

BIODIVERSITY

7. BIODIVERSITY

7.1 Overview

Biodiversity refers to the variety of life forms that exist in an area: the different plants, animals and micro-organisms, the genes they contain, and the ecosystems they form⁸¹.

Ecosystems in the region have changed over time in terms of diversity, quantity, quality and range, particularly since European settlement around 200 years ago.

The ecology of the region has changed and will continue to do so

Parts of the region are now modified extensively, such as urban areas and those developed for agriculture, while other areas

remain in a relatively 'natural' condition. A complex and inter-dependent mix of species occurs in a variety of terrestrial, aquatic, marine, urban and rural environments. Some species are highly valued and others are regarded as pests or weeds. Some existed prior to European settlement while many have been introduced from other parts of Australia and from overseas.

The ecology of the region has changed and will continue to do so, though our lifestyles, landscapes and livelihoods remain dependent on having healthy ecosystems. An important feature of this region is the continuing rapid urbanisation that is decreasing both the quantity and quality of native flora and fauna habitat.

There is a need to monitor the type and rate of change to maintain and enhance the benefits from our native and modified ecosystems. It is particularly important to ensure that natural ecosystems are well represented, maintained in good condition and protected because of their significant social, environmental and economic value. The use of introduced plants and animals in the region must be intelligent and well managed, with a strong emphasis on managing their impact on native biodiversity.

Natural biodiversity

The Port Phillip and Western Port region is at the confluence of seven state-defined bioregions and it contains indigenous vegetation categorised into around 100 ecological vegetation classes.

Human activity, especially in the last 200 years, has led to a significant decline in native vegetation. The loss of native

vegetation has been particularly severe in the Victorian Volcanic Plains, Gippsland Plains, Strzelecki Ranges and Otway Plains bioregions, as shown in Figure 26. Of the ecological vegetation classes, 14 have been depleted to below 10 per cent of their original extent (prior to European settlement) as shown in Table 7⁸².

A preliminary estimate of native vegetation quality across the region suggests that 25 per cent is in poor condition, 25 per cent in medium condition and 50 per cent in good condition. However, this broad assessment is not often reflected at a local level and the quality of native vegetation varies markedly between ecological vegetation classes and bioregions. While the Highlands–Southern Fall and Victorian Alps bioregions generally have high quality vegetation, the remaining bioregions contain mainly low quality remnants.

Further information and analysis of the existing native vegetation is being compiled in the regional Native Vegetation Plan.

Our lifestyles, landscapes and livelihoods remain dependent on having healthy ecosystems



⁸¹ National Strategy for the Conservation of Australia's Biological Diversity

⁸² Draft Port Phillip and Westernport Native Vegetation Plan

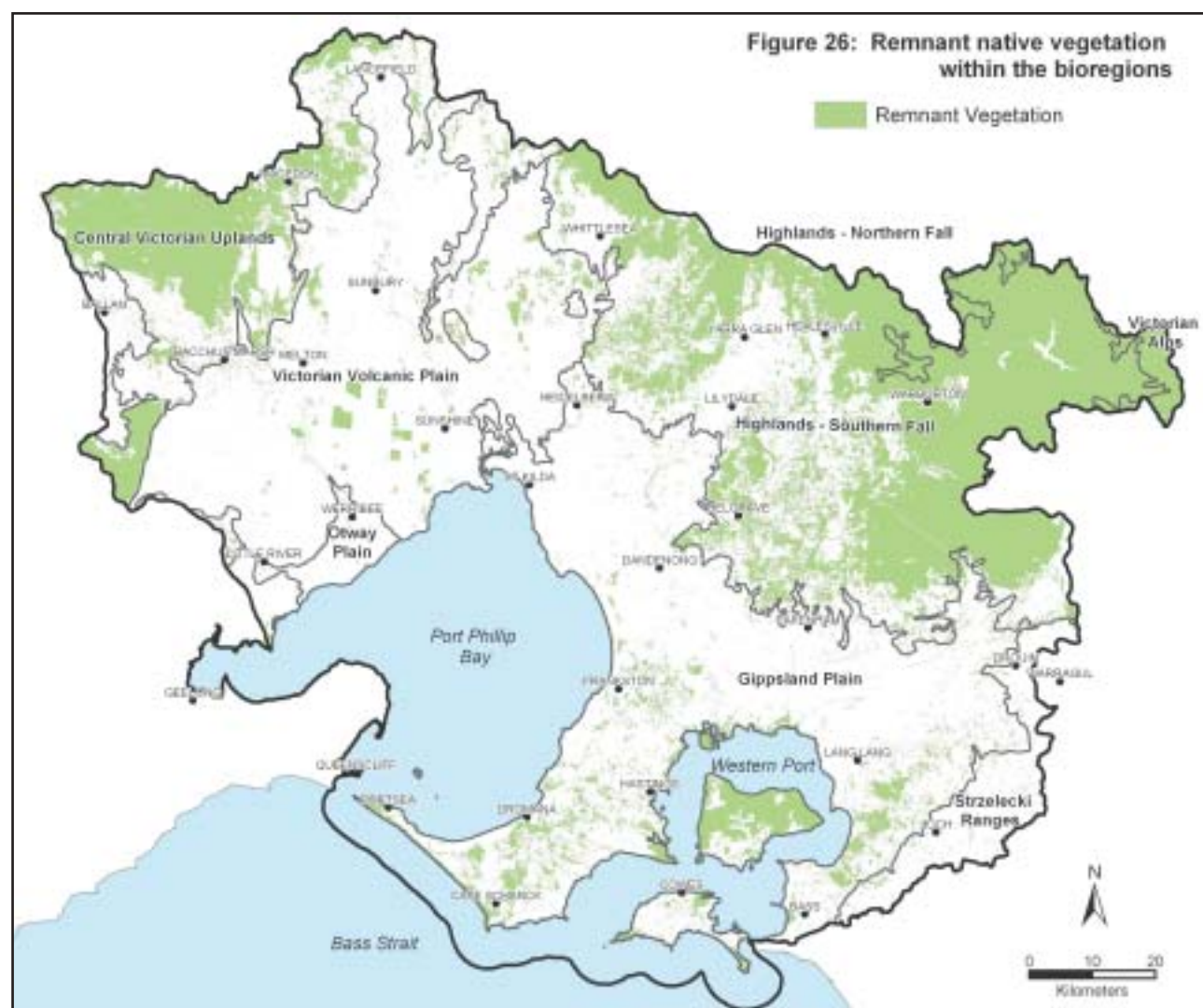


Figure 26: Remnant native vegetation within the bioregions

Native vegetation exists on land with a variety of ownerships and management regimes, and the level of protection of different classes of vegetation varies markedly. Around 40 per cent of the region's native vegetation is located in parks or reserves managed for conservation purposes, another 30 per cent is on other publicly owned land and 30 per cent is on private property⁸³. Management agreements or covenants protect some 1,700 hectares or just over one per cent of the remnants on private land⁸⁴.

While the extent and condition of native vegetation has changed markedly over recent centuries, changes have also taken place with individual flora and fauna species. While a number of species that were present 200 years ago are now extinct, the region still contains 1,860 indigenous vascular and non-vascular plant species⁸⁵, 616 indigenous vertebrate fauna species⁸⁶ and many invertebrate fauna species. This high number of species makes the region one of the most biodiverse in Victoria.

Of these species, 296 flora species and 128 fauna species are threatened, including some that occur nowhere else in the world such as the helmeted honeyeater, Dandenong freshwater amphipod, Kilsyth South spider-orchid and the Sunshine diuris. Ninety-five of these are listed under the Flora and Fauna Guarantee Act 1988 and 49 are listed for priority attention at a national level under the Environment Protection and Biodiversity Conservation Act 1999.

The region also has important riparian and aquatic environments. Sections of the Yarra and Lerderderg rivers are listed as heritage rivers due to their natural and cultural significance. Major wetlands at Western Port, Port Phillip Bay and Edithvale are internationally recognised with Ramsar status. Similarly, Victorian bays and estuaries contain a diverse range of biotic assemblages depending on their morphological and hydrological characteristics. The marine environment contains its own habitat classes, broadly being seagrass beds, reef systems, seafloor, unvegetated mud and sand, and the water column.

Port Phillip Bay is a marine embayment fringed by seagrass beds, rocky beaches and sandy beaches. The benthic assemblages in the muddy central region are different to those in the sand to the east and west. The turbid water in Western Port allows many deeper water animals to occur in relatively shallow water. Western Port is recognised as one of the world's most valuable areas for international migratory wader birds. Along with resident waders, many species of birds migrate from northern and central Asia to Western Port every year. Eight sites in Port Phillip Bay, Western Port and Bass Strait have been proclaimed as representative marine protected areas due to their environmental importance⁸⁷.

The waters off Australia's southern coast are very special and unique. Over 90% of the plants and animals living here are found nowhere else on earth.

Ecological Vegetation Class	Original extent (Ha)	Remaining extent		Revegetation to reach 10% of original extent (ha)
		(ha)	(%)	
Brackish grassland	850	1	0.1	84
Brackish wetland	330	4	1.2	29
Plains grassy wetland	7,220	98	1.4	624
Valley heathy forest	19,480	529	2.7	1,419
Plains grassland	129,810	4,363	3.4	8,618
Warm temperate rainforest	50	2	3.6	3
Plains sedgy wetland	460	19	4.2	27
Plains grassy woodland	162,910	6,943	4.3	9,348
Swamp scrub	76,470	3,962	5.2	3,684
Grassy woodland	83,960	4,397	5.2	3,999
Creekline grassy woodland	3,690	250	6.8	119
Hills herb-rich woodland	4,980	410	8.2	88
Scoria cone woodland	1,430	133	9.3	10
Reed swamp	70	6	9.4	1
TOTAL	491,710	21,117		28,054

Table 7: Ecological vegetation classes with less than 10 per cent of their original extent.

⁸³ Draft Port Phillip and Westernport Native Vegetation Plan
⁸⁴ Estimate from Trust For Nature
⁸⁵ Flora Information System
⁸⁶ Atlas of Victorian Wildlife
⁸⁷ Victoria's system of Marine Parks and Marine Sanctuaries: Management Strategy 2003 – 2004

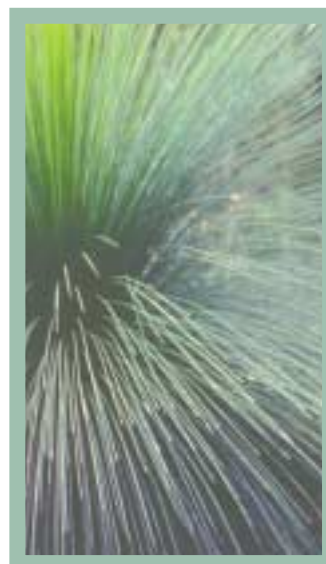
Introduced biodiversity

Management of the region's biodiversity is made more complex by having Victoria's capital city at its heart with the surrounding rural areas used for diverse urban and agricultural systems on both private and public land.

It is estimated that more than 10,000 non-indigenous flora species⁸⁸ and a range of fauna species have been introduced to the region since European settlement, mainly for food production, aesthetic purposes and to provide social and recreation values. Certain areas and industries of the region now value introduced species and modified ecosystems and depend on them for economic or social reasons. For example, many agricultural systems rely on introduced crops and grasses that continue to be modified for greater production. Similarly, many gardens and streetscapes use introduced species to create visual appeal that is highly valued by residents and visitors. Of the introduced plant species, around 1,100 have become naturalised and established viable populations⁸⁹.

Many introduced species have brought significant problems. Around 80 introduced flora species are now listed as noxious weeds⁹⁰ with significant impacts on the environment and productive systems. Plants that 'escape' from gardens or agricultural enterprises, for example bridal creeper and alligator weed, infest and degrade native vegetation and waterways, respectively. Similarly, animal species including foxes, rabbits, cats, Indian mynahs and blackbirds have had

substantial impacts on native habitats and species in both urban and rural areas, causing widespread degradation of natural ecosystems, food chains and agricultural systems. Legal and illegal importation of exotic species needs to be effectively managed to ensure minimum impacts on native ecosystems. More than 250 marine species are known to have been introduced to Australia's marine waters, of which 99 are known to have been introduced to Port Phillip Bay. Some of these, such as the Northern Pacific seastar, Japanese kelp and European fan worm, have become pests, posing a threat to habitats, food chains, marine industries and our enjoyment of the marine environment. Prevention, rather than cure, is the best approach when it comes to managing marine pests. Stopping pests being introduced to Australia and then spreading from one location to another is far more effective than trying to deal with them after they have established. Eradication attempts are only feasible under specific circumstances and should therefore not be relied on as the solution for marine pest management.



Natural and introduced biodiversity in today's urban and rural settings

The changes of the last 200 years have challenged the region's native flora and fauna. The extent of native habitat has decreased significantly, but even in urban areas many remnants of native vegetation still exist, providing important breeding habitats for native birds⁹¹. The interspersing of native remnants and new patterns of vegetation (native and introduced) provide new mosaics of vegetation and habitat opportunities.

Native species have responded in a variety of ways. Some native species are now extinct in the region and others are threatened. Many, such as the striped legless lizard, are limited to the relatively small and often-fragmented patches of habitat that can still support them, which bring risks from isolation and a limited gene pool. Other species survive only in the larger parks.

On the other hand, populations of some native species have remained constant, have adapted to change or even thrive in particular areas. Many native species now share the variety of urban and rural settings of this region with introduced species. While these modified ecosystems have evolved, and continue to do so, there are situations when active intervention and species management is necessary to achieve or maintain an appropriate balance. For example, some native species can at times be over-abundant and populations may need to be managed so that they are viable and

sustainable. In some urban settings excessive possum and silver gull populations can become pests. Similarly the grey-headed flying fox, a nationally threatened species, has found a niche in urban Melbourne and has, in recent times, been the subject of intense management programs. In rural areas, kangaroo populations can reach unsustainable levels, causing overgrazing on both farms and public land. Koala populations can also become unsustainable in some areas and must be managed.

Some native species can at times be over-abundant and populations may need to be managed so that they are viable



⁸⁸ Estimate from Department of Primary Industries

⁸⁹ A census of vascular plants of Victoria

⁹⁰ Declared noxious weeds – Landcare Notes

⁹¹ Bird communities of some urban bushland fragments: Implications for conservation

7.2 Policy context for the protection and management of biodiversity

A range of legislation and supporting policies applies to the protection and management of biodiversity and supports integrated catchment management.

The Commonwealth Environment Protection and Biodiversity Conservation Act 1999 and the Victorian Flora and Fauna Guarantee Act 1988 are the main statutory frameworks for protecting biodiversity including native plants and animals and ecological communities. Threatened species and communities, and threatening processes, can be listed under each Act. Threatened Species and Communities Recovery Plans and Threat Abatement Plans are developed under the Commonwealth Act. Action Statements for listed threatened species, communities and potentially threatening processes are developed under the Victorian Act.

The Wildlife Act 1975 provides for the protection and conservation of wildlife. It aims to prevent species becoming extinct and provides for the sustainable use of and access to wildlife. In addition, it provides for the establishment and management of State wildlife and nature reserves. National and other types of parks are provided for by the National Parks Act 1975.

The Crown Land (Reserves) Act 1978 provides for reservation of Crown land for a variety of public purposes, and the management, leasing and licensing of reserves, primarily for grazing. The Land Act 1958 makes provision for the leasing, occupation and sale of unreserved Crown land.

The Fisheries Act 1995 provides for the management, protection and ecologically sustainable development of the State's fisheries, aquaculture industries and associated aquatic resources and relates to the Commonwealth Fisheries Management Act 1991. The Forests Act 1958 specifies Forest Management Areas for Victoria's forests, and schedules to the Act provide sustainable yield rates for forest production.

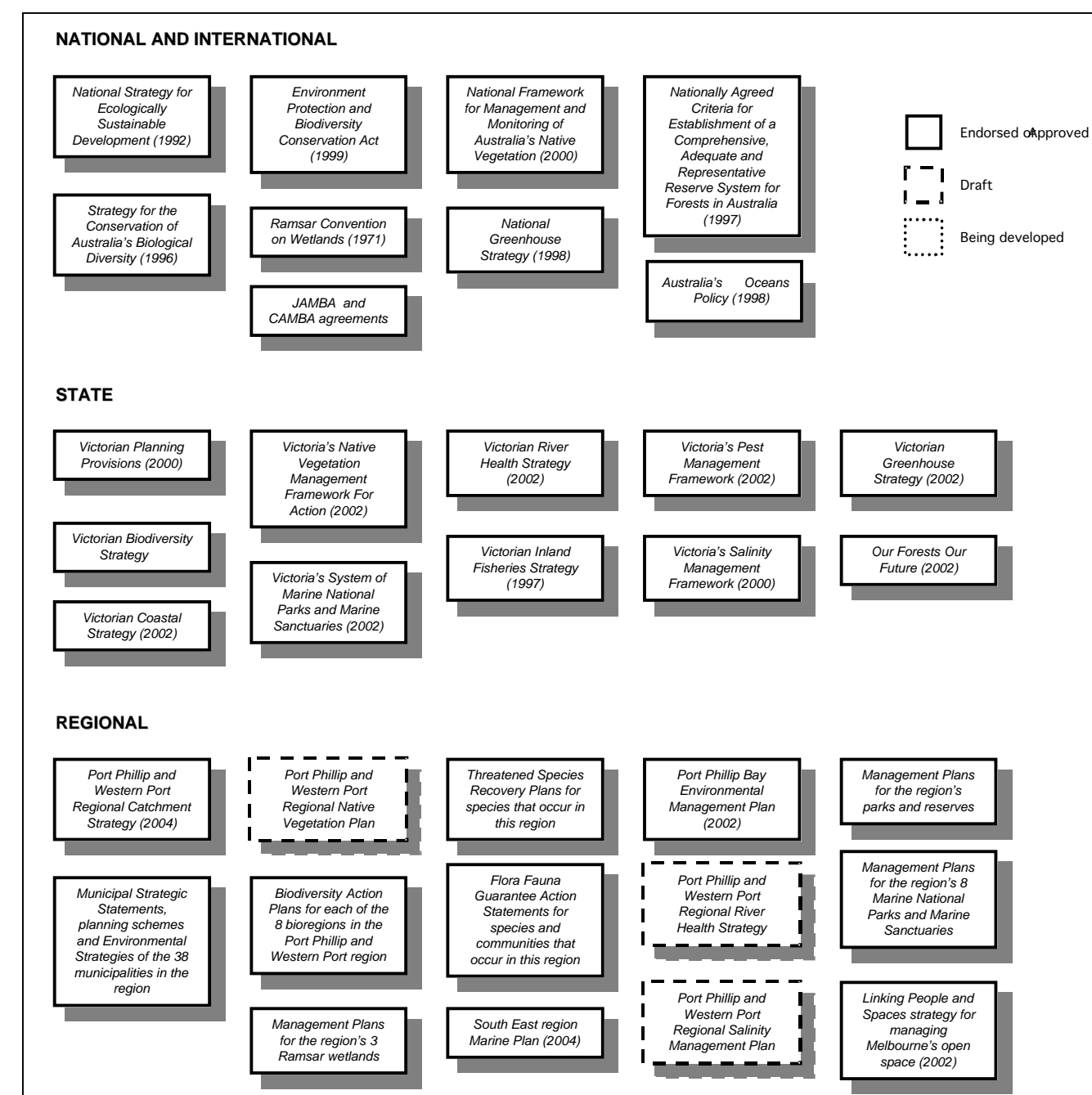
Victoria's strategic plan for the protection and enhancement of native vegetation, Victoria's Native Vegetation - A Framework for Action, establishes a policy to achieve "net gain" in the extent and quality of native vegetation. Sitting underneath the statewide framework and the Regional Catchment Strategies are Regional Native Vegetation Plans.

Operational guidelines are being developed to implement the statewide framework and the regional plans.

While the national and State legislation provides a comprehensive set of rules and standards for the maintenance of biodiversity, there are few requirements for biodiversity protection to be integrated into other catchment activities. In response, this RCS seeks ways to better link biodiversity protection with land and water management. As an example, it seeks to assist local government planning and decision-making to contribute to net gain for native vegetation.

Figure 27 depicts some of the national, State and regional policies, strategies and plans that are relevant to the protection and management of biodiversity in the Port Phillip and Western Port region.

Figure 27: Some of the important policies, strategies and plans relating to the protection and management of biodiversity



7.3 Regional goal

Having regard to both the natural biodiversity of the region and the circumstances of today, the long-term goal is to have:

Healthy and enduring ecosystems with a diversity of habitats and native species

This goal encompasses:

- understanding that ecological health underpins natural asset and resources management
- understanding the relationships between species, communities and ecosystems in this complex and diverse region
- understanding that incremental long-term detrimental changes are occurring
- the need to manage the threats to natural and modified ecosystems to safeguard the remaining native and marine vegetation and wildlife habitats and sustain the ecological health of the catchments, waterways, bays, estuaries and seas
- ensuring that management interventions are based on a good understanding of ecological processes and relationships
- the need for integrated approaches to biodiversity management with multiple social, economic and environmental benefits
- recognition that private land in this region makes an important contribution to the protection and maintenance of biodiversity.



7.4 Asset-risk assessment

7.4.1 Values of biodiversity

The natural and modified ecosystems and their inter-relationships are the building blocks of many important processes that are crucial to maintaining the environment on which we depend.

Examples of important and valuable processes driven by rich and healthy biodiversity include:

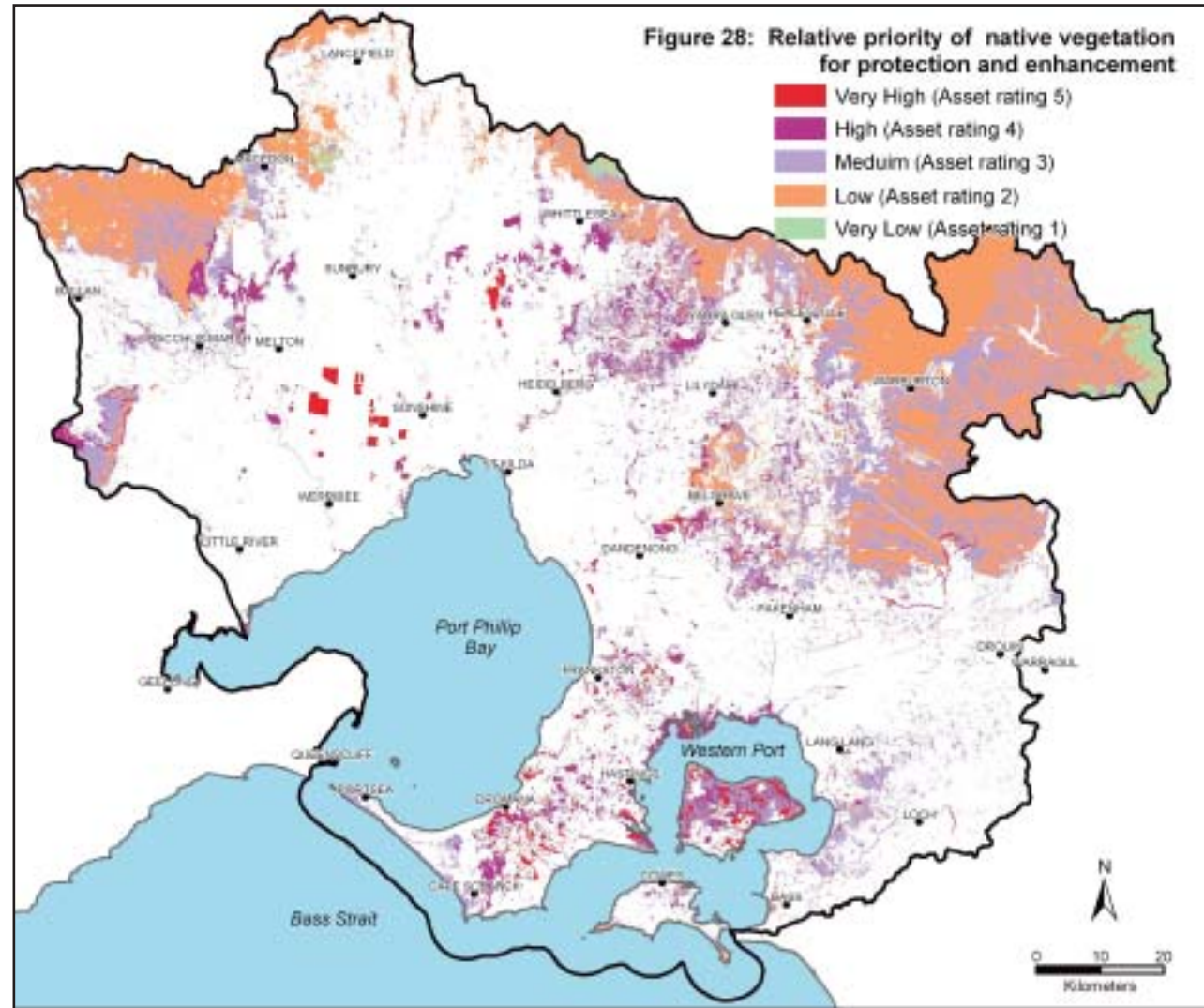
- recycling of nutrients in natural ecosystems, on farms and in gardens undertaken by a myriad of micro-organisms
- absorption and assimilation of urban and rural runoff by the region's waterways and bays
- treatment through natural processes of huge volumes of waste produced by the region's concentrated human population
- maintenance of the complex food chains that support native and beneficial introduced species
- stabilisation of land, protection of water quality and absorption of carbon dioxide by vegetation
- maintenance of stores of genetic material, much of which may yet to be discovered or researched
- production of valuable resources such as timber.

A diversity of ecosystems and species in healthy, viable and sustainable condition is also the important basis for economically important industries such as agriculture and tourism, and provides natural, scenic and serene areas highly valued by urban and rural residents.

The region includes many species and ecosystems whose current populations and range we should protect and increase, such as native species and communities and especially those that are rare and threatened. Other species are managed for consumption, recreation and aesthetics. Still others, including pest animals and weeds, should be decreased.

The extent, health and connectivity of native vegetation is an important indicator of biodiversity. Mapping of ecological vegetation classes has been undertaken across most of the region at 1:25,000 scale and has identified more than 33,000 individual fragments of native vegetation. Proximal fragments of the same ecological vegetation class have been grouped into 550 'vegetation management units' and each unit assessed for its relative value against various criteria including fragmentation, depletion, rarity, abundance and habitat for threatened species. This information is contained in the draft Regional Native Vegetation Plan and a combined assessment of the priority of these units is shown in Figure 28.

A diversity of ecosystems and species in healthy, viable and sustainable condition is the important basis for economically important industries



7.4.2 Key risks

Key Biodiversity Risks (BR1 – BR4) must be addressed in order to protect and enhance biodiversity, including incremental and cumulative impacts of various day-to-day practices. The key risks to the health and values of the region’s flora, fauna and ecosystems are described below.

BR1 - Loss and degradation of native vegetation through clearing and urban development

Less than one third of pre-European vegetation remains in the region as a result of land-use change that includes clearing for urban development, agriculture, extractive industries and infrastructure. The reduction in large tracts of linked vegetation and a loss of diversity has resulted in the extinction of some species and threats to others. The opportunity exists to manage further development by retaining and benefiting from the existing remnants. The habitat remaining, particularly the significant amount that exists on the region’s private land, is under significant pressure from human activity including from urban development and rural practices. Vegetation on public land and in parks is threatened by certain intensive recreation activities, in particular along foreshores, rivers and streams.

The following risk assessment methodology has been used to assess the level of risk to the environmental values of native vegetation from clearing, with the results shown in Figure 29.

Asset rating	x	Severity of threat	x	Sensitivity	= Risk
5 Very high		0.8 Areas, except parks, within the urban growth boundary		1 All ecological vegetation classes	
4 High		0.4 Areas, except parks, outside the urban growth boundary			
3 Medium					
2 Low					
1 Very low					

For example, a high priority vegetation management unit within the urban growth boundary is at risk of having all of its environmental values lost as a result of major urban development. In such a case, the asset rating of 4 is multiplied by the severity rating of 0.8 and the sensitivity rating of 1, resulting in a relatively high risk score of 3.2.

Figure 29 indicates that urban development and vegetation clearing pose a medium-to-high risk to some areas of native vegetation in all catchments of the region. At particular risk are the remnants in urban growth areas and the many high-value but fragmented remnant patches scattered around the lowland areas.

This is a preliminary risk assessment. The methodology will be substantially refined in the coming years as a better understanding and level of data is accumulated about vegetation quality, clearing practices and the varying sensitivity of ecological vegetation classes to disturbance and clearing.

Associated with the high population and intensity of land use of this region is a high level of various social and recreational activities in valuable environmental areas. The risk to biodiversity from this suite of activities needs to be assessed in the future to assist identification of priority sites and management actions.

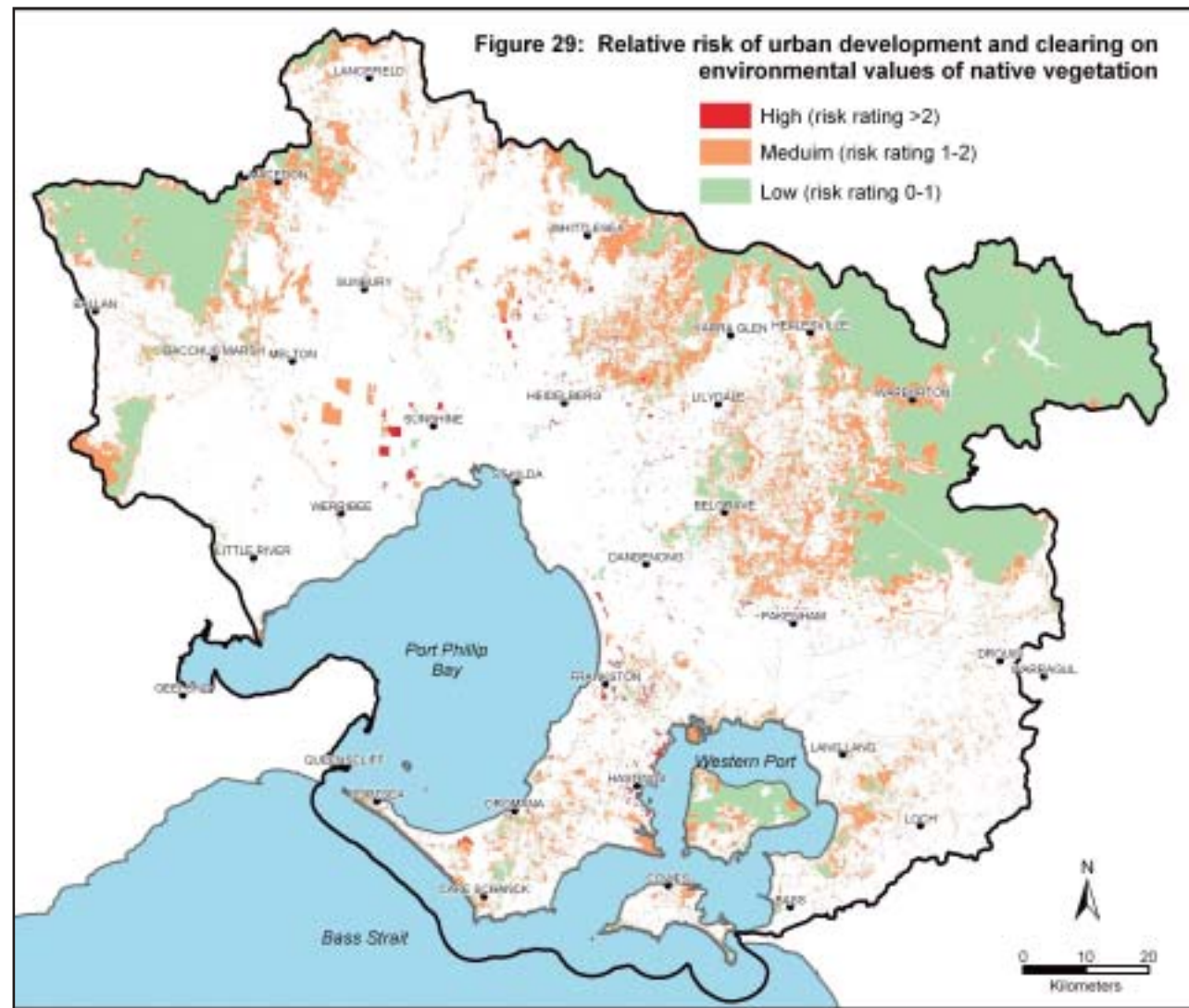


Figure 29: Relative risk of urban development and clearing on environmental values of native vegetation

■ High (risk rating >2)
■ Medium (risk rating 1-2)
■ Low (risk rating 0-1)

BR2 - Pest plants and animals

Various pest plant species have considerable impact on the biodiversity of the region. A number of established weed species thrive in areas of environmental value. These infestations can begin from garden escapes, poor choice of species planted in rural and adjacent areas, or inappropriate dumping of garden refuse in bush settings. Of particular concern are infestations of bridal creeper in bushland, serrated tussock and Chilean needle grass in grasslands, and salvinia, spartina and alligator weed in waterways and aquatic systems.

A number of introduced animal species are also impacting on native fauna and flora habitat and populations. Terrestrial species of particular concern, both in urban and rural areas, are foxes, rabbits, cats and deer. Aquatic and marine species of concern include the Northern Pacific seastar and a number of foreign fish species including mosquito fish and carp.

There is also a constant threat of new introductions of species that could have substantial impacts at a regional and state level. This is particularly so in this region with its large urban population, major sea ports and airports and important overland transport routes from interstate.

Plant diseases are also a serious concern. For example, *Phytophthora cinnamomi*, known as Cinnamon Fungus, is a serious root disease that can destroy native plants and habitat. It is a microscopic pathogen that lives in the soil and in plant roots. The pathogen can be spread into a new area by the introduction of infested soil and/or infected plants, or movement of water containing zoospores from nearby infested areas. *Phytophthora cinnamomi* already occurs at numerous sites in this region, including at Green's Bush, and there is a threat of continued spread of this and other plant diseases.

BR3 - Land and water management issues

Risks to the region's biodiversity can arise from the ways we manage land and water. For example, poor soil condition, erosion and land use practices such as ineffective stormwater management, poor dairy effluent control and excessive fertiliser usage can move sediments and nutrients to waterways and affect aquatic ecosystems. Wetland vegetation is also at risk from drainage and developments that lower water tables.

In areas where native vegetation remains, such as parks and Crown land, recreational pressure can degrade native vegetation. When activities such as horse riding, four-wheel driving, motorbike riding, camping and firewood collection are undertaken intensively in an area, vegetation and habitat can be damaged and destroyed. Human activities can also import harmful organisms such as *Phytophthora*.

The management of fire regimes is also a complex matter but is important for native species that are affected by altered frequency and intensity of fire.

BR4 - Salinity

Vegetation dieback is occurring incrementally across the region, affecting important areas of native vegetation and consequently, biodiversity. Some is due to salinity. The identified salinity hotspots are a particular concern as widespread salinisation is a possibility in the future. Localised salinity impacts are also likely on the plains and lowland areas of the region. The following risk assessment methodology has been used to assess the level of risk to the environmental values of native vegetation from salinity, with the results shown in Figure 30.

Asset rating		x	Severity of threat		x	Sensitivity		= Risk
5	Very high		0.8	Salinity hotspots		0.4	All ecological vegetation classes	
4	High		0.1	Other lowland areas				
3	Medium							
2	Low							
1	Very low							

For example, a medium priority vegetation management unit within a salinity hotspot is at risk of having its environmental values degraded by salinity. In such a case, the asset rating of 3 is multiplied by the severity rating of 0.8 and the sensitivity rating of 0.4, resulting in a relatively low risk score of 0.96.

Figure 30 indicates that salinity poses a medium risk to areas of native vegetation in many of the region's identified 'salinity hot spots' including those at Balliang, Rowsley, Rockbank, Whittlesea, Pakenham/Bunyip, the Mornington Peninsula and Phillip Island.

This is a preliminary risk assessment. The methodology will be refined in the coming years, particularly acknowledging that the susceptibility of certain areas to salinity needs a greater level of scientific assessment and that the sensitivity of different ecological vegetation classes to salinity will vary.

Objective	Sustainability Principles	Risks
BO4 Improve the connectivity and long-term security of indigenous habitats and species	P1, P2, P3, P4	BR1

Increasing the security of habitats and ensuring that they are connected is an important way of managing some threats and improving the long-term viability of natural biodiversity. Protection of vegetation in parks and reserves and through schemes such as covenants and Land for Wildlife is important, as is building more links between patches of vegetation. Inadequate protection and lack of connectivity threaten the long-term survival of plant communities and animal habitat as well as the long-term availability of some products we use and consume such as water, wood and fish. This objective addresses the principles of social cohesion, future economic prosperity and equity.

Objective	Sustainability Principles	Risks
BO5 Encourage intelligent use of introduced flora and fauna species with minimal impacts on indigenous habitats and species	P3, P4, P5, P6	BR3, BR4

Objective BO5 recognises the important benefits for the region of introduced flora and fauna species, particularly from economic and social perspectives. However, it also recognises that modified ecosystems should be managed in ways that ensure they have the least possible impact on indigenous habitats and species. It responds to the principles of ecological diversity, sustainable economic prosperity and community engagement.

7.6 Targets

These Biodiversity Targets (BT1 – BT10) are proposed to achieve the objectives and enhance the health of habitats and species in the region:

Targets BT1 to BT4 have been developed in concert with the development of the regional Native Vegetation Plan.

Target	Relevant objectives
BT1 The total extent of indigenous vegetation increased to at least 35% of the region by 2030	BO1, BO2

Target BT1 seeks an overall increase in native vegetation in the region from its existing 32 per cent; an increase of at least 39,000 hectares. To achieve this we will have to support revegetation projects, as well as being stringent in our protection of existing native vegetation.

Target	Relevant objectives
BT2 At least 95% of the region's ecological vegetation classes (EVC) represented to at least 10% of their pre-1750 extent by 2030	BO2

Currently, 14 of the EVCs in the region are represented by 10 per cent or less of their estimated pre-1750 extent. This target ensures that the remnant protection and revegetation effort is directed where possible towards those EVCs that are severely depleted.

Target	Relevant objectives
BT3 A net gain in the quality and extent of native vegetation in the region, with the total "habitat hectares" increased by 10% by 2030	BO1

Target BT3 places emphasis on gaining an overall improvement in the quality of our vegetation as well as increasing the extent of the vegetation. A focus is particularly needed on the enhancement and management of remnant vegetation and associated threats. Habitat hectares is a measurement of both the quality and extent of vegetation and, when further developed and applied extensively, will provide us with data to assess whether we are making gains at a site, local, regional and statewide level.

Target	Relevant objectives
BT4 All ecological vegetation classes in the region to have at least 15% of their current extent protected by 2030	BO2, BO3

This target aims to ensure that there is strong protection in place for a proportion of all of the ecological vegetation classes in the region. Vegetation can be protected by the reserve system, covenants or various long-term management agreements. The 15 per cent is a minimum baseline and should be much higher for heavily depleted ecological vegetation classes. For the vegetation types of which only a small amount remains, the target should be much closer to 100 per cent. More detail on the particular targets for each ecological vegetation class will be provided in the regional Native Vegetation Plan.

Target	Relevant objectives
BT5 Reduce the number of threatened flora species to less than 250 by 2030, and reduce the number of threatened fauna species to less than 100 by 2030, with no further regional extinctions	BO2, BO3

Currently, 296 flora species and 128 fauna species in this region are threatened. Target BT5 sets the task of improving on this situation and achieving viable populations of individual flora and fauna species across the region's terrestrial, aquatic and marine environments.

Target	Relevant objectives
BT6 Increase the connections between the region's fragments of native vegetation	BO4

Connections, links and proximity of habitat are important for the sustainability of flora and fauna populations. This target highlights this aspect of our revegetation and habitat protection efforts. This connectivity is being lost in many areas, particularly due to the urbanisation and densification of rural townships. We will need a methodology for measurement and this may build on a 'fragmentation index' that has been piloted within the draft Port Phillip and Westernport Native Vegetation Plan.

Target	Relevant objectives
BT7 Increase the diversity of native species in modified landscapes and aquatic systems	BO4, BO5

Humans have extensively modified this region's natural environments. Within these modified ecosystems, some species, both indigenous and introduced, have flourished while others have become threatened. Target BT7 encourages the exploration of opportunities for highly modified landscapes, including farmland and urban areas, to contribute to the provision of habitat for native species, particularly those species at high risk. Improving the connectivity of vegetation in these landscapes is a very important consideration. This target also applies to the region's freshwater and marine systems. A methodology for measuring this target needs to be developed, and a benchmark established, to enable it to be better quantified and to set dates towards which to work.

Target	Relevant objectives
BT8 Achieve a net gain in the extent and quality of seagrass communities by 2020, and retain the extent of all other broad marine habitat classes in the region at 2004 levels	BO2

The health and diversity of the marine environment depends on the retention of its various habitats. Target BT8 commits the region to managing the threats to marine systems to ensure no further losses whilst achieving a net gain in the region's affected seagrass communities.

Target	Relevant objectives
BT9 No human-induced reduction in species diversity for the freshwater, estuarine and marine environments of the region	BO2

The Victorian freshwater and marine environments support a diversity of temperate fauna and flora species that are largely endemic to southern Australia. Target BT9 commits the region to ensuring that ecologically viable populations of native freshwater, estuarine and marine species survive and flourish in the region. It recognises the importance of the diversity of species in these environments as an indicator of the health of these assets, whilst also recognising natural variation. Annual fish stock surveys will provide important information in assessing progress towards this target, but additional data may be required to better quantify it and monitor progress.

Target	Relevant objectives
BT10 Total annual seafood catch, by both commercial and recreational fisheries, to be maintained at ecologically sustainable levels	BO2, BO3, BO5

Commercial and recreational fishing is a significant economic and social value of the marine environment, however their combined impacts on marine ecosystems can be significant if not appropriately managed. Fisheries and associated ecosystems need to be maintained at ecologically sustainable levels, though further work is required to continually refine these levels.

7.7 Actions

A suite of Biodiversity Actions (BA1 to BA15) is required to collectively fulfil government requirements and meet the targets. The actions cover various aspects of the management of biodiversity assets, including the need for policy development, strategic planning, research, community education, on-ground works programs, monitoring, evaluation and reporting.

Native vegetation

Action	Relevant targets	Completion date	Lead role	Key partners	Level of investment	
BA1	Finalise and implement the regional Native Vegetation Plan including programs to protect, maintain and enhance existing high quality vegetation, increase connectivity and revegetate heavily-depleted native vegetation types	BT1, BT2, BT3, BT4, BT6	Ongoing	CMA, DSE	MW, Parks Victoria, Local government, Environmental organisations, Community groups, Trust For Nature	High

Protection and maintenance of existing native vegetation on both public land and private land is a priority for the region and there are various programs and incentive schemes managed by government and private bodies that contribute to this. These include creation and management of parks, covenant schemes, bush tender and rate rebates.

To guide the management of our regional native vegetation assets for best effect, the draft Native Vegetation Plan identifies the following hierarchy of action:

1. Protection of remnant vegetation
2. Management of existing remnants
3. Enhancement of degraded remnants
4. Enhancement of connectivity and integrity through re-creation of habitat
5. Revegetation for the mitigation of land degradation
6. Re-creation of isolated areas of habitat
7. Revegetation works of a lower order than those outlined above.

Though the protection and enhancement of our remnant vegetation is a priority, many of the region's ecological vegetation classes will benefit from revegetation programs to increase their quality, extent and links. Of particular importance are a number of heavily-depleted ecological vegetation classes, which need to be augmented through major revegetation programs. Revegetation programs will be most effectively undertaken as part of major integrated catchment management projects at a landscape scale. They need to be integrated with efforts to establish corridors of vegetation across the landscape to link fragments of vegetation and enable corridors for wildlife and, potentially, recreational activities. For example, better connections are needed between parks, reserves, coasts, open space, roadside vegetation and waterways. Highlighting contributions to the protection of focal species, such as the swift parrot, Leadbeaters possum, orange bellied parrot, striped legless lizard and the powerful owl should be considered to generate community involvement and potential corporate sponsorship.

Examples of important projects in the region are the Grow West project near Bacchus Marsh in the upper Werribee catchment, Warrandyte to Kinglake wildlife corridor, the biolinks project in the Cardinia catchment and the Dandenong Living Links program that seeks to link natural features in the urban and rural areas throughout the Dandenong Valley.

While contributions to the native vegetation targets will be achieved mainly in rural and semi-rural areas, it should be recognised that native vegetation in urban areas is also very important. Urban native vegetation provides various benefits in education for the region's residents, biodiversity refuges, open space, recreation, health and protection of cultural values.

Action	Relevant targets	Completion date	Lead role	Key partners	Level of investment	
BA2	Strengthen the controls on the clearing of native vegetation and ensure adequate implementation and enforcement	BT1, BT2, BT3, BT4	2006	DSE	Local government	Low

Native biodiversity conservation and management is an integral part of the Victorian Government's policy and is recognised as an essential component of responsible natural resource management. With the release of Victoria's native vegetation framework, there has been an emphasis on strengthening the controls on the clearing of native vegetation and ensuring adequate implementation and enforcement, particularly through the preparation of guides for local government. This work needs to be continued and finalised to achieve strong protection for important native vegetation.

This action is important to protect native vegetation in rural and urban-rural fringe areas, and is also important in moving to higher density development in urban areas including consideration of ways that urban design can minimise impacts on natural biodiversity.

Action	Relevant targets	Completion date	Lead role	Key partners	Level of investment	
BA3	Undertake a program of education, training and support for local government and other organisations to achieve consistency in the understanding and application of operational guidelines for vegetation protection and other mechanisms to achieve net gain	BT1, BT2, BT3, BT4, BT6	2006	DSE	Local government, CMA	Medium

Action BA3 highlights the importance of Victoria's Native Vegetation Framework and recognises the complexity inherent in its implementation, particularly in applying new operational guidelines for vegetation protection and management of offsets when clearing is necessary. It also recognises the need to improve protection through other measures such as planning scheme overlays, rate rebates, land management programs and other incentive schemes.

Action	Relevant targets	Completion date	Lead role	Key partners	Level of investment	
BA4	Undertake further mapping of native vegetation extent at an appropriate scale to assist vegetation protection measures by State government, local government and community groups	BT1, BT2, BT3, BT4, BT6	2007	DSE	Local government, community groups	Medium

The mapping of ecological vegetation classes across the region has provided extensive new data and understanding of the extent of vegetation. This has enabled sound planning to be undertaken at a regional scale for the first time, and provides a basis for future monitoring of trends in clearing, revegetation and connectivity.

The 1:25,000 mapping of native vegetation needs to be completed, and further mapping at a scale that is appropriate for detailed planning, ie. 1:5,000 scale, is desirable. A number of municipalities have been leading the way in undertaking this work as a sound basis for planning scheme overlays and local planning decisions. This action includes the mapping of native grasslands in the region which is a difficult but important task. Continued advances in the mapping are needed and strong coordination is required between State Government agencies and local government to ensure consistency, a complementary approach, and effective use of data in planning schemes to guide day-to-day planning decisions.

Action	Relevant targets	Completion date	Lead role	Key partners	Level of investment	
BA5	Assess and map the habitat hectare values of native vegetation in the region	BT3	2006	DSE	Local government, CMA	Medium

In addition to the mapping and assessment of extent of vegetation, there is a need to assess and map the quality of native vegetation in the region using the habitat hectare methodology or a simplified version. Implementation of this action will require a significant level of training to ensure that the assessment methodology is consistently understood and applied.

Action	Relevant targets	Completion date	Lead role	Key partners	Level of investment	
BA6	Increase the area and quality of heavily depleted vegetation types that are protected in parks/reserves or under covenant programs	BT4, BT6	Targets for vegetation types to be specified in the Native Vegetation	DSE	Parks Victoria, Trust for Nature, CMA, MW, some Local governments	High

The network of parks and public land in the region provides significant areas of protected native vegetation, but the amount needs to be increased in order to protect more of the heavily-depleted ecological vegetation classes. Similarly, programs that enable protection of native vegetation on private land, such as the Trust for Nature and Land for Wildlife programs, should be continued and expanded.

To achieve this action, there will be a need to think, plan and act laterally. It will not be sufficient to reserve or protect high quality remnant vegetation and ecosystems because, for some ecological vegetation classes, there is simply not enough of these areas. It will therefore be important to protect some degraded areas and focus efforts into restoring their quality, and/or to reserve some sites that are suitable for re-establishing locally indigenous vegetation

Action	Relevant targets	Completion date	Lead role	Key partners	Level of investment	
BA7	Develop and implement mechanisms to offset native vegetation clearance and achieve a net gain in habitat hectares	BT1, BT2, BT3, BT4, BT6	2005	DSE	CMA, Local government	Low

In deciding upon applications to clear native vegetation, the value of the remnant vegetation is assessed. In many instances, clearing will not be permitted in this region due to the depleted state of many of our ecological vegetation classes. However, given the high rate of urban development in the region, there will be some situations where clearing is permitted under certain conditions. The conditions will include the need to offset the clearance by making gains in the extent and quality of similar native vegetation elsewhere. For these situations, there is a need to develop and implement effective mechanisms to offset vegetation clearance so that net gain can be achieved at various scales. This should be undertaken with a view to achieving multiple benefits, for example salinity mitigation, development of vegetation corridors and enhancement of vegetation types that are heavily depleted.

Mechanisms to monitor the offsets are also required. A database should be developed to identify potential offset sites and to list and map offsets already undertaken.

Action	Relevant targets	Completion date	Lead role	Key partners	Level of investment	
BA8	Assess the risks to biodiversity from pest plants and animals, and establish integrated management programs to reduce the impact of environmental weeds and pest animals on native vegetation and fauna.	BT3, BT5	Risk assessment method developed by 2007	DSE	CMA, DPI, Parks Victoria, Local government	High

A robust methodology needs to be developed to assess the risks posed by pest plants and animals on our region's native biodiversity. This must include consideration of the impacts that weeds can have on certain vulnerable and depleted ecological vegetation classes such as grasslands.

At the same time, large-scale, coordinated programs are needed to deal with the impacts of environmental weed, pest animal and plant disease infestations on native flora and fauna on both public and private land. These programs must include a range of early intervention measures to prevent the introduction and establishment of new and emerging weed species. These large-scale programs must also enable cooperation and consistency between Government organisations, councils, the nursery industry and private landholders.

In addition, future reviews of the Regional Weed Action Plan priorities need to specifically consider environmental weeds and alignment is needed with noxious weed lists.

Threatened species

Action	Relevant targets	Completion date	Lead role	Key partners	Level of investment	
BA9	Develop and implement Biodiversity Action Plans, Flora and Fauna Guarantee Action Statements and recovery programs for threatened species and communities in the region's terrestrial and aquatic systems	BT5, BT7, BT8, BT9	2009	DSE	Parks Victoria, Local Government	High

Inherent in this action is the application of a rigorous methodology to assess whether species, communities and ecosystems are threatened and then to list and prioritise them.

There is a need for both a landscape-scale approach and an individual species approach for the protection and recovery of threatened species and their habitat. Existing programs that contribute to this include Biodiversity Action Plans that address areas of high biodiversity values, and flora and fauna action statements and recovery plans for individual species and communities. There is a need to expand and accelerate these programs which include on-ground actions and directions for further research.

Priority setting and decision making will benefit from improved data on the location, condition and status of threatened species and communities. Increased focus is therefore required on data collection and data management including its availability to land managers and decision-makers. Cooperation is also required between government and community monitoring programs undertaken by organisations such as the Field Naturalists, Birds Australia, the Bird Observers Club of Australia and Native Fish Australia.

Fire management

Action	Relevant targets	Completion date	Lead role	Key partners	Level of investment
BA10 Implement safe and environmentally beneficial fire management regimes in high risk areas	WT3, WT5, WT8, LT3, LT8, BT5	2005	DSE	Parks Victoria, CFA, Local government, EPA	Medium

This action recognises the complexity of fire management due to the occurrence of both risks and benefits associated with fire. Environmentally-beneficial fire regimes are very important for particular ecosystems and flora species. However, wildfire is a risk to ecosystems, water quality, agriculture, soil health, infrastructure, tourism, recreation and public safety, particularly in the large areas of forested uplands. Municipal planning schemes have a key role in ensuring land use is appropriate and considers the risks of fire. Prescribed fire regimes are used to manage fuel loads whilst community education campaigns can be effective in encouraging landholders to be prepared for fire and be able to take responsibility for their own safety.

Aquatic and marine biodiversity

Past research regarding the ecosystem processes of Port Phillip Bay, Western Port and the open ocean has highlighted key issues associated with maintaining their health. Some of the region's marine and estuarine waters have been the focus of significant research projects, such as the Port Phillip Bay Environmental Study, while other areas have had much less research attention.

There is a need to progressively improve our understanding of these environments and the links with processes that threaten them (such as the relationship between seagrass health and turbidity in Western Port).

A specific action (WA41) to continue investigations regarding marine ecosystems and the links with key threatening processes is included in Section 5.10 – Estuaries, Bays and Seas. Action WA41 reinforces the importance of continuing to improve our understanding of the key risks to the region's marine and estuarine waters, and continuing to improve our adaptive management of these risks in a timely and appropriate manner.

Additional actions (WA43, WA44, WA46, WA47, WA49, WA51, WA52) regarding coordination forums, water quality, nutrient and sediment management, stormwater management, dredging and marine pollution contingency plans are also included in Section 5.10 – Estuaries, Bays and Seas. All of these actions support the protection and enhancement of marine and aquatic biodiversity.

There are also two specific actions (WA42, WA53) regarding monitoring, evaluation and reporting on the health of the estuarine and marine assets in Section 5.10 – Estuaries, Bays and Seas. These actions seek to build on current monitoring and evaluation programs to establish a system to better identify key changes, indicate the health of our estuaries, bays and open seas, enable assessment of trends, gauge the effectiveness of our actions and determine future priorities.

All the actions mentioned above are complemented by the following actions that contribute directly to protecting and enhancing marine and aquatic biodiversity.

Action	Relevant targets	Completion date	Lead role	Key partners	Level of investment
BA11 Develop and implement action plans for the region's eight marine protected areas and other areas with special values	BT8	2008	PV and DSE	EPA, DPI, CCB, MW, CMA, Local government	High

The Government's establishment of Marine National Parks and Marine Sanctuaries provides strong protection for representative and unique elements of the region's marine ecosystems. The development and implementation of action plans associated with the eight sites in this region is now an important action. These plans must include consideration of the threats to the marine protected areas from the adjacent catchments.

In addition to the marine protected areas, nine "special management areas" have been identified in this region with particular values⁹³. An example is the seagrass at Clifton Springs in Port Phillip Bay which is an important area for the settlement of larval fish, including King George whiting, and shark but is threatened by declining water quality, introduced pests and physical damage from propeller scour and anchoring. The specific values in these nine areas, such as those at Clifton Springs, need to be protected. Some of the areas already have management regimes in place to do this, but this action aims to address those where adequate arrangements are not yet in place.

Action	Relevant targets	Completion date	Lead role	Key partners	Level of investment
BA12 Develop and implement Fishery Management Plans for the region	BT9, BT10	2009	DPI	EPA, DSE, Fisheries Co-Management Council, Victorian Aquaculture Council	Medium

The development of comprehensive Fishery Management Plans for all of the major fisheries in the region, including the bays and the region's rivers, is an important task. The plans will provide the over-arching policy and strategic planning framework to guide operations to ensure the fisheries are ecologically sustainable.

Allocation of fish stocks between the commercial and recreational sectors will be a key issue to resolve in order for these Fishery Management Plans to be developed and successfully implemented.

Complementing the development of the Fishery Management Plans and contributing to achieving sustainable fish stocks in this region, a number of other important actions are also required including:

- Encouragement for adoption of the voluntary Recreational Fishing Code of Conduct that has been recently developed through the peak body for Victorian recreational fishing VRFish
- Development of Best Practice Environmental Management Guidelines for key aquaculture sectors (guidelines for Salmonids and recirculated aquaculture systems have already been developed and guidelines for coastal abalone farming have been proposed).

⁹³ Marine, Coastal and Estuarine Investigation, Final Report, Environment Conservation Council, 2000

Action	Relevant targets	Completion date	Lead role	Key partners	Level of investment	
BA13	Develop and implement programs to prevent the introduction and spread of marine pests in the region	BT7, BT8	Develop and begin to implement by 2008	DSE	Parks Victoria, DPI, EPA, Local government, CCB	Medium

This action recognises exotic species as a key threat to the health and diversity of marine ecosystems, and seeks to minimise the introduction and spread of pest species.

The programs to prevent the introduction and spread of marine pests should include:

- implementation of measures to reduce the risks of marine pests being transported by small boats, as identified in the Boating Action Plan
- adoption of shipping practices to minimise the risks of pests being transported in ballast water and by hull fouling
- the adoption of best practices for the sterilisation of aquaculture farming equipment.

It is acknowledged that these environments and the species involved are inherently difficult to manage, and that initial monitoring will focus on 'response' indicators related to prevention arrangements.

Action	Relevant targets	Completion date	Lead role	Key partners	Level of investment	
BA14	Investigate and record the diversity of native freshwater fish species in the region and the extent and health of the populations, and establish links between this data and planning approval processes	BT5, BT7, BT9	2008	DPI, DSE	EPA, CCB, MW, CMA, Local government	High

A systematic research program is required to develop an improved understanding of native fish species populations, particularly in the freshwater environments of this region, including the extent of their habitat. The outcome of research and monitoring activities needs to be the progressive development of a central databank that brings together and makes accessible information from government agencies and other sources such as Native Fish Australia. Similar databanks already exist for native vegetation, birds and threatened species data. A further step will be to ensure the data can be linked to planning approval processes of local government to directly guide decisions that impact on waterways and biodiversity.

Urban biodiversity

Action	Relevant targets	Completion date	Lead role	Key partners	Level of investment	
BA15	Develop an inventory of urban biodiversity and undertake , research, community education and involvement campaigns to promote and pilot urban practices that contribute to the health of natural ecosystems	BT1, BT2, BT3, BT6, BT7	2008	CMA	Local Govt, DSE, Parks Victoria, Australian Research Centre for Urban Ecology	Medium

While the protection and enhancement of native biodiversity is critical, it is also important to encourage the intelligent use and management of introduced species, especially in this region that includes metropolitan Melbourne and important agricultural industries. There are existing programs of research into Melbourne's urban ecology, which could be expanded and integrated with catchment management programs for the region.

Community education and involvement campaigns must be developed to increase the understanding and awareness of urban communities and to minimise the impacts of urban practices on the natural biodiversity of the region. These programs could focus on the use of native species in gardens, pet management and weed management.

This action seeks to research and pilot ways for our region's substantial urban population including urban households, schools and businesses to get more in touch with our natural biodiversity and contribute to its protection and enhancement. Examples of innovative ideas might include:

- the involvement of urban residents in on-ground catchment projects in rural, urban and coastal areas
- the establishment of a "Friends of urban wildlife" network across Melbourne with the aim of helping urban families create habitat in their gardens for native fauna including birds butterflies and frogs
- policies and programs to reduce the impacts of pets on native biodiversity, such as for the management of domestic cats
- the availability of native animals as part of school education programs regarding our natural heritage.

This action, and the preliminary ideas that have been outlined, is acknowledged as a first step in a long-term program to better link catchment management with the diverse and populous urban community of this region.

7.8 Summary table

The following table summarises the translation of the goal for biodiversity through the steps of objectives and targets to actions.

Goal

Healthy and enduring ecosystems with a diversity of habitats and native species

Objectives

- BO1. Achieve a net gain in the quantity and quality of indigenous vegetation
- BO2. Maintain the diversity of indigenous habitats and species in terrestrial, aquatic and marine environments
- BO3. Achieve sustainable populations of indigenous flora and fauna species
- BO4. Improve the connectivity and long-term security of indigenous habitats and species
- BO5. Encourage intelligent use of introduced flora and fauna species with minimal impacts on indigenous habitats and species

Targets (pre-existing targets in Bold)

- BT1. The total extent of indigenous vegetation increased to at least 35% of the region by 2030
- BT2. At least 95% of the region's ecological vegetation classes (EVC) represented to at least 10% of their pre-1750 extent by 2030
- BT3. **A net gain in the quality and extent of native vegetation in the region**, with the total "habitat hectares" increased by 10% by 2030
- BT4. All ecological vegetation classes in the region to have at least 15% of their current extent protected by 2030
- BT5. Reduce the number of threatened flora species to less than 250 by 2030 and reduce the number of threatened fauna species to less than 100 by 2030, with no further regional extinctions
- BT6. Increase the connections between the region's fragments of native vegetation
- BT7. Increase the diversity of native species in modified landscapes and aquatic systems
- BT8. Achieve a net gain in the extent and quality of seagrass communities by 2020 and retain the extent of all other broad marine habitat classes in the region at 2004 levels
- BT9. No human-induced reduction in species diversity for the freshwater, estuarine and marine environments of the region
- BT10. Total annual seafood catch by both commercial and recreational fisheries to be maintained at ecologically sustainable levels

Actions (pre-existing actions in Bold)

- BA1. **Finalise and implement the regional Native Vegetation Plan including programs to protect, maintain or enhance existing high quality vegetation, increase connectivity and revegetate heavily-depleted native vegetation types**
- BA2. **Strengthen the controls on the clearing of native vegetation and ensure adequate implementation and enforcement**
- BA3. Undertake a program of education, training and support for local government and other organisations to achieve consistency in the understanding and application of operational guidelines for vegetation protection and other mechanisms to achieve net gain
- BA4. **Undertake further mapping of native vegetation extent at an appropriate scale to assist vegetation protection measures by State government, local government and community groups**
- BA5. Assess and map the habitat hectare values of native vegetation in the region
- BA7. Develop and implement mechanisms to offset native vegetation clearance and achieve a net gain in habitat hectares
- BA9. **Develop and implement Biodiversity Action Plans, Flora and Fauna Guarantee Action Statements and recovery programs for threatened species and communities in the region's terrestrial and aquatic systems**
- BA11. **Develop and implement Action Plans for the region's 8 Marine Protected Areas and other areas with special values**
- BA14. Investigate and record the diversity of native freshwater fish species in the region and the extent and health of the populations, and establish links between this data and planning approval processes
- BA6. **Increase the area and quality of heavily depleted vegetation types that are protected in parks/reserves or under covenant programs**
- BA8. Assess the risks to biodiversity from pest plants and animals, and establish integrated management programs to reduce the impact of environmental weeds and pest animals on native vegetation and fauna
- BA12. **Develop and implement Fishery Management Plans for the region**
- BA10. Implement safe and environmentally-beneficial fire management regimes in high risk areas
- BA13. Develop and implement programs to prevent the introduction and spread of marine pests in the region
- BA15. Develop an inventory of urban biodiversity and undertake research, community education and involvement campaigns to promote and pilot urban practices that contribute to the health of natural ecosystems