Hence, encouraging environmental stewardship is central to improving conservation outcomes on the Mornington Peninsula, and the Shire has a responsibility to engage with the community and help raise awareness of local environmental values and promote conservation.

3.2.7 Climate Change

Climate change will impact on biodiversity values in numerous ways, some of which are not yet fully understood; climate change will accentuate natural variability in the climate, leading to uncertainty regarding the full implications for biodiversity. Across Victoria, the climate will become warmer and drier. Around Greater Melbourne warming has increased since 1960, equivalent to 1.2 – 1.4°C on the Peninsula, while rainfall has decreased since 1950 (by up to 100 mm per year on the Peninsula). This trend is likely to continue, and will likely result in:

- Increased number of days of extreme heat and longer heat-waves
- Increased number of days of extreme fire danger
- Less spring and winter rainfall (south of the Divide)
- More frequent and intense downpours
- Fewer frosts
- Rising sea levels

These changes are likely to lead to:

- Increased frequency and intensity of wildfire (altered fire regimes)
- New and emerging environmental weeds and pest animals
- Altered phenology of flora and fauna (e.g. timing of flowering, breeding)
- Decreased stream flows and loss of ephemeral waterways
- Increased salinity of freshwater coastal wetlands
- Loss of coastal habitats from sea-level rise.

The most vulnerable habitats and species on the Peninsula are coastal, especially those with restricted distributions, or where the potential for inland migration with sea level rise is limited (Figure 3). These include beaches and primary and dunes, and coastal wetlands, which support nationally endangered species such as the Hooded Plover and migratory shorebirds. Inland streams and wetlands are also likely to be impacted from reduced catchment inflows, leading to decreased streamflow in waterways and decreased hydroperiod (the period of time a wetland holds water) in wetlands. Species which depend on these habitats include the nationally significant freshwater fish, the Dwarf Galaxias *Galaxiella pusilla*, as well as waterbirds such as the cryptic crakes and rails, and nationally endangered Australasian Bittern *Botaurus poiciloptilus*.

Figure 3 Vulnerability of ecosystems and their representative species on the Mornington Peninsula to the potential impacts of climate change, from lowest to highest.

3.3 Understanding the Mornington Peninsula Landscape

The landscape of the Mornington Peninsula has been shaped by complex geological formations and processes, which have given rise to different landforms and topography, vegetation types and habitats. The variety of landforms, from the undulating hills supporting woodlands and forests, to the coastal areas, supporting sandy beaches, wide intertidal mudflats and rocky shores, is reflected in the diversity of flora and fauna species of the Mornington Peninsula.

To better understand how biodiversity values, threats and management needs differ across the landscape, the Mornington Peninsula was divided into six distinct landscape zones, based on distinguishing landscape characteristics such as geomorphology, land uses, broad vegetation communities and habitat types (Figure 4). The biodiversity values that characterise each zone were analysed and mapped, to produce a map of relative biodiversity significance in each zone (see 3.3.1).

The most significant threats to biodiversity in each of the landscape zones were determined from an Analytical Hierarchy Process (AHP) undertaken by multiple stakeholders, which ranked various threats. This process was used to help identify the most important biodiversity management issues to be addressed on the Mornington Peninsula, as part of the Biodiversity Conservation Plan. Across the six zones, vegetation clearance, environmental weeds and introduced fauna were consistently ranked amongst the highest and most widespread threats across the Peninsula. Climate change, pollution, lack of public awareness and altered disturbance regimes were identified as lower-ranked threats.

Profiles for each of the six landscape zones are given below, summarising their environmental characteristics (e.g. landforms, hydrological features, and dominant vegetation types), areas of biodiversity significance, values and the four most important biodiversity threats in each zone.

3.3.1 Biodiversity Significance Mapping

A key tool developed to guide development of actions and for on-going biodiversity management is a map of relative biodiversity significance across the Mornington Peninsula (Figure 4). The map produced shows the areas that contribute most to biodiversity conservation based on analysis of remnant native vegetation cover, quality, landscape context and threatened species habitat. The analysis addresses the need for transparency, accountability and strategic investment in biodiversity conservation, and will assist the Shire in making objective and defensible decisions for biodiversity management and advocacy to other levels of government. Further detail on how the mapping was developed is presented in Appendix 1.

Figure 4 presents the mapping of biodiversity significance across the Mornington Peninsula, and the six landscape zones. The zones which make the highest contribution to biodiversity on the Peninsula include the Central Hills, Tootgarook and Hastings Zones. The Central Hills zone is distinguished by the fragmented and dispersed pattern of biodiversity values. Whilst areas supporting the highest biodiversity ranking are smaller in this zone than in neighbouring zones (i.e. Tootgarook) a higher percentage of the zone is covered by lower categories of significance, resulting in greater overall coverage of biodiversity values.

The Moorooduc and Southern Coast Zones are the most depleted. Although biodiversity values within these zones are low, these areas should not be disregarded. These areas will benefit most from actions that are targeted to enhancement of biodiversity values.

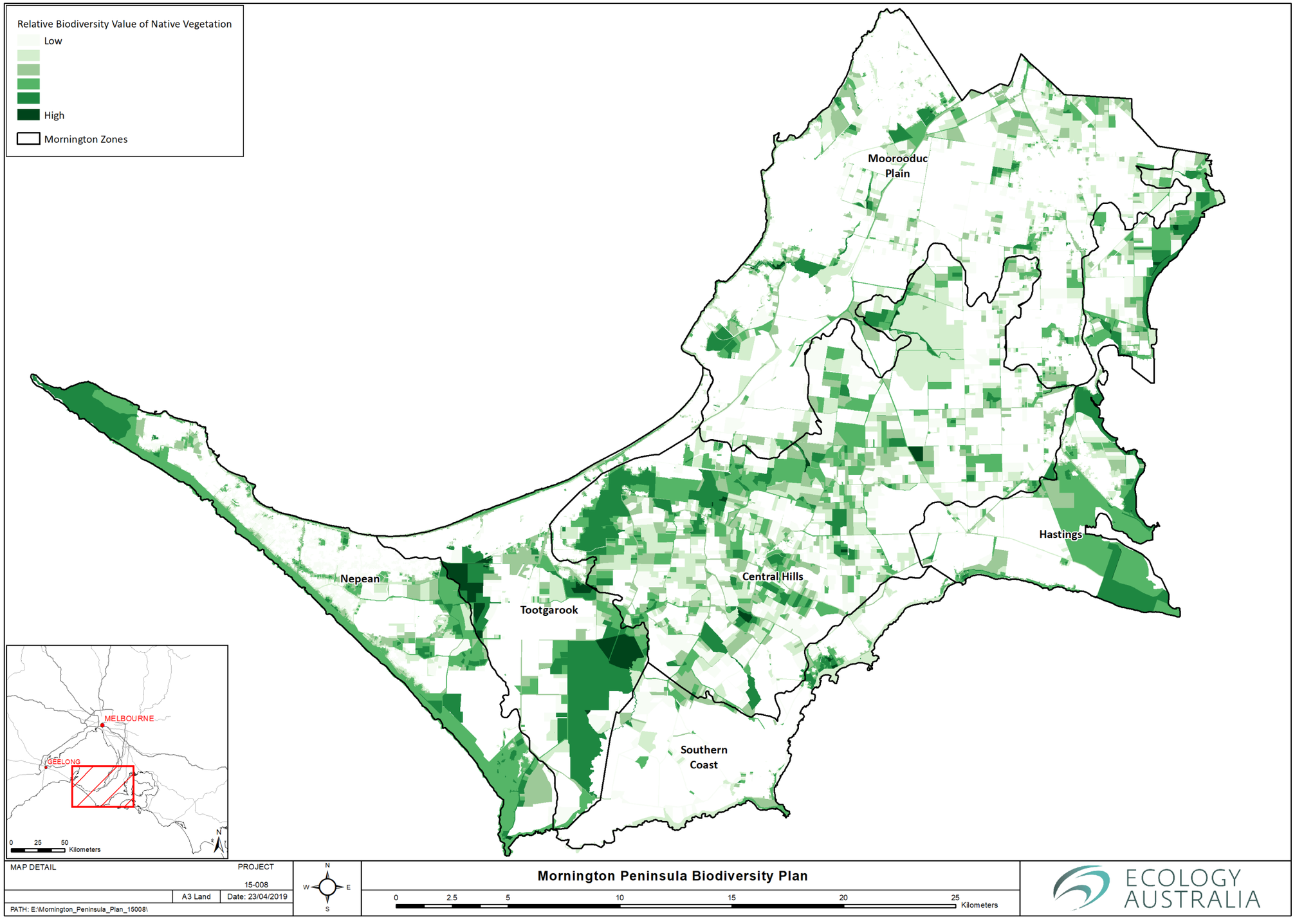
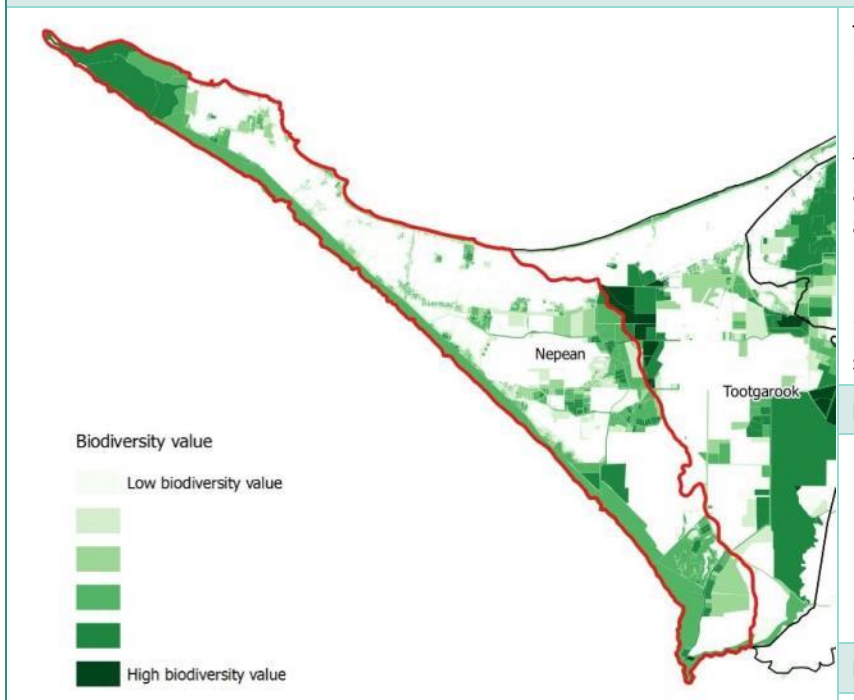


Figure 4 Landscape zones and biodiversity significance across the Mornington Peninsula

NEPEAN PENINSULA

Zone Profile



The Nepean Peninsula, which forms part of the Port Phillip Sunkland, is characterised by a barrier dune system, formed by the deposition of sediments during sea level retreat in the Pleistocene. Calcareous sands support closed coastal scrubs, sometimes consolidated into hard dune limestone or sandstone. Wave action continues to erode the southern coastline, forming limestone cliffs and horizontal platforms, while sand continues to be deposited along beaches on the Port Phillip coastline. The eastern boundary, between Cape Schanck and Rosebud, is defined by the edge of the Aeolian dune systems (The Cups).

Relicts of these systems occur from Point Nepean along the southern coastline, while the northern Port Phillip coast has been extensively developed. The Nepean Peninsula is an important area for tourism and recreation, supporting historic sites, popular beaches and hot springs, and is popular for horse riding and golf.

Major Conservation Areas

- Point Nepean National Park
- Mornington Peninsula National Park (coastal section)
- Police Point Shire Park
- Port Phillip Bay Coastal Reserve
- Weeroona Street Bushland Reserve

Land Tenure

Public Land: 2,182 ha (25.9%)
Private Land: 6,256 ha (74.1%)

Major Waterways and Wetlands

Portsea Lagoon Wildlife Sanctuary

Vegetation

Major Vegetation Types:

- Heathlands and Scrubs (3568 ha)
- Grasslands (2 ha)
- Freshwater and Inland Brackish Wetlands (9 ha)

Ecological Vegetation Classes (EVCs): 14

- Three EVCs classed as rare or threatened in the bioregion
- Dominant EVCs:
  - Coastal Alkaline Scrub
  - Coastal Headland Scrub

Listed Communities:

- Coastal Moonah Woodland (FFG Act-listed)

Threatened flora species: 20

Key flora species:

- Coast Helmet-orchid *Corybas despectans* (L, vu)
- Coast Wirilda *Acacia uncifolia* (r)
- Rare Bitter-bush *Adriana quadripartite* (glabrous form) (L)
- Leafy Greenhood *Pterostylis cucullata* (L, en)
- Coast Tabacco *Nicotiana maritima* (en)

Fauna

Important Habitats:

- Dune systems and heathlands provide important habitats for small and medium-sized mammals (e.g. White-footed Dunnart, Long-nosed Bandicoot)
- Coastal cliffs (often devoid of vegetation) provide shelter, roosting and breeding sites for coastal birds and microbats
- Point Nepean National Parks is an important site for the Hooded Plover

Threatened fauna species: 50

Key fauna species:

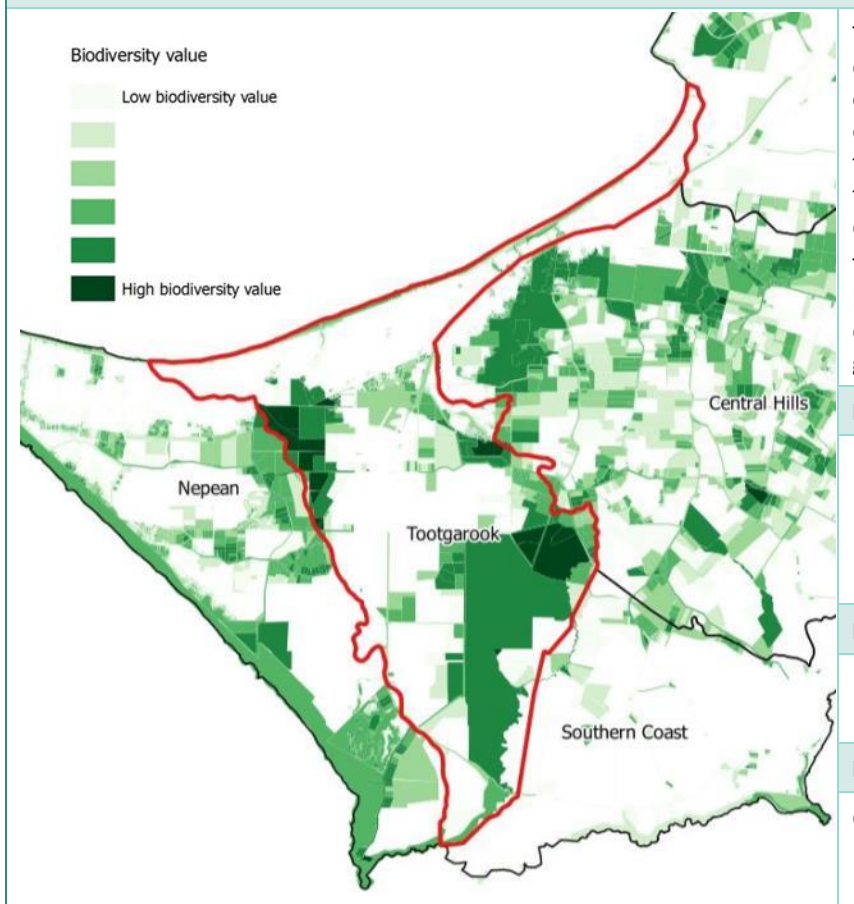
- White-footed Dunnart *Sminthopsis leucopus* (L, nt)
- Hooded Plover *Thinornis rubricollis* (VU/M, L, vu)
- Sooty Oystercatcher *Haematopus fuliginosus* (nt)
- White-throated Needletail *Hirundapus caudacutus* (Mi/M, vu)

KEY THREATS

1. Environmental weeds
2. Pest animals
3. Vegetation clearance
4. Climate change

TOOTGAROOK

Zone Profile



The Tootgarook Zone is characterised by swamp sediments and siliceous sands, supporting dense scrubs near the edge of the Port Phillip sunkland, with woodland and forest communities at higher elevations to the east. The calcarenite dunes which formed along the eastern boundary of the sunkland (The Cups) retarded groundwater and freshwater flows from the confluence of Drum Drum Alloc and Chinaman's Creeks during the Holocene, forming the Tootgarook Swamp. Tootgarook Swamp is one of the largest groundwater-dependent wetland systems in the region, and is a dominant feature of this zone.

The majority of this landscape has been cleared for urban and agricultural development, leading to significant hydrological modification and attrition of the Swamp. Urban development dominates the Port Phillip coastline, while agricultural land uses, include grazing, intensive horticulture and market gardens.

Major Conservation Areas

- Mornington Peninsula National Park (inland sections)
- Peninsula Gardens Bushland Reserve
- Tootgarook Swamp Bushland Reserve
- Rosebud Foreshore Reserve

Land Tenure

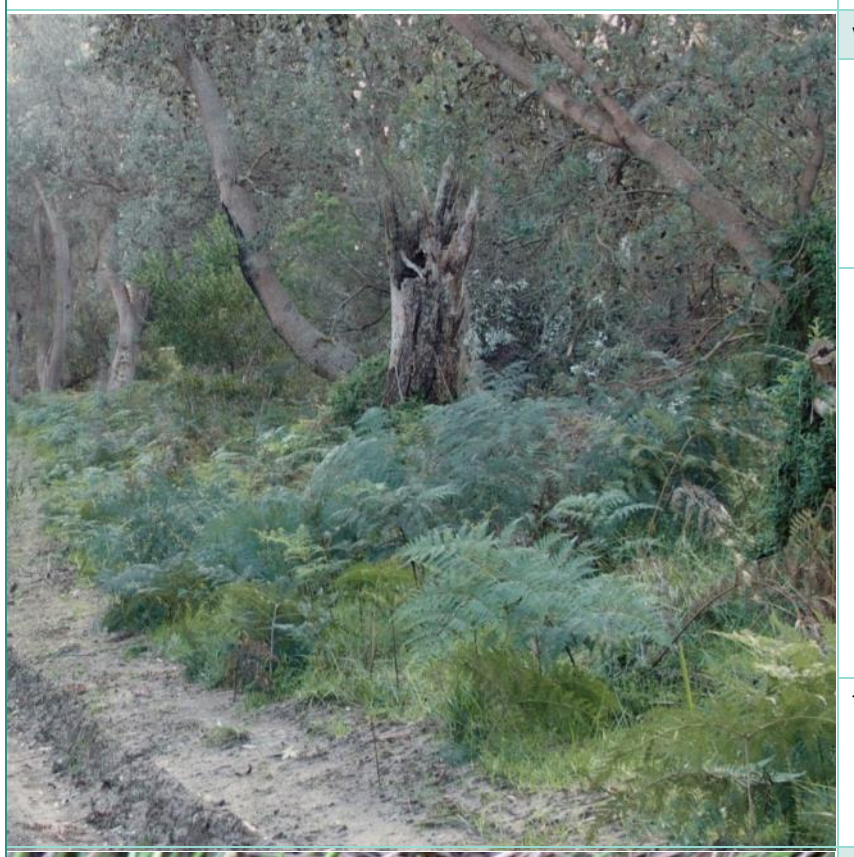
Public Land: 2,025 ha (25.2%)

Private Land: 6,014 ha (74.8%)

Major Waterways and Wetlands

Chinaman's Creek
Drum Drum Alloc Creek
Main Creek (lower reaches)

Tootgarook Swamp



Vegetation

Major Vegetation Types:

- Forests and Woodlands (2,350 ha)
- Heathlands and Scrubs (260 ha)
- Grassland (42 ha)
- Freshwater and Inland Brackish Wetland (308 ha)

Ecological Vegetation Classes (EVCs): 34

- Seventeen EVCs classes as rare or threatened in the Bioregion
- Dominant EVCs:
  - Coast Banksia Woodland
  - Damp Sands Herb-rich Woodland
  - Gully Woodland
  - Swamp Scrub

Listed Communities:

- South Gippsland Plains Grassland (FFG Act-listed)
- Natural Damp Grasslands of the Victorian Coastal Plain (EPBC Act-listed, EN)

Threatened flora species: 13

Key flora species:

- Venus-hair Fern *Adiantum capillus-veneris* (L, en)
- Purple Eyebright *Euphrasia collina* subsp. *muelleri* (EN, L, en)

Fauna

Important Habitats:

- Tootgarook Swamp is recognised for supporting a diverse assemblage of bird species, including international migratory birds, and is an important site for the Australasian Bittern
- Forest and woodland vegetation within Mornington Peninsula National Park supports numerous threatened bird, mammal and amphibian species

Threatened fauna species: 53

Key fauna species:

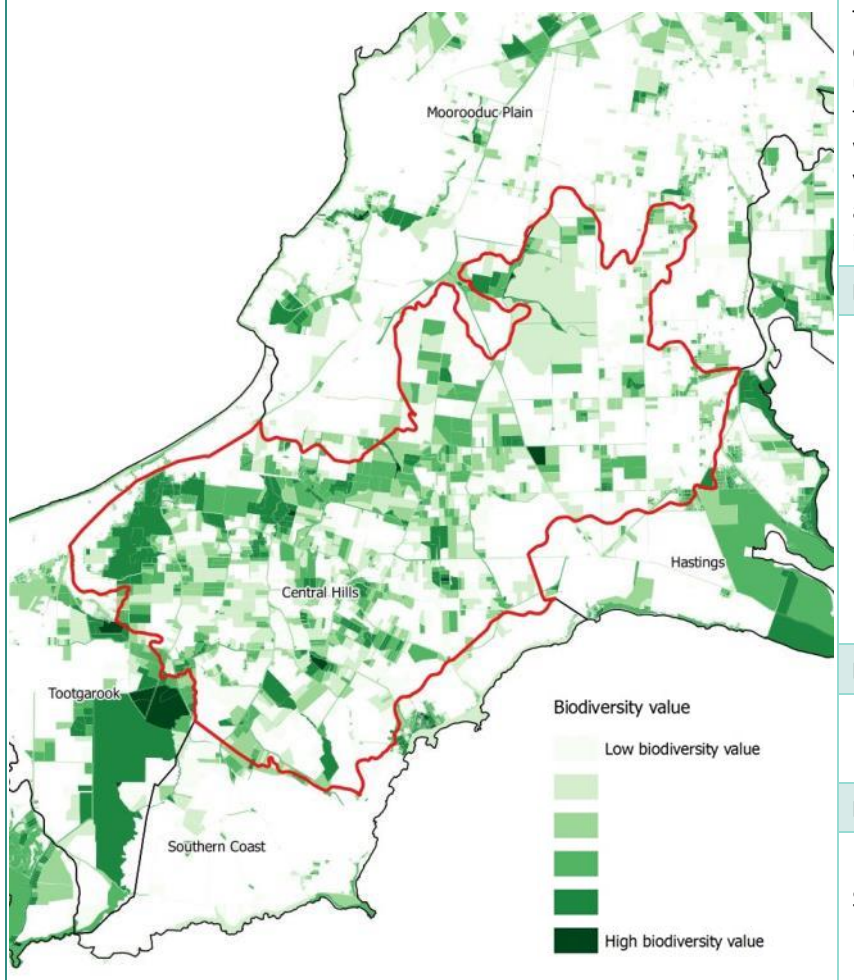
- Australasian Bittern *Botaurus poiciloptilus* (EN, L, en)
- White-bellied Sea-Eagle *Haliaeetus leucogaster* (M, L, vu)
- Powerful Owl *Ninox strenua* (L, vu)
- Swamp Skink *Lissolepis coventryi* (L, vu)
- Glossy Grass Skink *Pseudemoia rawlinsoni* (vu)

KEY THREATS

1. Environmental weeds
2. Introduced fauna
3. Vegetation clearance
4. Pollution

CENTRAL HILLS

Zone Profile



The Central Hills is defined by the broad zone of uplift through the centre of the Peninsula, created by the series of fault lines which weakly dissect the Peninsula, forming the gently undulating landscapes of Main Ridge, Red Hill, Arthur's Seat and Merricks. The boundaries of this unit are defined by the ridges and hills that support predominantly dry forests and woodland. The Central Hills zone supports some of the largest and most important areas of vegetation remaining on the Peninsula. Topography has limited the development of urban areas and intensive agricultural industries, which comprise small township settlements and industries such as viticulture.

Major Conservation Areas

- Arthur's Seat State Park
- Kings Falls and Forgotten Spur Bushland Reserve
- Main Ridge Nature Conservation Reserve
- Endeavour Fern Gully (private)
- Warringine Park (creek and woodland section)
- Buckley Nature Conservation Reserve
- Woods Bushland Reserve
- Devilbend Natural Features Reserve

Land Tenure

Public Land: 3,103 ha (14.3%)

Private land: 18,655 ha (85.7%)

Major Waterways and Wetlands

Main Creek (upper reaches)	Devilbend Reservoir
Stony Creek	Bittern Reservoir
Dunns Creek	
Manton Creek	

Vegetation

Major Vegetation Types:

- Forest and Woodlands (7,346 ha)
- Heathlands and Scrubs (399 ha)
- Freshwater and Inland Brackish Wetlands (51 ha)

Ecological Vegetation Classes (EVCs): 25

- Ten EVCs classed as rare or threatened in the bioregion
- Dominant EVCs:
  - Herb-rich Foothill Forest
  - Lowland Forest

Threatened flora species: 7

Key flora species:

- Purple Eyebright *Euphrasia collina* subsp. *muelleri* (EN, L, en)
- Clover Glycine *Glycine latrobeana* (VU, L, vu)

Fauna

Important habitats:

- Devilbend and Bittern Reservoirs (decommissioned) support:
  - habitat for a diverse assemblage of waterfowl,
  - a regular breeding site for the White-bellied Sea-Eagle; and
  - one of two Dwarf Galaxias metapopulations on the Mornington Peninsula
- Dry forest and woodland remnants on private and reserves throughout this landscape support mature eucalypts, important for hollow-dependent fauna (e.g. Powerful Owl)

Threatened fauna species: 47

Key fauna species:

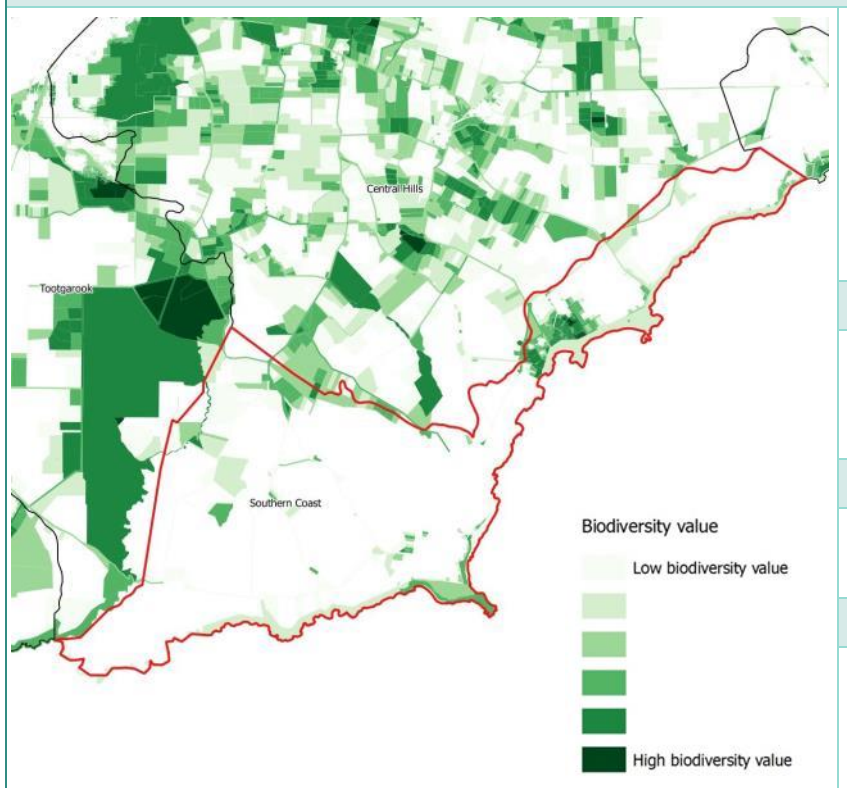
- Dwarf Galaxias *Galaxiella pusilla* (VU, L, en)
- Powerful Owl *Ninox strenua* (L, vu)
- White-bellied Sea-Eagle *Haliaeetus leucogaster* (M, L. vu)
- Hardhead *Aythya australis* (vu)
- Southern Toadlet *Pseudophryne semimarmorata* (vu)

KEY THREATS

1. Vegetation clearance
2. Environmental weeds
3. Introduced fauna
4. Lack of public awareness

SOUTHERN COAST

Zone Profile



The Southern Coast zone extends from approximately Cape Schanck to Balnarring. Land within this zone has been heavily cleared and is a primarily agricultural landscape. Remnants of forest and woodland vegetation occur along watercourses and on roadsides along ridgelines which form the hills to the north. The coastal environment is shaped by the exposed, high energy coastline of Bass Strait. It is dominated by calcarenite cliffs and slopes, with intertidal rocky shores, surrounded by sub-tidal rocky reefs. The eastern boundary of this zone around Balnarring, marks the change in coastal habitat from rocky shores to mudflats, mangroves and saltmarsh.

Conservation Areas

- Mornington Peninsula National Park (coastal section)
- Flinders-Somers Coastal Reserve
- Buxton Bushland Reserve

Land Tenure

Public Land: 752 ha (12.6%)

Private Land: 5,226 ha (87.4%)

Major Waterways and Wetlands

Stockyard Creek

Manton Creek (lower reaches)

Stony Creek (lower reaches)

East Creek (lower reaches)

Vegetation

Major Vegetation Types:

- Forests and Woodlands (764 ha)
- Heathlands and Scrubs (197 ha)
- Grasslands (47 ha)
- Freshwater and Inland Brackish Wetlands (2 ha)

Ecological Vegetation Classes (EVCs): 20

- Twelve EVCs classed as rare or threatened in the bioregion
- Dominant EVCs:
  - Coast Banksia Woodland
  - Grassy Woodland
  - Herb-rich Foothill Forest

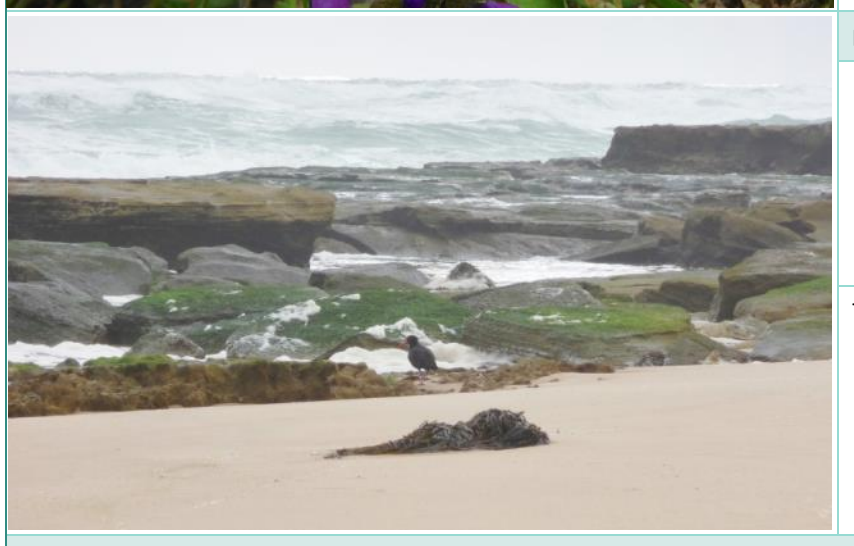
Listed communities:

- Natural Damp Grasslands of the Victorian Coastal Plain (EPBC Act-listed, EN)

Threatened flora species: 3

Key flora species:

- Clover Glycine *Glycine latrobeana* (VU, L, vu)
- Slender Tick-trefoil *Desmodium varians* (k)
- Fluffy-fruit Wood-sorrel *Oxalis thompsoniae* (k)



Fauna

Important habitats:

- Calcarenite cliffs provide shelter, roosting and breeding sites for coastal birds and the Peregrine Falcon
- Rocky shores, particularly around Cape Schanck, Flinders and Shoreham provide habitat for seabirds and shorebirds such as the Sooty Oystercatcher and Hooded Plover

Threatened fauna species: 41

Key Fauna Species:

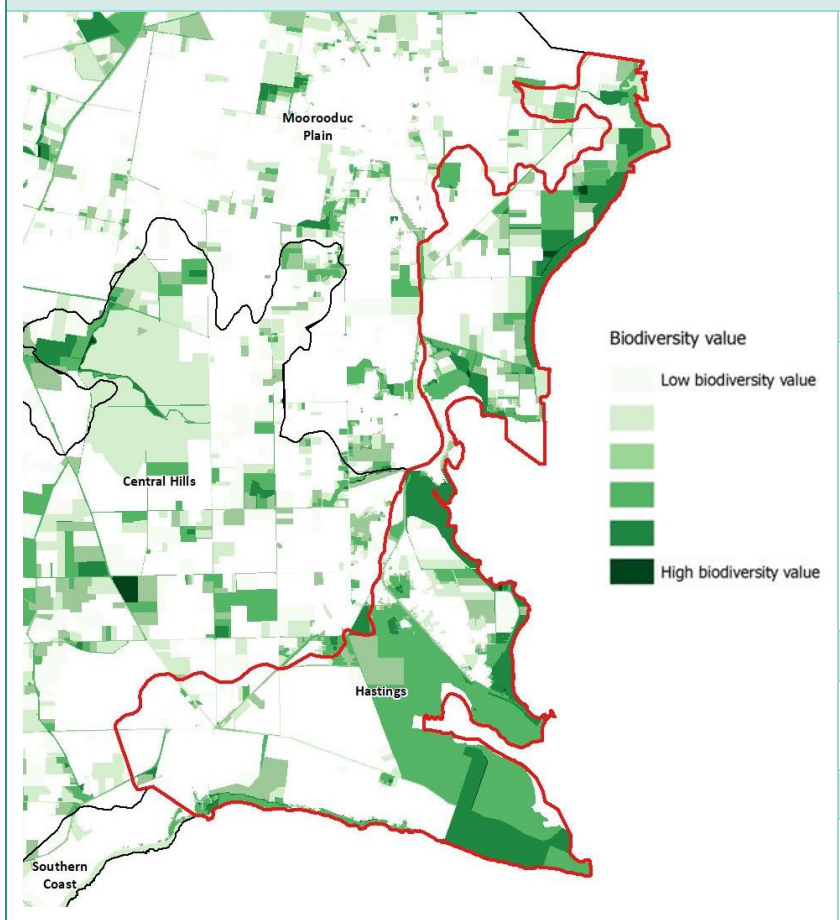
- Hooded Plover *Thinornis rubricollis* (VU/M, L, vu)
- Sooty Oystercatcher *Haematopus fuliginosus* (nt)
- Black-faced Cormorant *Phalacrocorax fuscescens* (nt)
- Common Bent-wing Bat *Miniopterus schreiberseii* (L, vu)

KEY THREATS

1. Environmental weeds
2. Vegetation clearance
3. Introduced fauna
4. Climate change

HASTINGS

Zone Profile



The Hastings zone extends along the coast from approximately Balnarring to Pearcedale. The sheltered, low-energy Western Port coastline is dominated by saltmarsh, mangroves and extensive mudflats, backed by coastal eucalypt woodlands and scrubs. The southern coastline, between Shoreham and Cribb Point, supports stable, well-vegetated dunes.

This zone retains areas of high biodiversity value, particularly along the Western Port coast, including threatened vegetation communities and wetlands of international importance (Ramsar wetland). It is also used extensively for recreation, especially boating, and supports significant areas of industry, such as the Port of Hastings and HMAS Cerberus.

Conservation Areas

- Western Port Ramsar Site
- Coolart Historic Reserve
- Somers Foreshore Reserve
- North Western Port Nature Conservation Reserve
- Yaringa Foreshore Reserve
- Hastings Foreshore Reserve
- Warringine Park

Land Tenure

Public Land: 2,815 ha (34.3%)
Private Land: 5,403 (65.7%)

Major Waterways and Wetlands

Merricks Creek Watson's Creek	Western Port Ramsar Site Bittern Coastal Wetlands (Ramsar) Coolart Lagoon

Vegetation

Major Vegetation Types:

- Forests and Woodlands (1,851 ha)
- Heathlands and Scrubs (1,245 ha)
- Tidal and Estuarine Vegetation (455 ha)
- Freshwater and Inland Brackish Wetlands (23 ha)

Ecological Vegetation Classes (EVCs): 30

- Sixteen EVCs classed as rare or threatened in the bioregion
- Dominant EVCs:
  - Coast Banksia Woodland
  - Damp Sands Herb-rich Woodland
  - Grassy Woodland
  - Heathy Woodland
  - Swamp Scrub

Listed communities:

- Subtropical and Temperate Coastal Saltmarsh (EPBC Act-listed, VU)

Threatened flora species: 7

Key flora species:

- Marsh Saltbush *Atriplex paludosa* subsp. *paludosa* (r)
- Grey Mangrove *Avicennia marina* subsp. *australasica* (r)
- Yellow Sea-lavender *Limonium australe* var. *australe* (r)
- Dense Leek-orchid *Prasophyllum spicatum* (VU, en)

Fauna

Important Habitats:

- Coastal habitats provide important habitat for shorebirds, including primary foraging habitat between Tyabb and Yaringa and at Hanns Inlet; dunefields along the southern coast provide habitat for the Hooded Plover and seabirds
- Coastal woodland and heathland provides the stronghold of habitat for the Southern Brown Bandicoot on the Mornington Peninsula

Threatened fauna species: 47

Key fauna species:

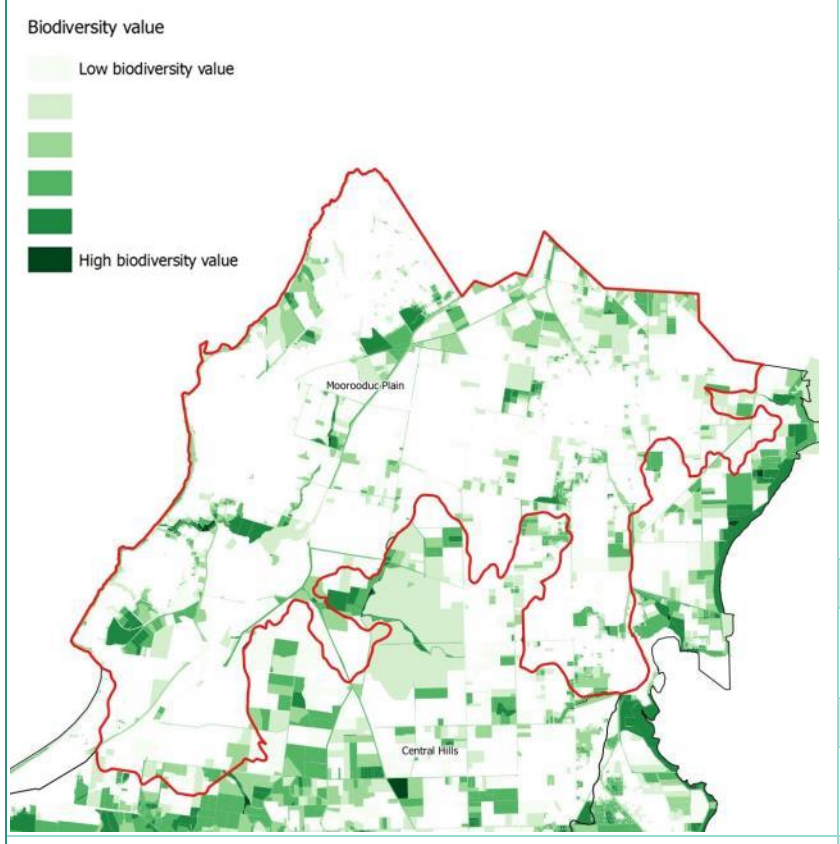
- Southern Brown Bandicoot *Isoodon obesulus obesulus* (EN, L, nt)
- Eastern Curlew *Numenius madagascarensis* (CE, M, Mi)
- Blue-billed Duck *Oxyura australis* (L, en)
- Azure Kingfisher *Alcedo azurea* (nt)
- Flatback Mangrove Goby *Mugiligobius platynotus* (L,vu)

KEY THREATS

1. Introduced fauna
2. Vegetation clearance
3. Environmental Weeds
4. Pollution

MOOROODUC PLAIN

Zone Profile



The Moorooduc Zone, which covers the northern Peninsula, is characterised by relatively flat topography and encompasses the Moorooduc Plain. This zone once supported extensive areas of Grassy Woodlands and Swamp Scrubs; these communities have been heavily depleted, but the extent of this zone is defined by their historic distribution. Extensive agricultural development within this zone has been facilitated by suitability for grazing (i.e. low relief landscape and grassland vegetation types). The coastal area to the west of the Moorooduc Highway is highly urbanised, characterised by hills and gullies and coastal cliffs.

Conservation Areas

- Tyabb Bushland Reserve
- Balcombe Creek Bushland Reserve
- Port Phillip Bay Coastal Reserve
- Mount Martha Park
- The Briars
- Moorooduc Quarry Flora and Fauna Reserve
- Balcombe Estuary Bushland Reserve

Land Tenure

Public Land: 1,526 ha (7.4%)

Private Land: 18,959 (92.6%)

Major Waterways and Wetlands

Watson’s Creek

Balcombe Creek

Vegetation

Major Vegetation Types:

- Forests and Woodlands (2,733 ha)
- Heathlands and Scrubs (592 ha)
- Freshwater and Inland Brackish Wetlands (16 ha)
- Grasslands (2 ha)
- Tidal and Estuarine Vegetation (2 ha)

Ecological Vegetation Classes (EVCs): 30

- Seventeen EVCs classed as rare or endangered in the bioregion
- Dominant EVCs:
  - Grassy Woodland (en)
  - Swamp Scrub (en)

Listed communities:

- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (EPBC Act-listed , CE)
- Subtropical and Temperate Coastal Saltmarsh (EPBC Act-listed, VU)
- Plains Grassland (South Gippsland) Community (FFG Act-listed)

Threatened flora species: 5

Key flora species:

- Mount Martha Bundy *Eucalyptus carolaniae* (en)
- Tasman Trigger Plant *Stylidium dilatatum* (k)

Fauna

Important habitats:

- Balcombe Creek, Watson’s Creek and Tuerong Creek support one of two metapopulations of the Dwarf Galaxias on the Mornington Peninsula
- The Briars supports a number of threatened fauna species, most notably small reptiles and amphibians
- The Port Phillip coastline supports shorebirds and seabirds, and is a known roost for the Black-faced Cormorant

Threatened fauna species: 47

Key fauna species:

- Black-faced Cormorant *Phalacrocorax fuscescens* (M, nt)
- Dwarf Galaxias *Galaxiella pusilla* (VU, L, en)
- Growling Grass Frog *Litoria raniformis* (VU, L, en)
- Glossy Grass Skink *Pseudemoia rawlinsoni* (vu)

KEY THREATS

1. Vegetation clearance
2. Environmental weeds
3. Introduced fauna
4. Altered disturbance regimes

4 The Planning Context

The Biodiversity Conservation Plan for the Mornington Peninsula Shire provides a framework for the protection and enhancement of biodiversity within the municipality. The Plan is guided by statutory conservation objectives and approaches set by the Australian and Victorian Governments, and associated legislative obligations.

Figure 5 identifies the key legislative, policy and operational frameworks that guide the management of biodiversity within the Mornington Peninsula Shire. These legislative instruments and policies set the strategic direction for the management of natural resources at the Federal, State and local level. The Biodiversity Conservation Plan must operate alongside and align with policies and plans set out under Federal and State legislation. It must also integrate with key strategic documents developed across other areas of Mornington Peninsula Shire (see 4.1.4), to provide an integrated and co-ordinated response to biodiversity management.

4.1 The Role of Mornington Peninsula Shire

Mornington Peninsula Shire is in a prime position to influence biodiversity, directly, and indirectly, by regulating a wide range of activities that impact upon the natural environment. The Shire is responsible for a range of legislative and functional activities, including:

- Providing community services and facilities (e.g. public health facilities, parks, waste management, animal management)
- Providing and maintaining local infrastructure (e.g. roads, bridges, drains)
- Strategic land use planning and regulation within the municipality
- Implementing and enforcing local laws, and administering national and state government policies and regulations
- Advocating and promoting proposals in the best interest of the local community.

Aside from these core functions, local governments are also in a unique position to perform several other functions to manage biodiversity. These include:

- Facilitating community involvement and supporting the work of community-based groups such as Landcare Groups and Friends Groups, to undertake on-ground works that help conserve and enhance biodiversity
- Managing grant and incentive programs that encourage the community to help protect biodiversity on private land
- Providing financial and administrative support to community groups; as organisations with professional administrators and administrative resources, Councils are in a strong position to provide this form of support to community groups
- Co-ordinating resource management and the delivery of community-based programs

Within the function of local government, Mornington Peninsula Shire has a role in managing biodiversity through land use planning and regulation, public land management and environmental risk management. The following sections describe Mornington Peninsula's role in these areas.

4.1.1 Land Use Planning and Regulation

Land use planning and regulation are among the most important functions of Council, with the greatest capacity to help protect and conserve biodiversity. The State Government controls the basic framework of planning across Victoria under the *Planning and Environment Act 1978* and the Victorian Planning Provisions and State Planning Policy. Within this framework there is scope for local Councils to develop and implement local strategies for inclusion in the local planning scheme provisions, with approval of the Victorian Minister for Planning. Councils are responsible for local land use planning and are the responsible authority in the assessment and determination of planning permit applications and regulation of compliance. In this role, they have the capacity to consider and integrate state-level planning objectives and apply them at the local scale, and to apply planning controls to meet local needs, so as to ensure that environmental values are considered during the decision-making process.

The importance of planning for the protection of environmental values has long been a feature of the Mornington Peninsula. The Mornington Peninsula Shire Planning Scheme contains a range of planning and development controls to protect local biodiversity values, including Environmental Significance, Vegetation Protection and Significant Landscape Overlays. The most recent addition is 'Environmental Significance Overlay Schedule 30 (ESO30) – Tootgarook Wetland', which recognises and aims to protect the ecological values of Tootgarook Swamp.

4.1.2 Public Land Management

Local governments are responsible for the management of significant areas of public land, such as Council-owned parks and reserves, foreshore reserves and road reserves. As managers of public land, local governments can make a direct and important contribution to conservation.

Mornington Peninsula Shire manages nearly 2,000 ha of public land for biodiversity conservation in its local bushland, foreshore and roadside reserves. This represents over a quarter (26%) of public land within the Shire which is managed for biodiversity within Parks and Reserves. Mornington Peninsula Shire also works closely with partner land management agencies in the management of its reserves, including Parks Victoria and Melbourne Water. In their role as land managers, Mornington Peninsula Shire undertakes a range of programs to protect and enhance biodiversity in Shire-managed reserves. Current programs are outlined in Table 3, below.

Table 3 Biodiversity Management Programs undertaken by Mornington Peninsula Shire

Shire Program	Description
Environmental Weed Control	Environmental weed control comprises the largest of the Shire's management programs. Under this program, the Shire has prioritised 40 environmental weeds to be targeted across 90 Shire-managed reserves. Species range from widespread weeds such as Sweet Pittosporum *Pittosporum undulatum*, Blackberry *Rubus* spp. and Panic Veldt Grass *Erharta erecta* var *erecta*, through to species known from only a few locations, such as Chilean Needle Grass *Nassella neesiana*, African Weed-orchid *Disa bracteata* and Serrated Tussock *Nassella trichotoma*. Works are planned on an annual basis and work towards achieving long-term biodiversity goals. The Shire also targets declared noxious weeds along priority roadsides to reduce the impact of widespread noxious species, including Blackberry, Bulbil Watsonia *Watsonia meriana* var. *bulbillifera*, Gorse *Ulex europaeus*, African Box-thorn *Lycium ferocissimum*.

Shire Program	Description
Feral Animal Control	Feral animal control aims to protect significant fauna and flora on Shire-managed land (mostly bushland and foreshore reserves), such as the Southern Brown Bandicoot *Isoodon obesulus obesulus*, White-footed Dunnart *Sminthopsis leucopus*, Australasian Bittern *Botaurus poiciloptilus* and shorebirds. Works are prioritised to focus on a few key locations and co-ordinate with other land managers, targeting the Red Fox *Vulpes vulpes*, European Rabbit *Oryctolagus cuniculus* and Feral Cat *Felis cattus*. This also includes the maintenance of a predator-proof fence at The Briars wildlife sanctuary.
Threatened Species Management	Mornington Peninsula Shire works in partnership with government agencies, such as the Department of Environment, Land, Water and Planning (DELWP) and special interest groups, to protect and enhance habitat for threatened species on Shire-managed land. Such species include the Frankston Spider-orchid *Caladenia robinsonii*, Leafy Greenhood *Pterostylis cucullata* and Swamp Skink *Lissolepis coventryi*. The 'Guidelines for management activities in Swamp Skink habitat' have also been developed by the Shire, an operational document, to assist with minimising impacts to this threatened species during management works on Shire land.
Habitat Protection and Enhancement	This program seeks to improve the habitat values of target areas on Shire-managed land. This includes retaining and increasing habitat features such as large logs and stags to enhance habitat complexity, and revegetation (Plate 4). Through this program, the Shire also monitors over 400 nest boxes that have been installed across 17 reserves to provide habitat for hollow-dependent fauna. The Shire has also partnered with researchers at La Trobe University, investigating the feasibility of chainsaw-carved tree hollows as an alternative to constructed nest boxes.
Tree Protection	The Shire has installed protective tree bands on over 200 indigenous trees (mainly mature eucalypts) in bushland reserves and streetscapes across Mt Eliza, Mornington and Mt Martha, to reduce the impacts of possum browsing, which was identified as a major cause of tree decline in these areas (Plate 4).
Bushland Manager	Bushland Manager is a GIS tool that has been developed by the Shire to plan, record, monitor and audit biodiversity management activities on Shire-managed land.

Plate 4 Biodiversity management works undertaken by Mornington Peninsula Shire. Left: Tree bands installed as part of the Tree Protection Program. Right: Log placement as part of the Habitat Protection and Enhancement Program

Mornington Peninsula Shire also has a long history of working with the community to develop and implement projects and programs to protect and enhance biodiversity. This includes supporting the work of community-based groups with financial and administrative support, and through the provision of training and resources. The Shire also provides financial incentives for local landowners, and seeks to engage the broader community through community engagement events. These initiatives are outlined in Table 4.

Table 4 Mornington Peninsula Shire's community-based initiatives for biodiversity

Initiative	Description
Friends Groups Support	The Shire works with over 50 Friends Groups who volunteer their time to undertake biodiversity management works in local bushland and foreshore reserves. The Shire provides support to these groups at working bees, assists with annual works planning, provides assistance with grant applications, and education and training opportunities. In 2017-18, the Shire supported 57 groups at 380 working bees across 60 reserves. At these working bees, volunteers contributed over 4,800 hours, undertaking 96 hectares of environmental weed control and planting 9,500 indigenous plants. Friends groups also received nearly $170,000 in grant funding for on-ground biodiversity conservation works in local reserves.
Landcare Support	The Shire supports Landcare on the Mornington Peninsula to enable the effective participation of Landcare groups, landholders and the wider community in natural resource management activities that help protect, enhance and restore the natural environment. There are currently 11 Landcare groups on the peninsula, which together form the Mornington Peninsula Landcare Network.
Conservation Land Rate	The Mornington Peninsula Shire offers a conservation land rate of 75% of the general rate to eligible properties to encourage best-practice land management and to engage the community in the protection and enhancement of the natural environment and biodiversity of the peninsula.
Indigenous Plant Supply	The Shire nursery at The Briars grows a range of indigenous plants for revegetation projects for community groups, schools, and local residents. The nursery also runs educational workshops and a volunteer program.
Community Engagement Programs	The Shire's community engagement programs include 'walk and talks' to schools and community interest groups, Junior Ranger and Night Walk programs at The Briars, Schools Environment Week and the Powerful Owl citizen science monitoring project. Mornington Peninsula Shire has also been a participant in Australian Government initiatives such as 'Science in the Park' as part of National Science Week.
Biodiversity Information Resources	The Shire has produced a range of educational and informative biodiversity resources for the community, including guides on native fauna, environmental and noxious weeds, 'How to be a good bushland neighbour', regional indigenous plant guides, and the 'Common Ground' fact sheets series for rural landholders.

4.1.3 Managing Environmental Risks

Councils have a range of responsibilities in relation to managing environmental risks, such as fire, flooding and storms, to protect assets, property and life. This includes providing drainage infrastructure and stormwater management, and may include implementing risk-mitigation measures such as fuel hazard reduction (to protect property and life from wildfire), all of which may directly impact biodiversity, either positively or negatively. Council has a responsibility to ensure that biodiversity values are considered and integrated into risk management strategies adopted by local councils.

The Mornington Peninsula Shire has developed strategies to deal with the ecological implications of fire, stormwater, drainage and wastewater management, as described in Table 5, below. The Shire actively manages fuel loads in Shire-managed reserves, including road reserves, to minimise the risk of wildfire that may threaten property or life, and does this with consideration of potential ecological impacts. Mornington Peninsula Shire has also made significant advances towards sustainable water resource management, with measures to reduce water usage and reduce the impacts of stormwater pollution through Water Sensitive Urban Design (WSUD). These initiatives are outlined in the Shire's 'Smart Water Plan', which is based on the principles of Integrated Water Management, and will ensure that the Shire's water resource management practices in line with local and state directions.

Table 5 Environmental risk management strategies implemented by Mornington Peninsula Shire

Risk management strategy	Description
Fire Management	The Municipal Fire Management Plan provides the framework for fire-risk management across the Shire. Through this plan, the Shire undertakes a range of fire management programs, including fire prevention inspections to address fire hazards on private land and the maintenance of Fire Management Zones in Shire-managed reserves. Planned burns are also undertaken with the aim of achieving multiple benefits, such as promoting the regeneration of species, creating diversity in habitat structure, controlling environmental weeds and reducing fuel loads. These works are planned to avoid and minimise negative impacts to indigenous flora, fauna and habitats.
Water Sensitive Urban Design (WSUD)	Mornington Peninsula Shire is active in the integration of WSUD features throughout the peninsula to improve waterway health. Council have used best-practice techniques to model passive transfer of pollutant loads into waterways, to ensure that storm water pollution targets are met. Over the past decade the shire has achieved significant reductions in reticulated mains water usage (across council and community) and has installed over 100 individual WSUD features, including raingardens, tree pits and stormwater treatment and harvesting measures which have reduced pollutant loads by 7-9%.
Wastewater Management	There are thousands of properties across the Peninsula without reticulated sewerage, and these properties rely on septic tank systems to dispose of their wastewater. These systems can cause contamination of waterways, groundwater, beaches and risks to public health. Through the implementation of the Shire's Wastewater Management Plan, the Shire undertakes a range of activities to reduce the environmental and public health risks posed by wastewater, including on-site inspections, compliance audits, community education programs and development of a septic tracking management system.

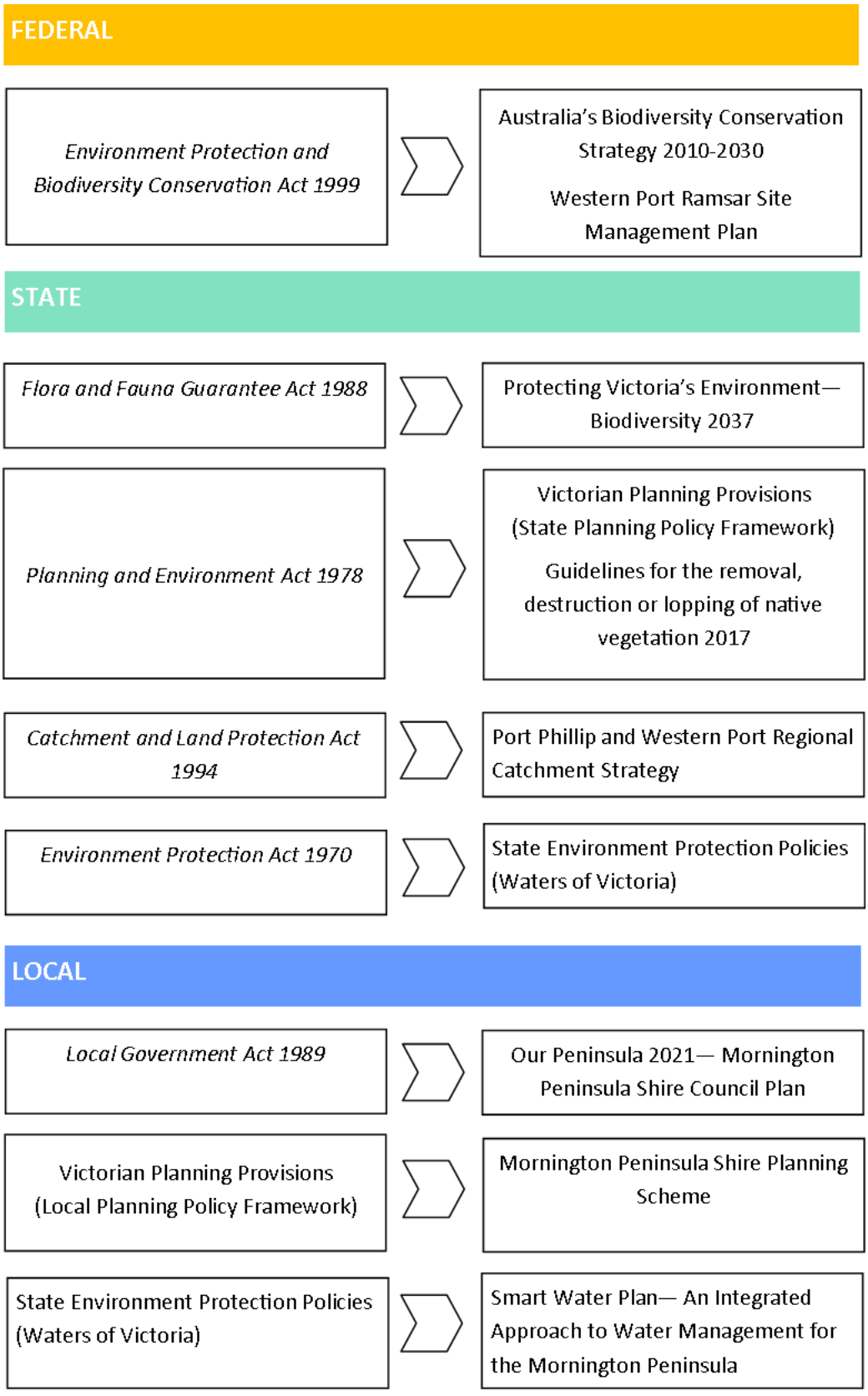


Figure 5 Legislative and policy framework

4.1.4 Local Strategies and Policies

Mornington Peninsula Shire has developed a number of local strategies and policies that also address biodiversity management and will support the Biodiversity Conservation Plan. The key strategies and policies are outlined below.

- **Our Peninsula 2021:** This document is the overarching Council strategy (MPS 2017a) which sets out the Vision and Mission for the Mornington Peninsula Shire and its community, and outlines the objectives and strategies aimed at achieving these.
- **Our Health and Wellbeing 2021:** This Plan outlines the Shire's strategic approach for protecting and promoting the health and wellbeing of community members across the municipality (MPS 2017b). It supports opportunities for social and nature-based connection and physical activity.
- **Green Wedge Management Plan:** The Green Wedge Management Plan (MPS 2018a) is intended to highlight the particular values of the Mornington Peninsula Green Wedge, outline key issues, opportunities and likely future pressures. The Green Wedge Management Plan contains actions to support biodiversity within the Green Wedge.
- **Climate Change — Carbon Neutral Policy:** This document sets the Mornington Peninsula Shire's policy for achieving carbon neutrality, with the aim of protecting locally bio-sequestered carbon.
- **Smart Water Plan:** The Smart Water Plan promotes an integrated approach to water management for the Mornington Peninsula (MPS 2013) and will assist with the protection of environmental values of waterways. The Plan sets strategic stormwater management targets, including water quality protection targets, and outlines objectives and actions for major catchments across the Shire.
- **Wastewater Management Plan:** The Mornington Peninsula Shire Wastewater Management Plan 2018-2023 (MPS 2018b) provides recommendations and actions to improve domestic wastewater management across the Shire. It outlines strategies and actions that focus on high-risk catchments and environmental monitoring targets.
- **Shire Coastal Management Plans:** Coastal Management Plans include actions to provide a strategic plan for the protection of biodiversity values in coastal habitats on the Mornington Peninsula.
- **Municipal Fire Management Plan:** The Municipal Fire Management Plan (MPS 2018c) provides the framework for fire-risk management across the Shire and supports best-practice management of local reserves.
- **Township Street Tree and Vegetation Policy:** This policy is intended to protect the ecological, landscape and cultural heritage significance of existing urban vegetation.
- **Reconciliation Policy and Action Plan:** These documents have been developed to support partnerships with Traditional Owners and collaborative community approaches in implementing projects.
- **Domestic Animal Management Plan 2017–2021:** This plan recognises the potential impact of domestic cats and dogs on biodiversity values on the Peninsula and outlines actions to support responsible pet ownership as part of the delivery of animal management services.

5 Biodiversity on the Peninsula: From Vision to Action

Improving the state of biodiversity across the Mornington Peninsula presents significant challenges in the context of cumulative and ongoing threats to biodiversity and the future implications of climate change. It requires the Shire to work closely with the community and other land management agencies, and relies upon co-operation across all levels of government, to reduce the effects of the most significant threats to biodiversity and improve resilience.

The Biodiversity Conservation Plan sets the vision, strategic directions and actions to protect and enhance biodiversity. These have been strongly influenced by community input, and align with principles developed in the Victorian Government's *Biodiversity 2037* plan and other strategies implemented across the Shire.

Development of the Biodiversity Conservation Plan also responds to the following key drivers:

- The Mornington Peninsula retains a diversity of natural environments, shaped by different geological and ecological processes, and supporting a corresponding diversity of flora and fauna. These environments have a fragmented distribution across the Mornington Peninsula, forming a patchwork of habitats that have varying levels of biodiversity significance, different sets of values, and different management needs and priorities. Understanding these differences will assist the Shire in directing management and funding priorities to different areas across the Peninsula.
- Much of the Peninsula's natural assets (including around 57% of remnant vegetation) are under private land ownership. The Biodiversity Conservation Plan must therefore focus on engaging private landowners and improving biodiversity conservation outcomes on private land. There is also an opportunity to provide co-ordinated and integrated actions across private and public land to manage current threats to biodiversity.
- Many of the threats facing biodiversity on the Mornington Peninsula represent the legacy of past actions. Many are irreversible, and some are ongoing. The implications of climate change will place further, unknown stresses on the environment, particularly upon water resources and aquatic and coastal habitats, their flora and fauna.
- Biodiversity health and resilience will depend on increasing the extent and health of remnant native vegetation, improving connectivity and reducing stressors within existing remnant vegetation (e.g. environmental weeds and pest animals). Strengthening ecological infrastructure (e.g. waterways) will help to build connectivity across the landscape.
- The connection between people and the environment, and their contribution to conservation must be recognised and fostered. There is a strong community interest in the natural environment across the Mornington Peninsula, including a wealth of volunteers and professional expertise, which should be strengthened.
- The Biodiversity Conservation Plan provides opportunities for the Shire to work with the other land management agencies to lead the way in best-practice biodiversity management.

5.1 A Vision for the Future

The Vision for biodiversity on the Mornington Peninsula articulates the desired future outcome, and reflects a vision shared by the Mornington Peninsula community. Development of the Vision is the result of an extensive consultation process, which gathered ideas and community consensus for a future Vision, which was then refined through a series of workshops with key stakeholders and with input from Mornington Peninsula Shire. The Vision provides the foundation for the Biodiversity Conservation Plan.

The long-term vision for biodiversity on the Mornington Peninsula is:

"The Mornington Peninsula's biodiversity is healthy, valued and protected"

5.2 Strategic Directions

Six strategic directions have been identified for the Biodiversity Conservation Plan, highlighting the main areas of focus for management on the Peninsula:

1. Engaging with the community and building stewardship
2. Facilitating biodiversity conservation on private land
3. Protecting biodiversity through planning and policy
4. Building a strong knowledge base
5. Demonstrating and leading best-practice land management
6. Building ecosystem resilience in a changing climate

Each of these reflects the key areas of responsibility, for which Mornington Peninsula Shire can make a significant difference in the conservation of local biodiversity, within the functions of Local Government. Major objectives and actions are identified under each strategic direction to achieve the overall vision for biodiversity on the Mornington Peninsula. These are outlined in the following sections. The Future Directions Paper provides background information on the key concepts and principles that apply to each Strategic Direction, and how they will address biodiversity management issues. The strategic framework, outlining the six strategic directions and the objectives of each, is represented in Figure 6.

VISION	
The Mornington Peninsula's biodiversity is healthy, valued and protected	
Strategic Directions	**Objectives**
Engaging with the Community and Building Stewardship	▪ Increase public awareness of local biodiversity values and threats ▪ Increase public participation in local biodiversity conservation initiatives ▪ Encourage greater positive interaction with nature amongst the local community
Facilitating Biodiversity Conservation on Private Land	▪ Provide incentives for the local community to manage land for conservation ▪ Encourage land owners to undertake works that contribute to biodiversity conservation ▪ Build capacity within the community to improve conservation outcomes
Protecting Biodiversity through Planning and Policy	▪ Increase the protection of biodiversity values through planning controls ▪ Improve compliance with planning regulations
Building a Strong Knowledge Base	▪ Improve knowledge of local biodiversity to inform decision-making ▪ Share biodiversity knowledge with the community and land management partners
Demonstrating and Leading Best-Practice Land Management	▪ Apply best-practice land management principles on Shire-managed land ▪ Improve planning to integrate consideration of biodiversity into decision-making
Building Ecosystem Resilience in a Changing Climate	▪ Maintain ecosystem function by reducing threats to biodiversity ▪ Enhance landscape connectivity ▪ Plan for climate change

Figure 6 Strategic framework for the Biodiversity Conservation Plan

5.2.1 Engaging with the Community and Building Stewardship

Engaging with the community to promote the value of biodiversity to society and increase understanding of biodiversity values is critical to reducing human impacts on the environment. A local community that feels connected to the natural environment is more likely to actively work towards protecting it, and participate in and support conservation initiatives.

The Mornington Peninsula Shire is fortunate to have a strong network of dedicated conservation volunteers, who currently undertake on-ground works in local bushland and foreshore reserves. Their efforts provide the Shire with valuable support in the management of public land across the municipality. It is therefore, vital that the Shire continues to work with the existing conservation community, to support conservation work undertaken to date, and engage local knowledge.

Diversifying community involvement across age groups and demographics on the Mornington Peninsula will also be important for encouraging the wider community to become good environmental stewards. This will involve providing educational resources, improving access to information, and engaging the community in a way that fosters behaviour that have a positive impact on the environment. Community consultation undertaken for the development of the Biodiversity Conservation Plan found that more than 70% of people surveyed would like more information on the environmental values of their local area (Ecology Australia 2016a).

1	Engaging with the Community and Building Stewardship
Objectives: • **Increase public awareness of local biodiversity values and threats** • **Increase public participation in local biodiversity conservation initiatives** • **Encourage greater positive interaction with nature amongst the local community**	
1.1	Promote the unique natural environments of the Mornington Peninsula, focusing on local reserves, their value to the community, and the health benefits of spending time in nature.
1.2	Encourage the community to interact with the natural environments of the Mornington Peninsula: a) Identify local reserves where passive recreational uses can be sensitively accommodated; b) Ensure they have the required infrastructure and signage that identifies appropriate uses; and c) Produce information guides for identified reserves, outlining their values and promoting visitation and volunteer opportunities.
1.3	Update the Shire's website to include: - Links to biodiversity-related content that are more prominently located and easier to navigate; and - An expanded range of information on the natural values of the Mornington Peninsula, such as biodiversity values, management issues and practical guidance notes for land owners.
1.4	Integrate biodiversity information layers into the Shire's public GIS interface, to enable the community to access vegetation mapping and flora and fauna records for the Mornington Peninsula, and update the information regularly.
1.5	Partner with conservation and research organisations, such as BirdLife Australia, to develop and promote local biodiversity-related citizen science projects.
1.6	Work with local community groups involved in biodiversity conservation, such as Friends Groups, to identify strategies for recruiting new members, and provide assistance that is tailored to the interests and needs of each group.

1	Engaging with the Community and Building Stewardship
1.7	Continue to provide support and training to volunteers involved in environmental improvement works by: a) Providing on-ground assistance and practical training at working bees in Shire-managed reserves b) Holding educational workshops to build capacity; c) Establishing a mentoring program to share the knowledge of experienced volunteers and Shire staff; d) Preparing a volunteer's manual to complement practical training; and e) Holding events to recognise and celebrate the work of local environment groups.
1.8	Develop a biodiversity protection and management partnership with local Traditional Owners.
1.9	Support the engagement of children and adults with nature through biodiversity-based art programs, linked to the Shire's Arts and Culture Strategy.
1.10	Adopt the 'Gardens for Wildlife Victoria' model to engage residents in urban and semi-urban areas of the peninsula to protect and enhance backyard biodiversity.

5.2.2 Facilitating Biodiversity Conservation on Private Land

Private land plays a critical role in conserving biodiversity. While the public reserve system provides the foundation for the conservation of biodiversity, approximately 80% of land within Mornington Peninsula Shire is within private ownership, and 57% of remnant native vegetation occurs on private land. Thus, improving land management practices and reducing threats to biodiversity on private land is essential.

Achieving better biodiversity conservation outcomes on private land requires an integrated approach that includes working with landowners and partner agencies and non-government organisations to building capacity in the local community. Biodiversity conservation requires the co-operation of everyone, including governments, land management agencies, and the community. Building capacity amongst the community therefore, requires sharing knowledge to improve skill sets.

2	Facilitating Biodiversity Conservation on Private Land
Objectives: • **Provide incentives for the community to manage land for conservation purposes** • **Encourage land owners to undertake works that contribute to biodiversity protection** • **Build capacity within the community to improve conservation outcomes**	
2.1	Evaluate the efficacy and cost-effectiveness of biodiversity incentives in achieving conservation outcomes on private land on the Mornington Peninsula: a) Review the Shire's Conservation Land Rate, with regard to the eligibility criteria and guidelines, uptake rates and on-ground outcomes; b) Investigate the potential benefits and costs of alternative incentive models (e.g. mixed financial and non-financial incentives); and c) Identify opportunities to improve the value and outcomes of a local incentives scheme.
2.2	Introduce an annual rate rebate for properties registered under a Trust for Nature covenant, including rural properties in the Green Wedge Zone, based on the area (i.e. dollars per hectare) of covenanted land that meets the Trust for Nature covenanting criteria. Work with Trust For Nature to determine administrative and funding arrangements.

2	Facilitating Biodiversity Conservation on Private Land
2.3	Prepare a 'Welcome Pack' for distribution to new land owners in target areas of the Mornington Peninsula, to educate land owners on the biodiversity of their local area and to help them understand their duty-of-care in protecting the natural environment.
2.4	Develop practical guidance notes for land owners on key biodiversity conservation topics including environmental weeds, pest animals, biodiversity and fire risk, understanding vegetation types and habitat values, and the benefits of planting indigenous species to increase the cover of native vegetation.
2.5	Partner with organisations, such as the Mornington Peninsula Landcare Network, to develop and promote a program of educational events for private landholders (e.g. workshops, field days, site tours, open days) with an emphasis on peer-to-peer learning.
2.6	Continue to support the work of the Mornington Peninsula Landcare Network, by providing in-kind and financial support, and by collaborating to achieve on-ground outcomes.
2.7	Investigate funding mechanisms and avenues for providing one-to-one advice to landholders seeking to undertake biodiversity conservation works on their land.
2.8	Partner with organisations, such as the Country Fire Authority, Parks Victoria and Bunurong Land Council, to build community understanding and capacity to manage fire risk in the context of best-practice biodiversity management.

5.2.3 Protecting Biodiversity through planning and policy

Across Victoria, native vegetation continues to be cleared at a rate of approximately 4,000 habitat hectares (a measure of vegetation loss) each year, with the greatest losses occurring on private land, primarily resulting from clearing associated with permitted land uses or exemptions (DELWP 2016). This means that losses currently exceed gains achieved through protection and management (TFN 2013, DELWP 2016). Strengthening land use planning and policy to better protect biodiversity values is therefore a key mechanism for the Shire.

The Mornington Peninsula Shire community has agreed that greater protection of remnant native vegetation is required on private land to help maintain biodiversity, and preserve the character of the Mornington Peninsula, that is valued by residents and visitors.

A large part of Council's planning compliance role is focused toward ensuring adherence to the Mornington Peninsula Planning Scheme in relation to vegetation removal and earthworks in areas of environmental significance and sensitivity. Many have also expressed support for working with the Shire to develop a better understanding of planning requirements and local policy (Ecology Australia 2016a). Building stewardship through public education and raising awareness and working together with community-groups are amongst the most cost-effective ways to ensure compliance and positive outcomes.

3	Protecting Biodiversity through Planning and Policy
Objectives: • **Increase the protection of biodiversity values through planning controls** • **Improve compliance with planning regulations**	
3.1	Progressively review and update the Mornington Peninsula Planning Scheme to better reflect the current status and distribution of biodiversity values, and improve their protection: a) Update the Local Planning Policy Framework to refer to and support the Biodiversity Conservation Plan; and b) Review current planning provisions to identify gaps, limitations and opportunities for improvement, and ensure that areas of important vegetation, habitat, waterways, wetlands and coastal areas are adequately protected.
3.2	Encourage compliance with environmental planning controls in the Planning Scheme, by: a) Producing educational and guidance materials to make landowners aware of requirements and help them understand their obligations; and b) Engaging with land holders through pre-planning meetings, information sessions and the Shire's website.
3.3	Develop and maintain a database of planning applications and permits that involve native vegetation removal and/or require protection or management of biodiversity, and use a risk-based approach to monitor compliance and respond to non-compliance with enforcement where necessary.
3.4	Investigate options to increase opportunities for native vegetation offsets to be located within the Mornington Peninsula Shire, including consideration of an over-the-counter offset scheme and future interactions with water and carbon markets.
3.5	Review and identify areas of significant biodiversity value within the Green Wedge Zone that may benefit from the development of a Land Management Plan as part of applications for new developments, to support and align with the policies set out in the Mornington Peninsula Shire Green Wedge Management Plan, so as to ensure biodiversity conservation values in these areas are appropriately managed.
3.6	Investigate the potential biodiversity impacts of native vegetation removal being undertaken to achieve bushfire risk reduction through planning scheme exemptions (for example under Clause 52.12) to establish an advocacy position for Council to adopt in discussions with State government on biodiversity and fire risk.

5.2.4 Building a Strong Knowledge Base

Mornington Peninsula Shire has made a significant commitment to investigating the natural values of the Peninsula, funding ecological survey and assessment, and working with other government agencies including the Department of Environment, Land, Water and Planning (DELWP), Melbourne Water and Parks Victoria, and organisations such as Trust for Nature and Birdlife Australia. The Shire recognises the need for detailed biodiversity information to inform management and ensure that environmental values are taken into account during decision-making.

It is vital that Mornington Peninsula continues to build a strong knowledge base, to ensure that up-to-date information is available to inform management and to gain an appreciation of the distribution and status of biodiversity values. In particular, there is a growing need for up-to-date mapping and monitoring of biodiversity values will also help to guide decision making and management works.

The use of GIS tools in mapping and monitoring is well established, assisting with co-ordination of management works. Mornington Peninsula Shire's 'Bushland Manager' - a GIS tool to track biodiversity management activities and outcomes on Shire-managed land, will play a key role in building a strong knowledge base. The tool will enable the Shire to better evaluate the benefits of management activities, and enabled them to be adapted where necessary. Ongoing development of the GIS tool, to integrate with mapping of other biodiversity values will be an important initiative.

4	Building a Strong Knowledge Base
Objectives: • **Improve knowledge of local biodiversity to inform decision making** • **Share biodiversity knowledge with the community and land management partners**	
4.1	Identify and prioritise research and survey programs to address gaps in local biodiversity knowledge.
4.2	Continue to update information on the status of biodiversity across the Mornington Peninsula with a monitoring program for local conservation reserves that uses standardised and repeatable monitoring methods.
4.3	Undertake a GIS-based tree canopy cover assessment, using a repeatable methodology, to monitor changes in tree canopy cover every five years.
4.4	Improve internal systems for storing and accessing shire-commissioned biodiversity reports, to facilitate greater communication and sharing of data within the Shire and wider community.
4.5	Continue to improve upon and expand the use of Bushland Manager, the Shire's key tool for spatially recording biodiversity management works in bushland, foreshore and roadside reserves.

5.2.5 Demonstrating and Leading Best-practice Land Management

Mornington Peninsula Shire is committed to leading and demonstrating best-practice principles in land management environmental stewardship in undertaking all of its roles and responsibilities. This involves demonstrating the responsible use, protection and management of the natural environment by implementing sustainable practices. Leading the way will involve developing and maintaining a strong knowledge base to inform management decisions, and continually improve management, applying best practice land management principles to public land and implementing innovative and sustainable practices in the management of infrastructure and local resources.

5	Demonstrating and Leading Best-practice Land Management
Objectives: • **Apply best-practice land management principles on Shire-managed land** • **Improve planning to integrate consideration of biodiversity into decision making**	
5.1	Continue to develop, review and update operational plans for local bushland, foreshore and roadside reserves that establish clear, measurable and achievable targets for biodiversity management works. Regularly review the outcomes achieved through these programs to inform and improve management decisions.

5	Demonstrating and Leading Best-practice Land Management
5.2	Review and update environmental weed and pest animal control strategies to demonstrate the Shire's ongoing commitment to continuous improvement and implementation of best-practice across Shire-managed land: a) Review and update the prioritisation framework for invasive species management, using a risk-based approach, that aligns with the principles of Integrated Pest Management; b) Review and implement best-practice control techniques to incorporate recent advances in technologies, and changes in pest control legislation and regulations; and c) Revise and update Standard Operating Procedures for staff and contractors.
5.3	Ensure best-practice environmental protocols are followed when other organisations, not engaged by the Shire, carry out works on Shire-managed land, by improving Shire processes and developing collaborative working relationships.
5.4	Continue to develop specific operational guidelines to improve biodiversity outcomes for maintenance activities in ecologically-sensitive sites, such as fauna and habitat protection guidelines for fuel reduction and vegetation management works.
5.5	Develop an urban street tree protection and renewal program, in consultation with residents, that incorporates measures to: - maintain or improve tree canopy cover, particularly in areas affected by die-back; - increase the cover of indigenous vegetation; and - increase species and structural diversity in plantings, to improve urban biodiversity.
5.6	Promote an aware and collaborative culture within the Shire to ensure that: - Biodiversity is considered and assessed early in the planning and implementation of Shire projects (e.g. new infrastructure projects); and - Shire officers required to make decisions that may affect biodiversity (e.g. statutory planners, infrastructure project managers) are supported with good processes and access to the relevant information and datasets.
5.7	Increase collaboration with public land managers, such as Parks Victoria and Melbourne Water, and private land managers during planning and implementation of the Shire's biodiversity management programs, to improve co-ordination across the landscape
5.8	Progress with consideration of conservation covenants for high value, biodiverse Shire-owned reserves to increase their level of protection, and help fund improvement works.
5.9	Advocate to state government for local participation in decision making forums relevant to biodiversity protection and management on the Mornington Peninsula.

5.2.6 Building Ecosystem Resilience in a Changing Climate

Ecosystem resilience is essentially contingent upon the stability of ecosystem functions, under a range of environmental perturbations. Building resilience in ecosystems relies upon reducing stressors to support the health and viability of systems and their ability to recover. Promoting resilience against the primary identified threats to ecosystem function, of environmental weeds and pest animals, is therefore essential.

Various factors interact at different levels to contribute to heath ecosystem function. The maintenance of ecological processes such as appropriate hydrological regimes, natural disturbance (fire and flood) and interactions between species is also important to maximise the ability of species to adapt naturally to change. Maintaining ecosystem function requires a whole of system approach that can only be achieved through co-operation between the Shire, public land managers, and the local community.

6	Building Ecosystem Resilience in a Changing Climate
Objectives: • **Maintain ecosystem function by reducing threats to biodiversity** • **Enhance landscape connectivity** • **Plan for climate change**	
6.1	Increase investment in Shire biodiversity management programs in bushland, foreshore and roadside reserves, for habitat improvement, environmental weed control and pest animal management.
6.2	Provide ongoing support to the community in planning and developing biolinks on the Mornington Peninsula: a) Develop a decision tool for the prioritisation of biolinks, that integrates natural landscape links and considers the social, environmental and economic values of different options, to assist with biolink planning; b) Provide advice, technical and on-ground support to the Mornington Peninsula Landcare Network for the delivery of their biolinks plan; and c) Provide overall co-ordination of biolink planning across the Peninsula.
6.3	In collaboration with Melbourne Water, determine measures required to improve waterway health and landscape connectivity in priority catchments and along waterways identified as part of the *'Healthy Waterways Strategy'* and: a) Work with the Mornington Peninsula Landcare Network to encourage private landowners to undertake conservation works along priority waterways; and b) Undertake management works along priority waterways on Shire-managed land.
6.4	Support the implementation of the '*Co-Designed Catchment Program for the Westernport and Mornington Peninsula Region'* and facilitate co-operation between the Shire, local land managers, scientists, Traditional Owners and the community, to ensure a co-ordinated and adaptive approach to waterway management at the local scale, that aligns with the Program.
6.5	Work with Agriculture Victoria, the Port Phillip and Western Port Catchment Management Authority, agricultural land owners and industry bodies to promote an understanding of sustainable agriculture, and the benefits to agricultural productivity from biodiverse landscapes.
6.6	Update the Shire's '*Smart Water Plan – 2013*' to align with key directions from the Victorian Government's '*Water for Victoria – Water Plan*' and *'Integrated Water Management Framework for Victoria*' to include measures that contribute to biodiversity protection and healthy waterways.
6.7	Annually review and coordinate actions of the Shire's '*Smart Water Plan'* that target environmental protection of waterways, wetlands, groundwater and marine waters. Key actions include: a) Development and implementation of a Water Sensitive Urban Design (WSUD) Masterplan, and WSUD guidelines for capital works projects; and b) Continued implementation and review the Shire's Wastewater Management Plan, to align with legislative changes and the Southern Peninsula Sewerage Scheme.
6.8	Review coastal planning across the Shire in the context of potential risks associated with climate change, and investigate adaptation strategies. As part of this review: a) Consider using tools such as those developed by Coast Adapt to assess potential impacts to beaches and estuaries, such as inundation, erosion, sediment transport and identify strategies to protect coastal areas; and b) Advocate to the Victorian Government for coordinated response planning and biodiversity protection works for which climate change is particularly challenging (e.g. near-shore marine and coastal habitats, beach nesting and migratory shorebirds).
6.9	Advocate for regional scale, multi-agency action to protect marine and near shore biodiversity in Western Port and Port Phillip Bays.

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7 Glossary

Aeolian	Pertaining to wind activity. In geology, the wind's ability to shape the earth surface.
Analytical Hierarchy Process	A structured technique for organising and analysing complex decisions, based on mathematics and psychology, with particular application in group decision-making. The technique asks participants to make a series of judgements, in each case considering two different scenarios and deciding which is more important
Biodiversity	The variety of all life-forms, plants, animals, fungi, protists (including algae) and bacteria, their encoded genes, and the ecosystems of which they form a part
Bioregion	Defined geographical regions of Australia with similar climatic and geophysical characteristics, and which generally contain a suite of distinct ecosystems and species
Calcareous	Limestone
Conservation status	Categorisation of the threat risk to biological assets (plant and animal species, EVCs or plant communities) at a defined scale (e.g. national, state), as determined by specific criteria
Ecological Vegetation Class (EVC)	A vegetation classification described through a combination of its floristic composition, life form and ecological characteristics, and its association with particular environmental attributes. EVCs may include one or more floristic communities that occur across a biogeographic range, and have similar habitat and ecological processes operating
Ecosystem	A biological community of interacting organisms and their physical environment
Endemic	Naturally found only in a defined geographic area
Environmental weeds	Plants that invade native ecosystems and adversely impact indigenous flora and fauna
Exotic	Plants, animals, fungi and other organisms that have been introduced (deliberately or accidentally) to Australia or a given area after European settlement
Exotic vegetation	Vegetation comprised wholly or substantially of exotic species
Floristic	Of or pertaining to plant species, i.e. flora
GIS	Geographic Information System. A digital platform for creating, analysing and viewing maps and other spatially referenced data
Habitat	The natural home or environment of an organism
Habitat Hectares	A measure of the quality and extent of native vegetation, incorporating attributes including presence of large trees, tree canopy health, understorey structure and diversity, weed cover and landscape context
High threat weeds	Introduced species (including non-indigenous 'natives') which, as invading species have highly deleterious impacts on indigenous vegetation and faunal habitats

Indigenous	Plant and animal species found naturally in pre-European Australia within a specific geographic region
Introduced	Deliberately or accidentally brought to Australia or part of Australia, usually by human agency
Life form	An abbreviated description of the habit, growth form and longevity of a plant species (e.g. tree, shrub, vine, annual, submerged aquatic)
Native	Species occurring in Australia as part of the pre-European flora or fauna, but not necessarily indigenous to areas where it is recorded
Native vegetation	Vegetation, including trees, shrubs and grasses that are indigenous to Victoria. Remnant native vegetation comprises plants originally present in an area
Noxious weeds	Weed species which are declared Noxious under Victorian *Catchment and Land Protection Act 1994*
Pest animals	Animal species, typically introduced species, which have detrimental impacts on indigenous plants and animals
Phenology	The timing of life-cycle events influenced by environmental conditions, particularly climate. Examples include: flowering and fruiting of plants; onset of breeding in animals; timing of migration; spawning events; and timing of insect emergence.
Vegetation community	Term for interacting plant populations forming vegetation. A vegetation community in formal classifications may have characteristic plant species, composition and structure

Appendix 1 Biodiversity Significance Assessment and Mapping

The primary purpose of this assessment was to develop a map of relative biodiversity significance across the Mornington Peninsula, to assist the Shire in making objective and defensible decisions for biodiversity management. This requires a transparent and objective assessment of attributes, that can be easily replicated (i.e. does not rely on subjective allocation of significance). The inputs and methodology used for this assessment are outlined below.

Biodiversity Attributes

Multiple factors contribute to the biodiversity value of an area; however, there are limited data available that can be analysed in a consistent and objective manner for many of these factors. The method used for this assessment, therefore, focuses on attributes that are known to influence biodiversity, and for which there are scientific data, uniformly available across the Peninsula, that can be analysed consistently and objectively. The application of spatial data in the assessment of significance, through the integration of mapped and/or modelled datasets, in Geographic Information Systems (GIS) allows the relative significance to be presented in a clear and transparent manner for use in decision making. This approach also ensures that the significance assessment can be readily updated with new information, as necessary (e.g. from revised mapping or new species records).

Primary considerations for the assessment of biodiversity significance include attributes, such as native vegetation cover and condition, and landscape quality variables, for which there is well-founded literature on their influence on ecosystem resilience, as well as the provision of habitat for threatened species. These matters indicate a site's value for the protection and maintenance of biodiversity, and the need for prioritisation in planning for the likelihood of further biodiversity loss.

Six major attributes have been selected for the assessment of biodiversity significance on the Mornington Peninsula; these are identified below.

Native Vegetation Cover

The importance of native vegetation for the support and maintenance of biodiversity is well-recognised and reflected in environmental policy at all levels of government. Native vegetation provides the fundamental basis for natural ecosystems, typically forming the primary habitat components that support fauna. Native vegetation supports nearly all of Victoria's terrestrial biodiversity, and is therefore considered a key indicator of the spatial occurrence of biodiversity (VEAC 2017). The presence of remnant native vegetation, together with vegetation extent and quality, are therefore, useful and widely accepted proxies for biodiversity status. The presence of remnant native vegetation indicates areas of lower soil modification, a higher likelihood of naturally occurring habitats for fauna and persistence of ecological processes associated with the vegetation.

Approximately 70% of native vegetation on the Mornington Peninsula has been lost, as a result of historic land clearance for agricultural, industrial and residential development. The protection of native vegetation is therefore, vital for the maintenance of biodiversity on the Peninsula, and all remnant vegetation is considered to have value.

Native Vegetation Condition

Most native vegetation in Victoria has been subject to some disturbance, either from historic or current land uses, weed or pest animal invasion or changes to fire regimes. Such disturbances can result in the loss or alteration of structural vegetation components, changes in habitat components (e.g. woody

debris, rocks), or degradation of soil structure. The condition of vegetation impacts directly on biodiversity and ecosystem function through its ability to support a diversity of microhabitats and species, particularly rare or threatened species of flora or fauna, and to sustain ecosystem processes. Hence, priority should be given to vegetation that is considered to be in relatively good condition, to help maintain biodiversity.

Landscape Context

The landscape context of native vegetation is also an important determinant of its ability to support biodiversity and contribute to ecosystem function and resilience. Factors such as patch size and shape, proximity to neighbouring patches of vegetation and connectivity all affect the value of remnant vegetation; for example, smaller patches of vegetation, and those that are isolated, are more prone to degradation than larger patches that are well connected or close to neighbouring patches of vegetation. The fragmentation and isolation of vegetation patches results in a loss of species diversity, changes to species composition and disruption to ecological processes. Therefore, an assessment of landscape context is an important factor in the assessment of biodiversity significance.

Rare and Threatened Vegetation Communities

The Mornington Peninsula supports a diversity of vegetation types, many of which have become significantly depleted in the region, because of their suitability for agricultural or industrial development. This criterion is intended to consider the location and status of vegetation communities, to assign significance to vegetation types that are locally rare, to help prevent further loss.

Rare and Threatened Species

This criterion explicitly considers site records of rare and threatened species, as a means to providing an indication of habitat use by these species at a local scale, and assigns significance to sites used by rare or threatened species. It is recognised that knowledge and documentation of the distribution of species is based upon incomplete survey coverage across the Peninsula; for example, public land has been better surveyed than private land. The existing data therefore, does not provide uniform coverage of the Peninsula. However, the use of multiple data sources, such as the state-wide Victorian Biodiversity Atlas, as well as the Birdlife Atlas, Melbourne Water Fish Database and Mornington Peninsula Shire Fauna Atlas, can help to overcome this limitation.

Waterways and Wetlands

Freshwater and estuarine habitats, including rivers, estuaries and wetlands are widely recognised as being amongst the most depleted and threatened habitats, worldwide. These habitats support unique ecosystems that include a diversity of vegetation types, and aquatic and semi-aquatic species. Healthy and functioning waterways and wetlands are also essential for supporting healthy terrestrial and marine environments, and are important for agriculture and industry. However, they are under increasing pressure from climate change, surrounding land management practices and human use. The protection and maintenance of aquatic ecosystems is therefore an important consideration when determining biodiversity management priorities.

Assessment and Mapping of Biodiversity Attributes

Mapping biodiversity values across the Peninsula provides a visual representation of relative biodiversity significance that can be used to prioritise areas at a landscape scale. Spatial data for each biodiversity attribute were analysed using GIS.

Biodiversity attributes were analysed at a 75 X 75m grid resolution, for compatibility with state-wide modelled datasets. Each grid cell was assigned a score for each criterion, as per the table below; scores for each criterion were then added to derive a total biodiversity value score. The results of this analysis are presented in Figure 4.

The map produced shows the areas that contribute most to biodiversity conservation on the Mornington Peninsula by identifying the value of each location, relative to all other locations on the Mornington Peninsula. This map prioritises the importance of each location on the basis of native vegetation cover, quality, landscape context and threatened species.

Native Vegetation Cover

Native vegetation cover was determined using mapping of Ecological Vegetation Classes (EVCs); EVCs provide the basis for classification of native vegetation communities in Victoria, and form the basic mapping units for most biodiversity planning assessments. EVC mapping has been derived from a combination of three datasets, including state-wide EVC modelling (NV_2005), on-ground mapping of saltmarsh vegetation by the Victorian Saltmarsh Study Group (VSSG 2011), and on-ground mapping of vegetation on the Mornington Peninsula undertaken by Sinclair et al. (2006). Where on-ground mapping of vegetation is available, the modelled dataset (NV_2005) has been replaced, to improve the spatial accuracy of the dataset. Using the integrated mapping, each grid cell was then scored on the basis native vegetation presence or absence, as shown in Table 6; native vegetation presence is assigned the highest score of all attributes, given the fundamental importance of native vegetation to biodiversity.

Native Vegetation Condition

Assessment of native vegetation condition was based on the state-wide mapping of vegetation condition, as modelled by the Department of Environment, Land, Water and Planning (DELWP) (NV_2005QUAL). Modelled vegetation condition reflects how close the vegetation is to its mature, natural state, with regard to composition, structure, function and spatial context. In producing the modelled dataset, pre-European condition 'benchmarks' have been developed for a series of environmental attributes for each vegetation type in Victoria; these were derived from examples of each vegetation type that were considered to be in very good condition (i.e. having suffered little or no disturbance), where the 'benchmarks' represents the average characteristics for mature and long-undisturbed vegetation. Current environmental attributes of native vegetation were then modelled based on data collected from a large number of sites. Vegetation condition at each site has been assessed by scoring each attribute against the pre-European condition benchmarks for the relevant vegetation type, to generate a modelled condition score (see Parkes et al. 2003). The condition score reflects how closely the vegetation matches its pre-European state (i.e. a score of 1.0 is achieved if the current vegetation condition matches the benchmarks exactly). For this assessment, the modelled condition score for each site Is used as a measure of vegetation condition, and then re-scaled so that the maximum score for any site Is 0.5 (see Table 6).

Landscape Context

Landscape context is based on the modelled state-wide dataset (NV2005_CONN10). The modelled dataset is based on the current extent of native vegetation (NV2005_EXTENT) and rates the landscape according to its connectivity and proximity to surrounding native vegetation. This is data contributes to the 'landscape' component of Vegetation Quality, as assessed by the Habitat Hectares method (DSE 2004), which scores habitats based on 10 separate metrics – seven of which are site-based vegetation

condition metrics, and three of which make up the Landscape Context Score. The Landscape Context Score describes the spatial context in relation to patch size, shape and proximity value (i.e. connectivity) of a location. The modelled dataset classifies the landscape context value into 10 categories; this assessment uses the average modelled landscape scores, re-scaled to a maximum score of 0.5 (see Table 6).

Rare and Threatened Vegetation Communities

The status of vegetation communities, for the purposes of this assessment, has been determined with reference to Bioregional Conservation Status. The Bioregional Conservation Status for each EVC provides a measure of the current extent and quality of each EVC, compared to its original extent and quality (pre-1750), within a particular Bioregion, to reflect rarity.

The DELWP has mapped EVC's along with their Bioregional Conservation Status, across each Bioregion in Victoria. The precise distribution of vegetation communities listed as threatened under the Victorian *Flora and Fauna Guarantee Act 1998* or *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* on the Peninsula is difficult to determine, as these communities are not necessarily synonymous with EVCs (i.e. not all examples of an EVC fit the defining criteria that classifies a listed community); accurate determination of this could only be achieved through on-ground assessment. Therefore, the use of Bioregional Conservation Status provides the most useful representation of the rarity and depletion of vegetation communities, at a regional scale.

The mapping of rare and threatened vegetation communities is taken from the DELWP layer of Modelled EVCs with Bioregional Conservation Status (NV2005_EVCBCS). The dataset is derived from a combination of three input databases: Victorian bioregions (VBIOREG100), Pre 1750 EVCs (NV1750_EVC) and the current version of Native Vegetation Extent (NV2005_EXTENT). Bioregional Conservation Status and geographic occurrence are applied to unique Bioregion-EVC units, and EVCs are classified as Least Concern, Rare, Depleted, Vulnerable or Endangered. The Bioregional Conservation Status for terrestrial EVCs follows Victoria's Native Vegetation Framework. The Bioregional Conservation Status for wetland EVCs is taken from DELWP (2016) following revision of Victoria's wetland EVC typology. EVCs with a Bioregional Conservation Status of Depleted, Vulnerable or Endangered in the Gippsland Plain Bioregion were all scored 0.25, as shown in Table 6.

Rare and Threatened Species

Data used as part of the assessment has been derived from various sources, including the state-wide Victorian Biodiversity Atlas (VBA_FAUNA25, VBA_FLORA25), as well as the Birdlife Atlas, Melbourne Water Fish Database and Mornington Peninsula Shire Fauna Atlas. Collated databases have been curated for accuracy. Consideration was given to the chronology and complexity of taxonomy for some records, as was the source of data, likely origin of the attributed records, opportunities for misidentification, and likelihood of observer error in database entries. Subsequently, doubtful records and taxonomically redundant records were removed from the analysis, as were records with lower accuracy (VBA_FAUNA100 and VBA_FLORA100).

Species status was determined according to their listing as threatened under the *Environment Protection and Biodiversity Conservation Act 1999*, the *Flora and Fauna Guarantee Act 1988*, the Advisory List of Rare or Threatened Plants in Victoria (DEPI 2014), and Advisory List of Threatened Fauna in Victoria (DSE 2013).

Sites with records of listed flora or fauna species were scored as shown in Table 6. Adjacent sites were scored similarly, to add significance to land adjoining sites where threatened species are known to occur, so that similar vegetation and habitats on that land are identified for relevant values. It is also intended to recognise the local dispersal requirements of many species.

Wetlands and Waterways

Wetlands were identified and defined using the Victorian Wetland Inventory, as shown in the DELWP Current Wetlands GIS layer (WETLAND_CURRENT). This layer contains polygons showing the extent and types of wetlands in Victoria, updated from the Wetland 1994 layer. The updated mapping identifies and delineates wetlands which are not mapped in the 1994 layer, using aerial photography (2007 to 2011), vegetation and topographic mapping, to provide context and help define wetland boundaries. Waterways were identified and mapped using hydrology layer of watercourses. A 10 m buffer was applied to all wetlands, and to either side of a waterway, for the purposes of scoring, to incorporate riparian habitats. Each site containing a wetland and/or waterway was allocated a score of 0.25, as shown in Table 6.

Biodiversity Significance Mapping

Property parcel boundaries were used as the unit for identifying priority areas for biodiversity management across the Peninsula. The process was tenure blind, as the primary objective of the assessment is for strategic identification of landscape-level values. Each property parcel has been assigned a biodiversity value score based on the mapping produced in Figure 1. As each 75 X 75m grid cell has been scored on a continuous scale, the overall score for each parcel is an average of each grid cell within that parcel.

Table 6 Assessment and scoring of biodiversity attributes

Biodiversity Attribute	Data	Assessment	Divison	Score
Native Vegetation Cover	NV2005_EVCBCS Sinclair et al. (2006) VSSG (2011)	Presence of Native Vegetation as shown by Ecological Vegetation Class mapping or modelling	Site supports remnant vegetation	1
			Site supports no remnant vegetation	0
Native Vegetation Condition	NV2005_QUAL	Modelled Site Condition Score	Average score scaled to a maximum	≤0.5
Landscape Context	NV2005_CONN10	Modelled Landscape Connectivity Score	Average score scaled to a maximum	≤0.5
Rare or Threatened Vegetation Communities	NV2005_EVCBCS	Bioregional Conservation Status of: Depleted; or Vulnerable; or Endangered	Site supports locally threatened vegetation type	0.25
Rare or Threatened Species	VBA_FAUNA25 VBA_FLORA25 Birdlife Atlas Mornington Peninsula Fauna Atlas Melbourne Water Fish Database	Site supports species listed as threatened under the EPBC Act; or Site supports species listed under the Victoria FFG Act; or Site supports species listed as rare or threatened under the Advisory List; or	1 species recorded	0.05
			2-9 species recorded	0.2
			≥ 10 species recorded	0.5
		Site is adjacent to records of rare or threatened species (as determined above)	Sites scored as above	_
Wetlands and Waterways	WETLAND_CURRENT	Site contains a waterway; and/or Site contains a wetland; or Site is within 10 m of a waterway or wetland.	Site supports waterway and/or wetland	0.25