



NATURAL VICTORIA

Conservation Priorities for Victoria's Natural Heritage



NATURE CONSERVATION REVIEW 2014
Public Summary



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Victorian National Parks Association

An independent, non-profit, membership-based group, VNPA exists to protect Victoria's unique natural environment and biodiversity through the establishment and effective management of national parks, including marine national parks, conservation reserves and other measures. VNPA works by facilitating strategic campaigns and education programs, developing policies, conducting hands-on conservation work, and by running bushwalking and outdoor activity programs which promote the care and enjoyment of Victoria's natural heritage.

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Traditional Owners

The Victorian National Parks Association acknowledges the many Traditional Owners of Victoria's natural areas. Aboriginal people occupied Victoria for tens of thousands of years before their communities were decimated by European occupation.

This fourth VNPA Nature Conservation Review 2014 acknowledges the long history of Indigenous occupation, and respects the ongoing roles and responsibilities of Victoria's Traditional Owners in caring for country.

The review concentrates on the period since European occupation.

Photos & Maps

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Narrow-leaf Peppermint, Wombat State Forest. Photo courtesy Tibor Hegedis, Wombat Forestcare

FOREWORD

What an amazing place we live in! Deserts, grasslands, heathlands, dry forests, tall wet forests, alpine meadows, reefs and seagrass meadows are but some of the hundreds of beautiful and diverse ecosystems of which Victorians are custodians. The coastline is dramatic and we have the highest density of waterways on mainland Australia.

VNPA Nature Conservation Review 2014 draws on scientific, government and community sources to document the values of our natural heritage and the threats. It analyses conservation gaps and priorities and, most importantly, proposes thoughtful solutions to many of our most pressing problems.

Initiated in 2008, this report builds on previous nature conservation reviews, undertaken by the VNPA in 1971, 1987 and 2001. Compared to these earlier reviews, this report is broader in scope and more detailed. It is a reflection of how far we have come in understanding the complexity of our natural heritage, and it also highlights the complexity

Matt Ruchel
VNPA Executive Director



of the laws, rules, institutions and programs aimed at managing our impacts on the environment.

This review starts with an historical perspective, for many of today's problems are legacies of the past. This is not to lay blame, but to recognise that conserving Victoria's natural heritage is not just about managing the impacts of what we do now, but also the dramatic impacts 'European' settlement have had in the past. This ecological debt is profound in Victoria and one we need to address, particularly in the face of a changing climate, if future generations are to enjoy the bush as we do.

Importantly, the report dedicates a whole chapter to environmental governance: the system of laws, implementation mechanisms, accountability regimes, and institutional arrangements needed

to manage these challenges. There is no doubt that, while Victoria has made progress since the first nature conservation review in 1971, our current system of environmental stewardship is failing and we still have a huge amount of work to do. To address the gaps and flaws in this system, we have made 163 recommendations, some detailed, some big picture, focused primarily at the state level. Our aim is to encourage debate and action.

As a community-based organisation, the VNPA has been a voice for nature in Victoria for over 60 years. This report was a major undertaking, and could not have been completed without the generous support of the Dara Foundation and our many members and supporters. It has also benefited from many hours of volunteer input from scientists, community members and others. As with previous reviews it will guide our work, and hopefully the work of others, for at least the next decade.

Matt Ruchel
Executive Director
Victorian National Parks Association

There is no doubt that, while Victoria has made progress since the first nature conservation review in 1971, **our current system of environmental stewardship is failing and we still have a huge amount of work to do.**

ABOUT THE REVIEW

This is the fourth nature conservation review by the Victorian National Parks Association (VNPA). When the first review was published 42 years ago, just 1.2% of Victoria's land area was protected (to a limited extent), there were no marine protected areas, the management budget for national parks was \$141,000, and little was known about the state's biodiversity.

We know a great deal more now (although still surprisingly little about many aspects of biodiversity such as invertebrates), and about 5% of state waters and 14% of Victoria's land area are protected in the national park estate. But pressures on nature have also grown, far exceeding the progress made, and on current trajectories they condemn our seas, lands and fresh waters to growing

biological poverty and ecological dysfunction.

For this fourth review, VNPA commissioned seven expert reviews of Victoria's environmental history and conservation issues in marine, coastal, terrestrial and freshwater ecosystems. This report synthesises those reviews, supplemented by information from a wide range of other publications, and with recommendations developed by a VNPA reference group. The focus of reform is primarily the state government.

The objectives are to:

- review new information, knowledge and approaches to nature conservation and their applicability to Victoria

- identify priority areas for nature conservation and national parks
- review threatening processes and identify reforms to improve nature conservation in Victoria.

After a brief outline of Victoria's environmental history and major trends and drivers of environmental change, this summary focuses on values, conservation gaps and priorities, and future recommended directions for marine and coastal, terrestrial and freshwater ecosystems. It concludes with analysis of the flaws in environmental governance that underpin Victoria's failure to arrest environmental decline, and a summary of proposed reforms.



Short-headed Seahorse. Photo John Gaskell

SETTING THE SCENE

A short environmental history

Understanding the Victorian environment requires knowledge of its past and how it has been shaped by humans over more than 40,000 years of habitation. The following brief history focuses only on the short and turbulent period since European colonisation, less than 1% of the duration of Aboriginal settlement.

European colonisation, 1800-1970

1800s–1840s sealing and whaling:

The discovery of large fur seal colonies in the late 1700s brought sealers from Sydney and Van Diemen's Land to exploit the seals' fur and oils. But the industry drove itself to extinction by the 1830s, after almost exterminating fur seal populations. A similar pattern was followed by the whaling industry, which killed right whales migrating each winter from Antarctica. The industry ceased to operate from Victorian stations in the 1840s after whale populations crashed.

1834–1851 pastoral settlement:

Sheep grazing became the major industry in eastern Australia in the 1830s and 1840s due to demand from British textile industries. By mid-century, sheep and cattle were grazing over much of central and western Victoria. Early pastoralists regularly burned the land to clear it of scrub and promote fresh grasses. Degradation soon became apparent. The Port Phillip district gained a population of nearly 100,000 Europeans.

1851–1870 the gold era: Days after Victoria became a separate colony in 1851 gold was discovered, triggering a great rush. Gold took over from wool as the principal export industry, the state's population surged in 20 years to nearly 750,000, and Victoria became one of the world's wealthiest places. But it was at great environmental cost as creeks were



Looking from Pillar Point across Norman Bay towards Wilsons Promontory's Mt Oberon. Pillar Point was proposed as the site for a large 'chalet' in the early 1960s.

dammed and diverted, arsenic-contaminated tailings accumulated, and vast woodlands were stripped for timber for mining from deep shafts. Concern about timber losses drove the first efforts at forest conservation in the 1860s, and close to 400,000 hectares of timber reserves and state forests were set aside by 1874. Because of increased demand for food, agriculture expanded, also leading to large-scale

clearing. With arable land being converted to crops, pastoralism was pushed into drier areas. Harmful new plants and animals were introduced, including blackberries, foxes and rabbits. Manufacturing industries were established, and Australia's first large dam was built to service Melbourne.



Philip Crosbie Morrison, VNPA's first President and first Director of National Parks, (left) with members of the Mt Buffalo National Park's committee of management, 1957. Photo courtesy DSE Historic Places

1870–1901 selection laws, agriculture and marvellous Melbourne:

Under a series of selection laws in the 1860s to 1880s, land used for grazing was subdivided for small farms. By 1900, almost half of Victoria's land had been privatised and millions of hectares had been cleared. But fragile soils, low fertility and an irregular climate made survival tenuous, and many farmers were ruined in the 'federation drought' (1895–1902). Exacerbating the degradation was a great rabbit plague. With irrigation promoted as the solution for a dry climate, the state government took control of most waters, and the Goulburn (Eildon) dam was built. There was also large-scale drainage of wetlands. Victoria became increasingly urban, Melbourne reaching a population of half a million. Known as 'Marvellous Melbourne', it also earned the nickname of 'Smellbourne' due to industrial and human wastes pouring into open drains and rivers. Tower Hill became Victoria's first conservation reserve in 1866 and others followed

at Fern Tree Gully in 1882, and Mount Buffalo and Wilsons Promontory in 1898.

1901–1945: closer settlement, irrigation, forestry: Under various settlement schemes, large areas continued to be cleared. There were great efforts to develop irrigation, leading to allocation of more water than was available, and the area under crops more than doubled, to 3.8 million hectares by 1931. The 1930s brought massive dust storms due to large-scale clearing, rabbit plagues and damaged soils. As Melbourne's population exceeded 1 million, timber cutters worked their way into surrounding hills and mountains. The exploitation of brown coal as a cheap energy source enabled Victoria to maintain its position as a major industrial and manufacturing centre. But mounting concerns about the scale of exploitation stimulated some conservation advocacy, which led to the establishment of timber reserves, to provide for future timber use or to protect water catchments. As bird

protection and bushwalking became popular, naturalist and bushwalking clubs lobbied the government to preserve wilderness areas, and were instrumental in the establishment of national parks.

1945–1970 prosperity, technology and environmentalism: The boom period after World War 2 brought more degradation, but also a growing movement for environmental protection. Large-scale immigration and a high birth rate pushed the Victorian population to 3.5 million by 1971. Agriculture intensified, with more soldier settlement schemes, new technologies such as bulldozers and chainsaws, fertilisers and the damming or diversion of most of the state's rivers. A housing boom and woodchip exports drove increasing exploitation of forests. This led to the establishment in 1944 of a professional organisation, the Save the Forests Campaign, which became the Natural Resources Conservation League of Victoria. In 1952 the Victorian National Parks Association was created by



Victoria's faunal emblem, the Leadbeater's Possum. Photo Steve Kuitert

a federation of organisations, and it led advocacy resulting in a 1956 National Parks Act that more clearly defined and protected national parks, and established a state government agency to manage them. Probably the single most important trigger in the rise of environmental consciousness in Victoria was the successful campaign in the late 1960s to save the Little Desert from subdivision for farms. It led to the 1970 establishment of the Land Conservation Council (now the Victorian Environmental Assessment Council) to carry out investigations on the best use of public lands, which resulted in the declaration of many more national parks and other protected areas.

VNPA nature conservation reviews, 1971-2001

The three previous reviews – in 1971, 1987 and 2001 – tell the more recent history of European impacts on Victoria's environment, and are also themselves part of that history because of their influence on conservation reforms.

Nature Conservation in Victoria: A Survey (1971): At the time of the first review by Judith Frankenberg, only 1.2% of Victoria's land area was in protected areas, and little was known of their values or the status or biology of the state's

wildlife. The National Parks Act, which established a National Parks Authority, was only 15 years old. Prior to that, most national parks and nature reserves were managed by local committees, which often had to lease them for timber cutting and grazing to finance management. To assess the adequacy of the reserve system, Frankenberg compiled the first systematic description of vegetation communities in Victoria, listing 62 'vegetational alliances' and recording their distribution. About 40% were assessed as reasonably well protected, while 27% required 'urgent measures'. Frankenberg warned that it could be difficult to locate 'relatively undamaged examples' of some communities, especially grasslands. She compiled the first state list of flora and vertebrate fauna and their likely conservation status, and found that 39% of native plants were not recorded in any reserve. Highlighted threats included fire, fertilisers, invasive species, pollution, spear fishing, river improvement schemes, dams and grazing in alpine areas. The review recommended the establishment of large reserves in 11 regions and eight multiple-use national parks, the conservation of 11 other areas and extensions to eight national parks. It also advocated the establishment of marine reserves, particularly in coastal waters.

Nature Conservation in Victoria: Study Report (1987): The second

review, by Doug Frood and Malcolm Calder, assessed the adequacy of the reserve system and identified species and communities in need of further protection. By this time, the Land Conservation Council had completed the first round of regional studies and made over 4000 recommendations for the reservation of public land for different purposes. Most high priority areas identified in the 1971 review had been protected in national parks. Frood and Calder described major land uses and the extent of alteration in each of Victoria's vegetation provinces. They estimated that about 60% of the state had been cleared, a third of wetlands had been drained, and close to 80% of rivers and wetlands had been much modified. They reviewed major management issues such as fire regimes, timber harvesting, grazing, introduced species and disturbance factors. The issues and dilemmas they discussed still largely apply today. Lowland grasslands, grassy woodlands, mallee woodlands, saltbush shrublands, wetlands and riparian communities were in urgent need of conservation, they said.

Nature Conservation Review

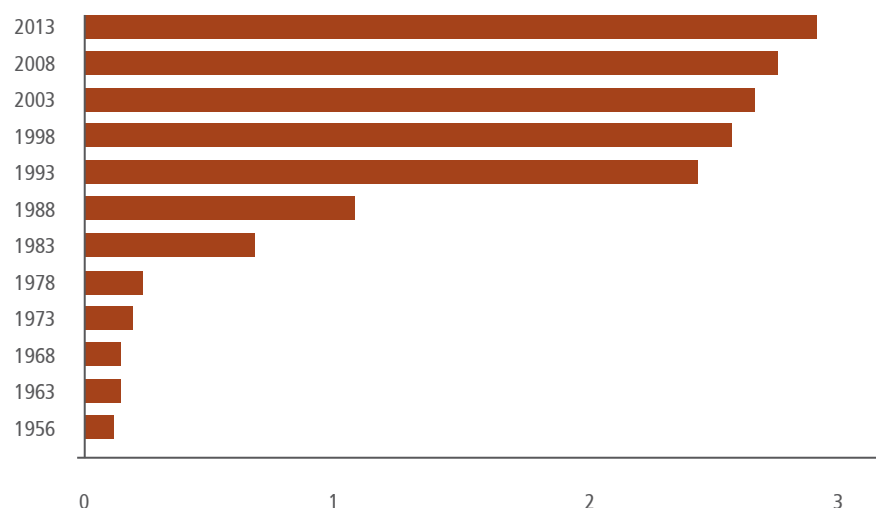
Victoria 2001: The aim of the third review, by Barry Traill and Christine Porter, was to identify gaps in the reserve system and conservation policies and programs, and recommend reforms to slow and reverse biodiversity losses.

Adapting to climate change will surely be Victoria's greatest challenge in the near-term future.

Clearing controls on private land, introduced in 1989, had reduced losses from about 15,000 hectares to 3000 hectares annually. But despite this and many other new measures such as the 1988 Flora and Fauna Guarantee Act, vegetation mapping and catchment management planning, Traill and Porter concluded that extinction processes were continuing largely unabated. Less than a fifth of ecological vegetation classes were adequately protected and more than half were threatened or extinct. High priority recommendations were to protect all vegetation remnants in highly fragmented landscapes and establish protected areas for south-western Victoria, riverine forests and woodlands, the Strzelecki Ranges, and box-ironbark woodlands and forests. Action was needed to address invasive species and climate change threats and impacts on freshwater systems. Only 600 hectares of Victoria's marine waters were then protected. The Environment Conservation Council (successor of the Land Conservation Council) had developed draft recommendations for a system of protected areas that Traill and Porter recommended the VNPA support in principle. But they criticised the process as overly influenced by economic considerations and insufficient to protect variation within bioregions. They recommended that 20% of each major marine habitat be protected within a minimum of two national parks in each bioregion, with integrated coastal zone management and more funding for management.

Progress since 2001: Although the

Growth of Victoria's terrestrial national park estate, 1956-2013 (millions of hectares)



majority of recommendations from the 2001 review have not yet been adopted, some important progress has been made:

- regulatory and policy reforms to reduce clearing (but clearing is expected to rise again with the 2013 weakening of these regulations)
- 13 marine national parks and sanctuaries, protecting 5.3% of state waters
- new national parks, including to protect box-ironbark woodlands, red gum woodlands, East Gippsland forests, grasslands and the Otways.

However, since the 2010 state election, many environmental reforms

have been reversed or abandoned, including a 2009 white paper for protecting biodiversity under climate change, completed at the end of a four-year process (*Securing Our Future: A White Paper for Land and Biodiversity at a Time of Climate Change*). Controls on land clearing, forestry, firewood collection and planning have been weakened, and national parks are being opened to damaging exploitation. The government reneged on creating Murray River Park in favour of allowing ongoing cattle grazing.



Close to 60% of Victoria's land area is used for agriculture. Of that about 80% has been cleared. Photo Yasmin Kelsall

Drivers and trends

There are many continuities in this nature conservation review with the findings of the three previous reviews. Victoria is still far from having a comprehensive, adequate and representative national park and conservation system, and most major threats to nature identified in past reviews, many initiated in the early days of settlement, are still very much with us – habitat loss and degradation, invasive species, harmful fire regimes, over-grazing, modified water flows and over-exploitation of natural resources. Several have intensified, and the speed, magnitude and types of change are increasing. As well as dealing with the legacies of a destructive past, Victorians must prepare for a more difficult future. Major drivers and trends – particularly rapid climate change, a growing population and intensifying land uses – increase the urgency of reforms to strengthen protections for nature.

Climate change: Already significantly affecting life in Victoria, high levels of atmospheric greenhouse gases will drive multiple cascading changes – in temperature and rainfall patterns, extreme weather events, sea level rise and ocean acidity – and exacerbate many other threats, particularly severe fire events and invasive species. Since the 2001 nature conservation review, Victorians have experienced the longest, hottest and driest period since European colonisation, and catastrophic fires. Fourteen of the past 17 years have recorded below-average rainfall and every year has been warmer than the 1961-1990 mean. Half of the 10 hottest years recorded in Victoria

have been this century. The extremes of recent times are consistent with climate change, and some patterns of change can only be explained by factoring in anthropogenic warming.

With the global failure to arrest greenhouse gas emissions – Victoria among the world's worst with its heavy use of fossil fuels – and continued warming inevitable, there needs to be a concerted effort to optimise the resilience of ecological and human communities and their potential for adaptation. Mitigating other threats to nature and expanding the national park and conservation system have become even more important. Adapting to climate change will surely be Victoria's greatest challenge in the near-term future.

Population growth: Victoria's burgeoning human population is the driver of many threats. Precious habitat remnants are being bulldozed for urban expansion or paved for roads. More people are emitting more greenhouse gases, consuming more natural resources (eg water and firewood) and introducing more invasive species. Victorians consume several times their equitable share of planetary resources. At the same time, a more indoor lifestyle is severing many Victorians from nature, undermining their health and wellbeing as well as interest in conservation.

Victoria's population has grown by almost a million over the past decade, reaching 5.8 million in 2013. By mid-century it is predicted to reach 8.7 million, which will add enormously to pressures on biodiversity, particularly

in the urban fringes. The impacts of a burgeoning population are exacerbated by levels of consumption that are also increasing.

Land-use intensification: The majority of land in Victoria, and much of the sea as well, is subjected to intense human exploitation. A major driver of change is increasing intensification of land-use, primarily for agriculture, which involves simplifying habitats and increasing inputs of water, fertilisers and pesticides. In Victoria, it has included the conversion of grazing lands to crops, the planting of 'improved' pastures (using introduced plants and applying fertiliser), the use of new technologies such as centre pivot irrigation (for which paddock trees and small buloke remnants are removed) and basalt rock crushing on the Victorian Volcanic Plains. Declining terms of trade for agriculture and aspirations to increase Australia's food exports are likely to drive further intensification. On the other hand, some former agricultural lands are being used for other purposes, including new types of production (such as timber plantations), lifestyle properties and nature conservation and restoration.

Close to 60% of Victoria's land area, about 13 million hectares, is used for agriculture and about 80% of this area has been cleared. Conventional farming practices – clearing, cultivation, irrigation, grazing, spraying, fertilising – have caused the greatest ecological damage in Victoria, and any intensification of these practices is likely to have further conservation consequences.

Victoria's National Park and Conservation System



Victoria's national park and conservation system

The greatest progress in Victorian conservation has come from according public lands and waters a high level of conservation security in the national park estate. Although it is fairly extensive, this estate is far from comprehensive, adequate and representative, mainly because of the early privatisation of land in the most productive landscapes for agriculture.

There are many public land and marine tenures that imply management for conservation, but only properties listed in schedules 2, 2A, 2B, 7 and 8 of the National Parks Act or as reference areas under the Reference Areas Act have a high level of protection from most forms of exploitation and strong requirements for conservation management. In this report, the 'national park estate' refers only to this category of highest security protection. It covers about 14% of Victoria's land area and 5% of state marine waters.

A second tier of protected areas, also part of what is referred to here as the 'national park and conservation system', includes properties in schedule 3 of the National Parks Act, certain categories under the Crown Lands (Reserves) Act and Wildlife Act, and private properties with covenants

Marine: National Park Estate	Number	Area (hectares)	Percentage of the state
Marine national parks	13	52,241	5.2
Marine sanctuaries	11	864	0.1

Terrestrial: National Park Estate	Number	Area (hectares)	Percentage of the state
National parks	45	2,901,284	12.8
State parks	26	157,825	0.7
Wilderness parks	3	200,699	0.9
Reference areas ⁽¹⁾	54	25,392	0.1
Subtotal	128	3,274,528	14.4

Terrestrial: Other Conservation Properties	Number	Area (hectares)	Percentage of the state
Public: eg nature conservation reserves	2,775	526,041	2.3
Private: Conservation Trust Act properties	1,330	93,456	0.4
Subtotal	>4,000	595,033	2.7

Marine and Terrestrial: Total National Park and Conservation System	Number	Area (hectares)	Percentage of the state
Terrestrial total	>4,000	3,901,941	17.2
Marine total	24	53,776	5.3

Sources: Federal Department of the Environment (CAPAD 2012), Victorian Department of Environment and Primary Industries (Public Land Management spatial data 2013), Trust for Nature (2014). Note: (1) There are additional reference areas that overlap with other protected area categories.

and other forms of protection under the Victorian Conservation Trust Act. They cover about 3% of the state.

Other tenure types lack sufficient

security or permanence or do not require a sufficient focus on conservation management to be counted here as genuinely protected.



MARINE & COASTAL ECOSYSTEMS

Values

The wild beauty of Victoria's southern edge draws millions of visitors each year – to stroll on beaches and peer into rock pools, to watch seabirds riding coastal breezes and shorebirds probing sand and mud for prey to fuel up for their flight to the northern hemisphere, to surf and paddle, to explore underwater reefs and sponge gardens. The multiple attractions reflect the great diversity of habitats – sandy and muddy flats, estuaries, saltmarshes, cliffs, rocky reefs, seagrass meadows, kelp forests, among many others – inhabited by a multitude of life forms, many unique to Victoria.

The biological richness and uniqueness of Victoria's marine environments come from 80 million years of geological isolation, a lack of mass extinction events, and a high density of different habitats within a relatively small area. Several oceanic influences intersect in Victorian waters, placing them at the confluence of three biogeographic provinces, reflected in the mix of species shared with western, eastern and southern oceans. Although Victoria's state waters account for less than 0.1% of Australia's exclusive economic zone, 8% of national bioregions are represented, a reflection of habitat diversity. The terrestrial coast also has high habitat diversity, featuring six national bioregions and 10 subregions. The coast (defined here as the land within 500 metres of the shoreline) has 95 vegetation types (ecological vegetation classes), almost one-third of Victoria's total, 34 of them unique to the coast. The wetlands,

sandflats and mudflats merging with beaches, sand dunes, cliffs and shore platforms on Victoria's coastline provide many different habitats for coastal plants and animals, and are strongholds for shorebirds.

Australia's southern waters, particularly those in the southeast, are more species-rich than most other temperate seas worldwide and host many more unique species than the more celebrated Great Barrier Reef. The level of uniqueness in many marine groups is close to 90%, and diversity is particularly high in seaweeds, animals living in soft sediments on the sea bottom, hydroids, sea mosses and sponges. Southern Australia has the highest level of seaweed endemism (62%) of any region globally, as well as the highest species richness, with more than 1150 species. Seaweeds have additional high value because, along with seagrasses, they are the main primary producers in marine waters and serve as food, habitat and predator protection for many animals. Sponge diversity and endemism are also exceptional, Victorian waters hosting more than a third of Australia's described species.

In 2002, following a decade of environmental campaigning, Victoria became the first place in the world to implement a biologically representative system of marine protected areas, declaring 13 marine national parks and 11 marine sanctuaries encompassing about 5.3% of state waters. A greater but less representative proportion of the coast is securely protected, with about 37% of the area from the

shoreline to 500 metres inland in the national park and conservation system. In 1881, the Victorian government had shown great foresight by reserving a narrow strip of crown land along almost the entire coast, 96% of which remains in public ownership, although under multiple management arrangements, some incompatible with conservation. Five wetland sites of global significance recognised under the Ramsar Convention are found on or near the coast.

Threatened biodiversity: Many marine and coastal species have become much rarer due to human impacts. More than 180 are considered threatened (listed on government advisory lists). Threatened marine species include 17 invertebrates, 10 seabirds and five mammals but the status of most marine life, particularly marine invertebrates, is poorly known. Coastal species considered threatened include more than 30 plants and more than 30 birds. Only about half the species on threatened species advisory lists have been formally listed under legislation, and only about half of these have action statements to guide recovery efforts. Just two marine and three coastal ecological communities are formally listed as threatened but almost two-thirds of ecological vegetation classes within 500 metres of the shoreline are informally classed as threatened. Marine communities are poorly documented, with no equivalent to the ecological vegetation class classification used for terrestrial communities.

▮ **Australia's southern waters, particularly those in the southeast,** are more species-rich than most other temperate seas worldwide and host many more unique species than the Great Barrier Reef.



Juvenile Scalyfin shelters under a rocky reef. Photo John Gaskell

Conservation gaps and priorities

Strengthening protection for marine and coastal ecosystems is essential not only to protect biodiversity from multiple current threats but also to foster their resilience and adaptation to rapid climate change. Marine and coastal habitats are among the most vulnerable to climate change. With the East Australian Current strengthening, southern Australian waters have been warming very rapidly.

Knowledge: Knowledge of biodiversity and ecology is essential for management of any environment but is particularly lacking for Victoria's marine habitats. Even for the national park estate, one of the serious threats highlighted in government assessments is limited knowledge of important ecological processes. With much of Victoria's marine biodiversity yet to be described, and some yet to be discovered, marine taxonomy requires a considerable boost. At the current level of investment, it will take many decades to gain a comprehensive inventory of Victoria's marine life, and species

could be lost before they are even identified. We need a program of systematic data collection, with field sampling and taxonomic support, to identify rare and threatened biodiversity. The state of knowledge is too rudimentary to be able to predict with certainty the ecological implications of many changes occurring in the marine environment. Apart from species exploited for fishing and aquaculture, little is known even about the basic biology and ecology of most marine life.

A systematic approach through the development of a marine and coastal research strategy and action plan is needed to address knowledge gaps and improve linkages between research and management priorities. Long-term research and monitoring programs are needed to establish the extent and state of marine biodiversity. More effective dissemination of information is essential to improve marine and coastal protection, planning and management.

The national park and conservation system: As a high priority, Victoria

needs an independent inquiry into marine and coastal biodiversity to recommend new areas for protection to achieve conservation of biodiversity and maximise resilience to current and looming threats. It is more than a decade since a network of highly protected areas was established in 5.3% of Victorian waters. A gap analysis conducted for this review shows they are inadequate to protect the values they were established for and to achieve the goal of a comprehensive, adequate and representative network. Bioregional priorities for increased protection have been identified in this review.

The past decade has also brought compelling evidence that a substantially larger network is needed to protect biodiversity and ecological processes and to foster ecosystem resilience, a growing imperative in the face of climate change. Many ecologists now consider that strict protection of 30% of marine ecosystems is the minimum needed, which is consistent with the level of 'no take' protection in the Great Barrier



Reef Marine Park. There are various lines of evidence to support this, such as experiments showing that intact habitats are more resistant to biological invasions, and observations that organisms in protected areas suffer from less disease and trophic cascades.

Substantial coastal areas with important natural values, including endangered vegetation communities, lack effective protection due to development pressures, insecure tenure and inadequate management. Subregional priorities for increased protection have been identified in this review, which can be achieved by upgrading protection for crown land reserves; buying, leasing or covenanting private land; and improving land zonings. The aim should be to securely protect all existing remnant vegetation, a relatively small area with extremely high values under extreme pressures. A coastal private land conservation program is needed to fund high-priority acquisitions or leases of private land. A public acquisition overlay could be considered to protect high-priority private land from development and give the government first option to buy when properties are offered for sale.

Victoria's protected areas need science-based, dedicated management. A 2011 audit by Victoria's auditor general found major deficiencies in management of the marine estate – 'little management activity is evident', it declared. All recommendations from that audit should be implemented, informed by advice from a 2014 report by the Victorian Environmental Assessment Council. Coastal reserves – many lacking management plans and highly vulnerable to developmental

pressures, invasive species and unregulated recreation – also need better management.

Bays, inlets and estuaries: The many wriggles in Victoria's coastline and a high density of coastal waterways have endowed the state with a multitude of diverse bays, inlets and estuaries of immense value to both humans and wildlife. At the intersection of freshwater and sea water, estuaries are a dynamic transitional environment, linking catchments to marine environments and affected by conditions both in local catchments and far upstream. Most have been modified and degraded due to catchment degradation, changes to freshwater inflows, coastal urbanisation and alteration of estuary entrances.

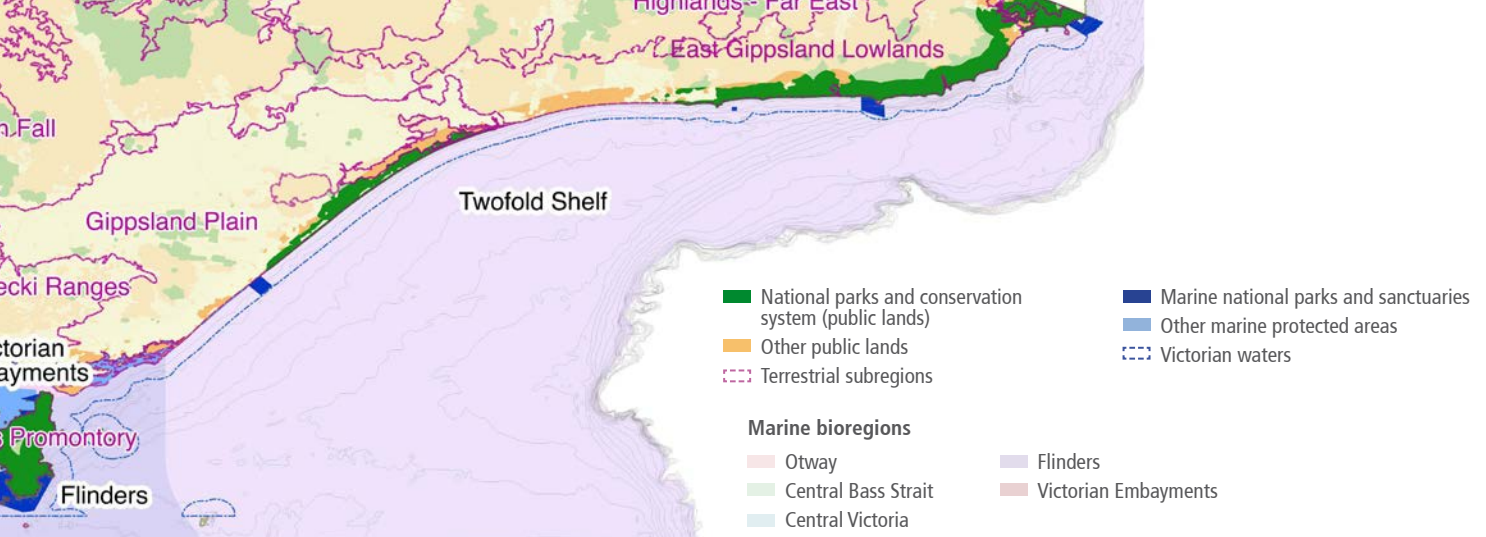
With very high values and threats, Victoria's bays, inlets and estuaries warrant a special conservation focus. The two largest, Port Phillip Bay and Western Port, which have internationally significant values at risk from major industrial enterprises and catchment pressures, should be managed by an independent authority. Getting serious about the ecological health of Victoria's bays and inlets requires a program with clear measurable improvement targets, monitoring and public reporting, including a regular 'state of the bays' report. Other recommended measures are a state environment protection policy for estuaries and a shorebird protection strategy.

Ecosystem-based management: Marine management is plagued by shortcomings arising from a predominant focus on single sectors (fishing, boating, mining) and single species. The complex interconnectedness of marine environments requires a more

holistic focus on ecosystems and ecological processes. One of the main goals of ecosystem-based management is to build ecological resilience – to sustain or restore the capacity of ecosystems to resist, buffer or recover from impacts of climate change and other pressures. Although governments have accepted that an ecosystem approach is essential, there are few examples of implementation. A new overarching legal and policy framework and a marine and coastal authority with the mandate to achieve this outcome are needed. Integration between marine and coastal management can also be fostered by preparing regional marine and coastal plans, aligning coastal regional boundaries with those of catchment management authorities and improving links with regional catchment strategies.

Coastal protection and restoration:

As the interface between land and sea, where many different landforms and oceanic influences meet, Victoria's coast is naturally a dynamic and diverse environment. As the most popular zone for living and recreating, Victoria's coast is also under much pressure, placing at risk much of what lures people there. With climate change already impacting coastal nature and much more change inevitable, 'resilience' and climate 'adaptation' need to become much more than buzzwords. Essential to this are easing existing pressures (due to development, invasive species and bushfires among others) and restoring natural habitats. As a starting point, objectives to foster resilience and adaptation should be included in Victorian planning provisions and planning framework, complemented by changes to coastal statutory zoning and overlays to provide for in



situ protection of coastal habitats for as long as possible and assist inland retreat as sea levels rise.

Coastal habitats are being burdened by an accumulation of infrastructure – roads, tracks, car parks, buildings and utilities – that compromise natural, scenic and recreational values. Much of it is unnecessary or could be sited elsewhere. An independent review of infrastructure adjacent to the coastal national park and conservation system should be commissioned, with the aim of relocating, removing or better managing it to minimise impacts on natural values.

Governance structures and processes:

Victoria's governance structures and processes are too disparate to achieve the state's goals for marine and coastal management. Reforms proposed here include new laws to implement ecosystem-based management and ecologically sustainable development – a Victorian Marine and Coastal Planning and Management Act – and a marine and coastal strategy, with subsidiary marine and coastal plans. To provide oversight and integration, an independent authority – a Victorian Marine and Coastal Authority – should be established to absorb and expand the functions of the existing Victorian Coastal Council, with regional marine and coastal boards to replace the existing coastal boards. Transparent decision-making and meaningful community participation are also essential to sound governance.

Biosecurity: Current approaches to invasive species tend to be the opposite of ecosystem-based management – more reactive than proactive, mostly focused on a few harmful species, and prioritising short-term commercial

interests over long-term ecological health. The well-accepted prevention-first hierarchy needs to be comprehensively applied, by requiring risk assessment of all introductions, conducting surveillance and responding quickly to new incursions. Ecosystem-based management requires bolstering resilience to invasive species impacts (eg by restoring predators and reducing nutrient enrichment). In a 2011 audit of marine protected areas management, Victoria's auditor general found that the environment department was ill-prepared and underfunded to respond to new incursions of invasive marine species. A marine pest biosecurity plan, with a strong prevention focus, should be a high priority.

Fishing: Although a requirement for ecosystem-based management is recognised in some Victorian fisheries, there has been no rigorous evaluation of the ecosystem effects of fishing, and knowledge of ecosystem processes on which to base evaluations is largely lacking. Criteria to assess the ecological sustainability of all fisheries, whether commercial or recreational, should be developed, and site-specific ecological risk assessments conducted. The introduction of ecosystem-based limits – such as the abundance of particular functional species in fished ecosystems – is a partial solution to the difficulties of insufficient knowledge. Reducing fishing pressure on some targeted populations is needed to buffer ecological communities against other disturbances. For example, maintaining healthy populations of large adult rock lobsters, which are efficient predators of long-spined sea urchins, can help prevent the destruction of giant kelp marine forests by the urchins. Ecosystem-

based management also requires better protection of habitats critical to targeted species (such as fish nurseries and important feeding grounds) and whole-of-catchment programs to improve water quality and protect coastal habitats.

There is little monitoring or management of the impacts of recreational fishing, even though the recreational catch for several species is similar to or exceeds the commercial catch, and pressures on some species and ecosystems are substantial. With about half a million participants, recreational fishing pressure in Victoria has surged, and enforcement of regulations is difficult and hamstrung by too few resources. Recreational fishers typically discard most fish they catch, retaining a few favoured species. The impacts on discarded species could be substantial, particularly for rare or declining species. High priorities include conducting surveys and monitoring to assess impacts on target and non-target species and habitats, improving enforcement, and allocating a substantial proportion of funds collected by sale of recreational fishing licences to habitat management.

Other impacts of potential high or moderate risk, such as animal entanglements with lost fishing gear, death or injury of animals due to boat strikes, the spread of invasive species and fish stock enhancement, need to be identified and addressed. Examples of measures needed to reduce risks are phasing in the use of biodegradable hooks and fishing lines, requiring all stock enhancement proposals to be subject to public environmental impact assessment, and prohibiting the transport of live invasive species as bait.

Overview of future directions

This is a brief summary of some of the review's major recommendations for marine and coastal ecosystems.

Research and information sharing

- Prepare and implement a marine and coastal research strategy and action plan.
- Establish a long-term scientific research and monitoring program, which includes a systematic biodiversity assessment program, for marine national parks and sanctuaries and other coastal and marine environments.
- Establish a marine and coastal research and information service to address high priority knowledge gaps, promote the value of research, and function as a clearing house for information and advice.

National park and conservation system

- Commission the Victorian Environmental Assessment Council (or other credible independent body) to conduct an inquiry into marine and coastal biodiversity to recommend areas for new or expanded marine national parks and sanctuaries. The latest science and expert opinions, taking into account the threats to Victorian ecosystems, suggest that targets should include 30% of each habitat type in marine bioregions and 100% of remnant coastal vegetation, habitats of threatened species and special features such as Ramsar wetlands.
- Implement all outstanding recommendations from the 2011 inquiry by Victoria's auditor general into the environmental

management of marine protected areas.

- Establish a coastal private land conservation program with a fund to buy, lease or covenant private land abutting coastal conservation reserves, coastal crown land reserves or the high water mark for protection and restoration.
- Strengthen protection of coastal crown land reserves for conservation and public purposes by developing coastal management plans and applying a zoning scheme to coastal reserves consistent with the recommendations of the Land Conservation Council (1978).

Iconic bays and inlets

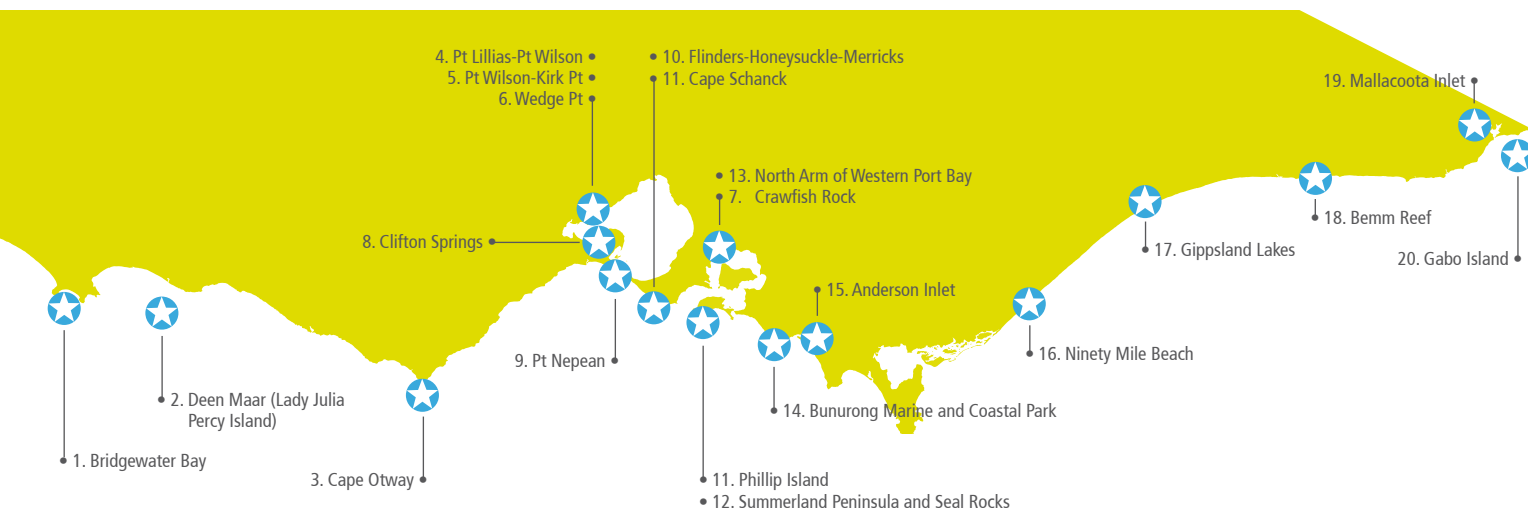
- Establish a Two Bays Board for strategic oversight of the health of Port Phillip and Western Port and their catchments.
- Produce a five-yearly State of the Bays report.
- Develop improvement targets for bays and inlets with water quality, ecosystem health and open space and recreation criteria. Link the targets to statutory planning instruments and controls on future development.
- Set up a scientific monitoring program to publicly report on progress towards the bays and inlets improvement targets on a two-yearly basis.
- Develop a state environment protection policy for estuaries.
- Establish the boat carrying capacity of Port Phillip Bay, Western Port and other bays and estuaries in Victoria, and set limits on boat numbers consistent with their carrying capacity.

- Develop a shorebird protection strategy.

Marine and coastal management

- Develop a Victorian Marine and Coastal Planning and Management Act as a basis for implementing ecosystem-based management of all marine and coastal waters.
- Establish a Victorian Marine and Coastal Authority and regional marine and coastal boards.
- Require that all coastal catchment management authorities have at least one-third of their board members with coastal or marine expertise.
- Merge many of the small committees of management along the coast into combined community committees of management.
- Develop a Victorian marine and coastal strategy, coordinated by the Victorian Marine and Coastal Authority, to provide an overarching framework for ecologically sustainable, ecosystem-based management of all human uses and impacts affecting Victoria's seas and coast.
- Prepare and implement regional marine and coastal plans. Include strategies to prepare for the impacts of climate change on coastal and marine ecosystems by identifying areas at risk and measures to limit damage and promote adaptation.
- Develop ecosystem-based management plans for marine and coastal invasive species threats, including a strong focus on prevention and rapid responses to new incursions.

20 priority areas for marine conservation



Coastal protection and restoration

- Expand and strengthen the BushBroker, CoastalTender and saltmarsh protection projects.
- Commission an independent review of infrastructure within and adjacent to the coastal national park estate and crown land reserves with the aim of relocating or removing unnecessary infrastructure or better managing it to minimise impacts on natural values.
- Establish a Coastal Infrastructure Unit to ensure that coastal infrastructure is assessed, designed, constructed and maintained within the principles of ecologically sustainable development and ecosystem-based management.
- Foster climate change adaptation by identifying where coastal settlements and nature can move to as a result of sea level rise, and reviewing the zoning and conservation status of all identified priority areas. Include in the Victorian planning provisions and planning framework an objective to

assist adaptation and retreat, and amend coastal statutory zoning and overlays to aim for in situ protection of coastal nature for as long as possible and assist inland retreat as sea levels rise.

- Introduce a new vegetation restoration overlay to the state planning provisions, to protect a 100-200 metre buffer around coastal crown land.

Fishing

- Implement ecosystem-based management of commercial and recreational fisheries: declare 'key fishery habitats', implement whole-of-catchment plans to maintain coastal habitat and water quality, establish criteria for ecological sustainability of individual commercial and recreational fisheries, and conduct location-specific ecological risk assessments.
- Develop a policy framework to follow up and manage important risks uncovered in environmental risk assessments.
- Monitor the community ecology

of important benthic and pelagic ecosystems.

- Assess the recreational fishing catch and impacts, including by conducting large-scale surveys of participation and catch every three to five years, requiring all recreational fishers to be licensed, conducting fisheries-independent monitoring for key recreational species, re-establishing annual trawl surveys of Port Phillip Bay, and investigating the impacts of fishing discards on declining target species.
- Improve enforcement of fishing laws, with a strong focus on protecting marine national parks and sanctuaries from illegal fishing.
- Require all stock enhancement proposals to be subject to a public environmental impact assessment, prohibit the transport of live invasive species as bait, and phase in the use of biodegradable hooks and fishing lines.
- Allocate a substantial proportion of fishing licensing fees to support long-term fish habitat recovery projects.

TERRESTRIAL ECOSYSTEMS

Values

From sprawling salt-sprayed coastal scrubs to high alpine herbfields, from grasslands and heathlands of intricate beauty to rainforests of mossy lushness, from stunted mallee woodlands to wet eucalypt forests of towering grandeur, Victoria offers an abundance of natural diversity and beauty. The state's 23 million hectares of climatically, geographically and geologically diverse landscapes are inhabited by a multitude of different life forms.

The state spans two of six climatic zones and 11 of 85 national bioregions, and has more than 300 vegetation communities (ecological vegetation classes). Australia is recognised as one of the world's megadiverse countries, and on the 3% of land area constituting Victoria are some 80,000 to 100,000 species, including about half of Australia's

bird species, more than a quarter of its mammals and lichens, and about a fifth of its vascular plants. There are many species yet to be identified or described, particularly invertebrates (animals without backbones), fungi and non-vascular plants (mosses for example). The majority of species are small and overlooked – the likes of insects, worms and fungi – but their ecological importance is immense. About 10% of plants and hundreds of invertebrates are unique to the state. Several hundred fungi are also likely to be endemic but only a fifth or so have been scientifically named.

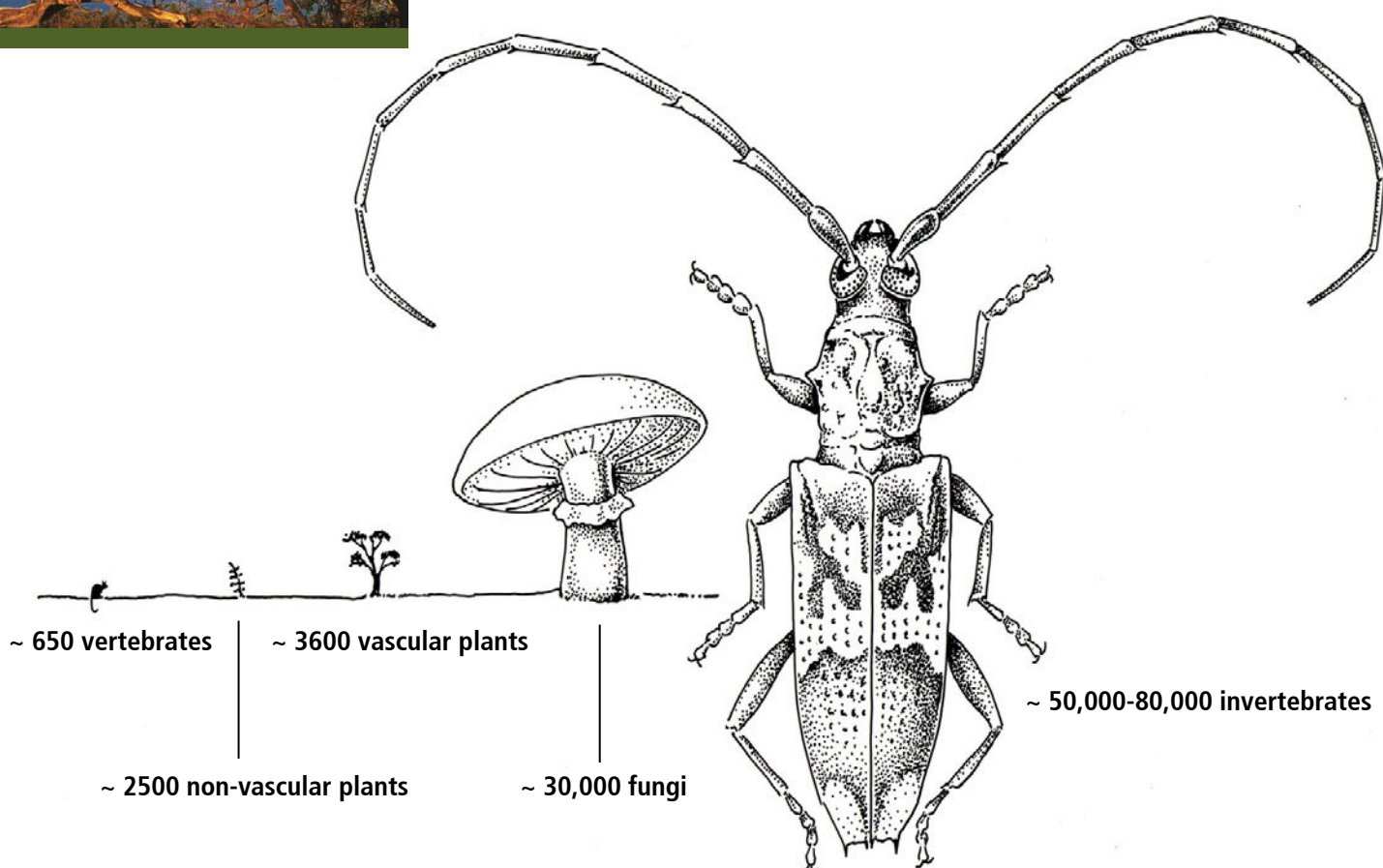
As well as the intrinsic value of each component of Victoria's biodiversity, many species and ecological communities have great value for their contribution to ecosystem services. Mountain ash forests, for example, have the highest known biomass carbon density in

the world, of value for mitigating global warming; native insects, birds and mammals provide pollination services; worms and many other soil organisms maintain productive soils; and natural places offer great recreational opportunities and aesthetic pleasures. These numerous services of value for humans are poorly documented and appreciated.

Of tremendous environmental, social and economic value is the 17% of Victoria's land area in the national park and conservation system. About 1300 plant species and 180 animals are known only from national parks, and in fragmented landscapes parks often protect the last remaining large areas of natural vegetation. Although the area of private lands securely protected is small (about 100,000 hectares), they have particularly high value in largely cleared regions where national parks are scarce.



Victorian native grasslands. Photo: It's a Wildlife



Relative numbers of native species in Victoria represented by size

The size of the images is proportionate to the relative number of species in Victoria, an estimated 80,000-100,000.

Places recognised for outstanding biodiversity values include the Australian Alps as one of 11 Australian centres of plant endemism, and the Victorian Volcanic Plain as one of 15 national biodiversity hotspots, due to its combination of high values and high levels of threat.

Victoria specialises in giant trees, with the tallest flowering plant in the world, mountain ash, found only in Victoria and Tasmania. Large old trees are immensely important habitats, providing shelter and nesting sites for more than 40 species of cavity-using vertebrates and food (fruits, flowers, leaves and nectar) for many more, creating micro-environments with high levels of soil nutrients and plant species richness, playing a crucial role in local hydrological regimes, and storing large quantities of carbon.

Threatened biodiversity: Victoria's terrestrial ecosystems have suffered grievous losses: more than 80 species

extinct, more than 1000 threatened and another 1000 or so rare, near threatened or with their status unknown (according to government advisory lists). About a fifth of Victoria's terrestrial vertebrates (mammals, birds, reptiles, frogs) and plants are threatened, as are more than half the state's ecological vegetation classes. Eleven ecological communities are listed nationally as endangered or critically endangered.

Mammals have suffered the greatest losses, with 19 species extinct and another 19 threatened. The losses affect not only these species, but many ecosystem functions, with consequences for forest health, vegetation structure and composition, and soil quality. But many animals extinct in Victoria are not extinct Australia-wide, offering potential for future recovery of species and their ecosystem functions if exotic predators can be controlled and habitats restored.

The need for habitat restoration is highlighted by the fact that about 40% of Victoria's land vertebrate species are totally reliant on fragmented landscapes. Conservation attention should extend beyond rare and threatened species, as some widespread species are also at risk of decline – monitoring of greater gliders in the Central Highlands recorded annual declines of 8.8% over 12 years – and maintaining their abundance may be important for ecological processes such as seed dispersal and pollination, for food webs, for structure and biomass in ecosystems and for variance in species richness.

Gaps and priorities

With less than half the land retaining original vegetation and only a quarter with largely intact vegetation, major challenges lie ahead to avert further degradation and loss of biodiversity and restore health to Victoria's landscapes. For a great many reasons – ecological, economic, social and moral – this mission is worthy of a concerted state-wide effort. A great many Victorians are contributing to the effort in multiple ways. Over large areas, the damage has been severe – due to extensive land clearing and logging, a multitude of invasive species and damaging fire regimes in particular. With climate change already pushing out the extremes of drought and fire, now is the time to do as much as possible to mitigate threats, foster resilience and facilitate adaptation.

National park and conservation system: Expanding the national park and conservation system is more important than ever as a core conservation strategy. About three-quarters of Victoria's subregions remain poorly protected, with fewer than half their ecological vegetation classes meeting the reservation targets adopted in this review, shown in the table above (see map next page). Because of the historical tendency to establish national parks in 'leftover' areas – mostly rugged, dry or infertile land not favoured for development – the most cleared subregions of Victoria generally have the lowest proportion of native vegetation in protected areas, the highest numbers of endangered vegetation communities and high rates of private land ownership. Of the 10 subregions with more than 30 endangered ecological vegetation classes, all except one have more than two-thirds of land area in private tenure.

The state government should commission a state-wide assessment by the Victorian Environmental

The Nature Conservation Review Reserve Targets

Status of ecological vegetation class	Nature conservation review reserve targets
Extinct	Rehabilitate, revegetate, and reserve
Endangered	90% (preferably 100%) of remaining extent
Vulnerable	60% of remaining extent, 90% in fragmented bioregions
Depleted	60% of remaining extent, 90% in fragmented bioregions
Rare	90% (preferably 100%) of remaining extent
Least Concern	30% of remaining extent, 50% in fragmented bioregions
Coastal	100% of remaining extent within 500 metres of the coastline

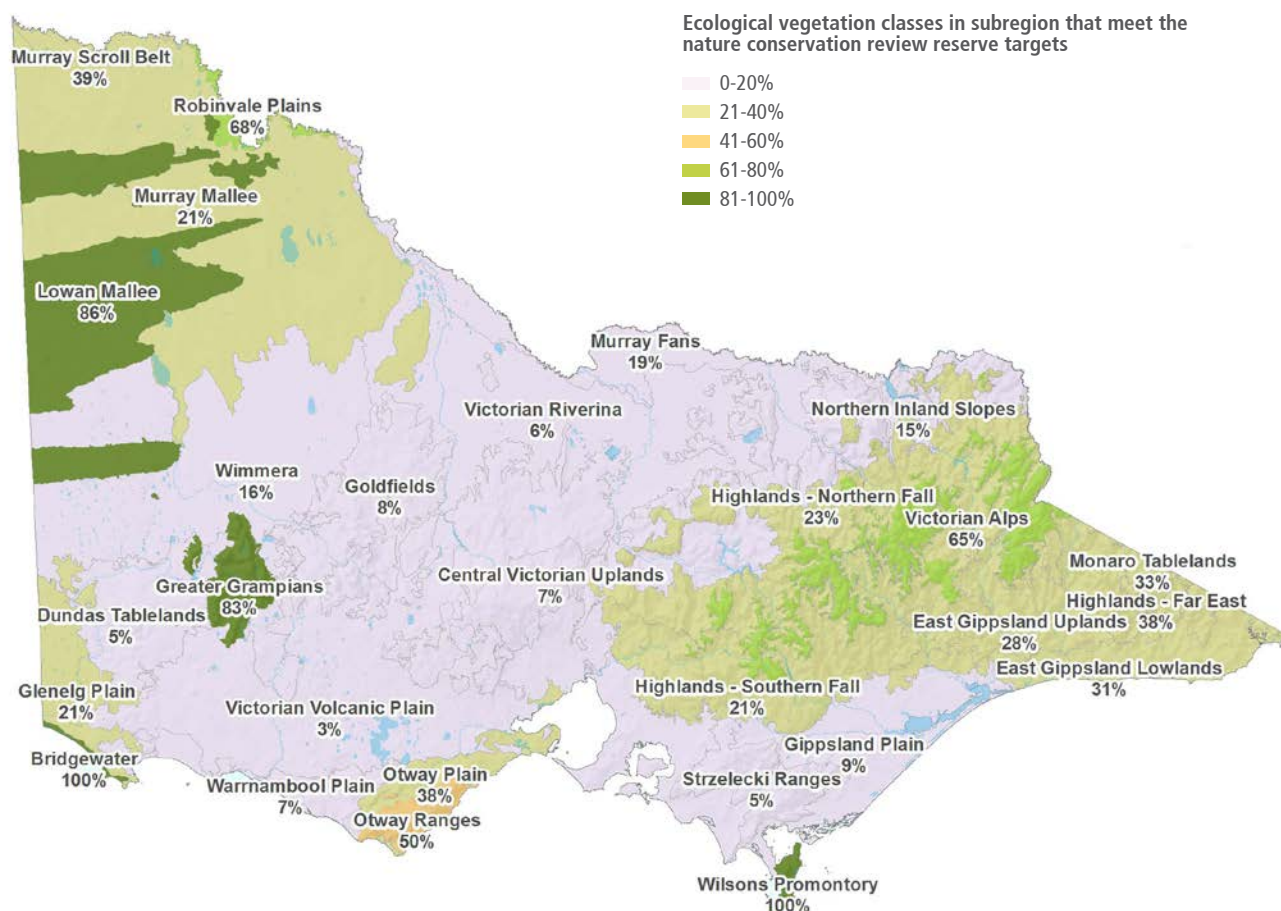
Assessment Council to determine the most efficacious way to achieve a comprehensive, adequate and representative system on both public and private lands. This will require secure and permanent protection of an additional 3 million hectares, about half of which can be achieved on public land. VNPA has identified five priority clusters for expanding protection, based on their poor representation in the national park and conservation system, and current threats and opportunities (see page 47).

The gap analysis shows the importance of private land conservation in Victoria. To achieve the reserve targets will require a strong focus on perpetual conservation covenants and purchases for the public estate. The contribution of private landholders to Victoria's conservation estate is small but growing rapidly. Private land conservation will be greatly aided by the Trust for Nature's identification of 12 focal landscapes that 'provide the best opportunities for maintaining priority ecosystems and species on private land'. The Victorian Environmental Assessment Council should be tasked with an investigation into how to overcome barriers to conservation on private land. Essential measures include greater incentives for landholders to

enter into Trust for Nature covenants and support for conservation on Indigenous lands.

After a long struggle by Aboriginal people in Victoria, some land and sea is being returned to Traditional Owners and Indigenous culture is becoming increasingly respected. Joint or cooperative management of protected areas and Indigenous protected areas offer ways for Traditional Owners to maintain connections with their country, practise and promote their culture and contribute to the conservation of biodiversity. This review recommends an increased focus on negotiated agreements for joint or cooperative management of protected areas, ongoing financial support for these management arrangements and stronger support to realise Indigenous aspirations for conservation management.

At a time when natural environments are under increasing pressure, law and policy changes and inadequate resources are undermining the capacity of park managers to protect national parks from threats such as climate change and invasive species. Imposition of a damaging and misguided burning target, and proposals for exploitation such as commercial tourism development and grazing, and the potential



The proportion of ecological vegetation classes in Victorian subregions that meet the nature conservation review reserve targets (in table, page 22)

to allow logging under the guise of ecological thinning, are all incompatible with maintaining conservation values. Unless short-comings in invasive species management in the national park estate are addressed, inexorable deterioration in some of the state's finest natural places will result. Shortcomings include limited knowledge of the distribution and impacts of weeds and pests, inadequate resources for control, and a lack of monitoring to measure effectiveness. Reliable recurrent funding for long-term multi-species control programs is essential.

Park planning in Victoria is in crisis and should be returned to the hands of a revitalised parks agency with expertise in managing ecological systems. (Parks Victoria is contracted by the government to manage parks but is not in charge of planning.) In 2011-12, only 65% of properties managed under the

National Parks Act had approved management plans less than 15 years old. Managing threats and monitoring trends in national parks require high level expertise. As much of this expertise is outside the parks agency, arrangements such as expert advisory bodies are needed to ensure that park managers have ready access to advice. But nothing can replace a high level of in-house knowledge and experience – staff training and the recruitment of highly qualified staff should be a high priority. A strategic plan is needed to guide the future of the national park estate and communicate its great importance.

Vegetation: With more than half the state cleared of native vegetation and much of the rest degraded, the priority must be to protect what remains and work to reverse degrading processes, while embarking on restoration of high priority areas. Instead

of strengthening protection, the Victorian government has recently weakened regulations. The requirement to prioritise the avoidance of clearing (in the hierarchy of avoid, minimise and offset) has been abandoned in favour of default approval of clearing except if it cannot be offset. Mapping has placed more than 95% of native vegetation on private land in the category allowing as-of-right clearing of any area less than one hectare if offsets are provided. Enforcement of vegetation laws is poor and the extent of illegal clearing is unknown. The system of vegetation management is opaque, with no public reporting on permits issued, permit conditions, offsets, compliance and monitoring.

The area of native vegetation protected and restored through offsets is small and far exceeded by what has been lost. Some offsets deliver only paper gains

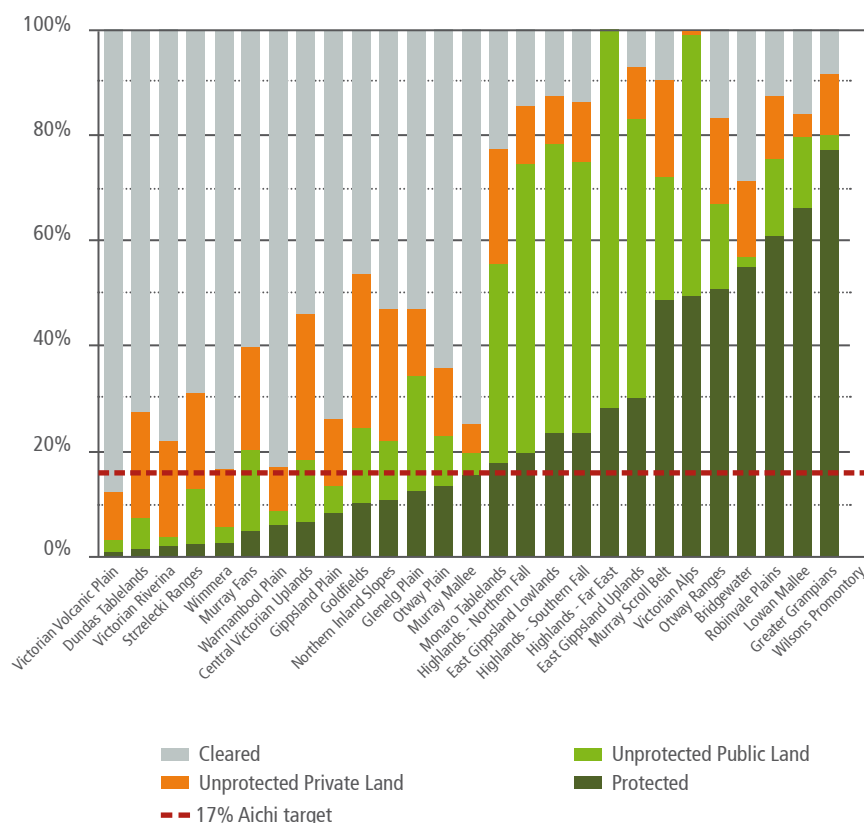
(eg changes in tenure with little improved management), and gains from restoration and management are often uncertain and require long-term commitment, but only 10 years of active audited management is required. Most offset sites are not monitored, so confirmation of offset 'gains' are rarely verified. An independent audit is needed to assess the extent to which offset targets are being achieved, their degree of permanence, and how the system can be reformed to deliver genuine compensation for vegetation destroyed or damaged. Offsets should be required for all threatened biodiversity, as identified on government advisory lists.

Because protecting vegetation is foundational to ecosystem and landscape health and fraught with governance challenges, it needs an independent regulator with stand-alone legislation to give force to the native vegetation management framework. As proposed by the Victorian Competition and Efficiency Commission, this independent statutory authority should be responsible for operational functions: assessing clearing applications, administering offsets, monitoring and compliance, and providing expert advice. Other reforms needed are a public register of documents – including clearing permits, assessment reports, offset agreements and plans, monitoring and audit reports – and a monitoring and compliance framework.

Stewardship and restoration:

Protecting natural values on private lands is essential to Victoria's future but an immensely challenging policy area because of the rights afforded property owners and the commercial focus of much land use. It will be necessary to motivate and support many thousands of landholders to better manage their land for conservation. Victoria has been a leader in ecomarket schemes (eg BushTender, EcoTender), which provide landholders with income for protecting biodiversity and providing ecosystem services. These schemes should be strengthened

The proportion of cleared, unprotected and protected vegetation in each Victorian subregion

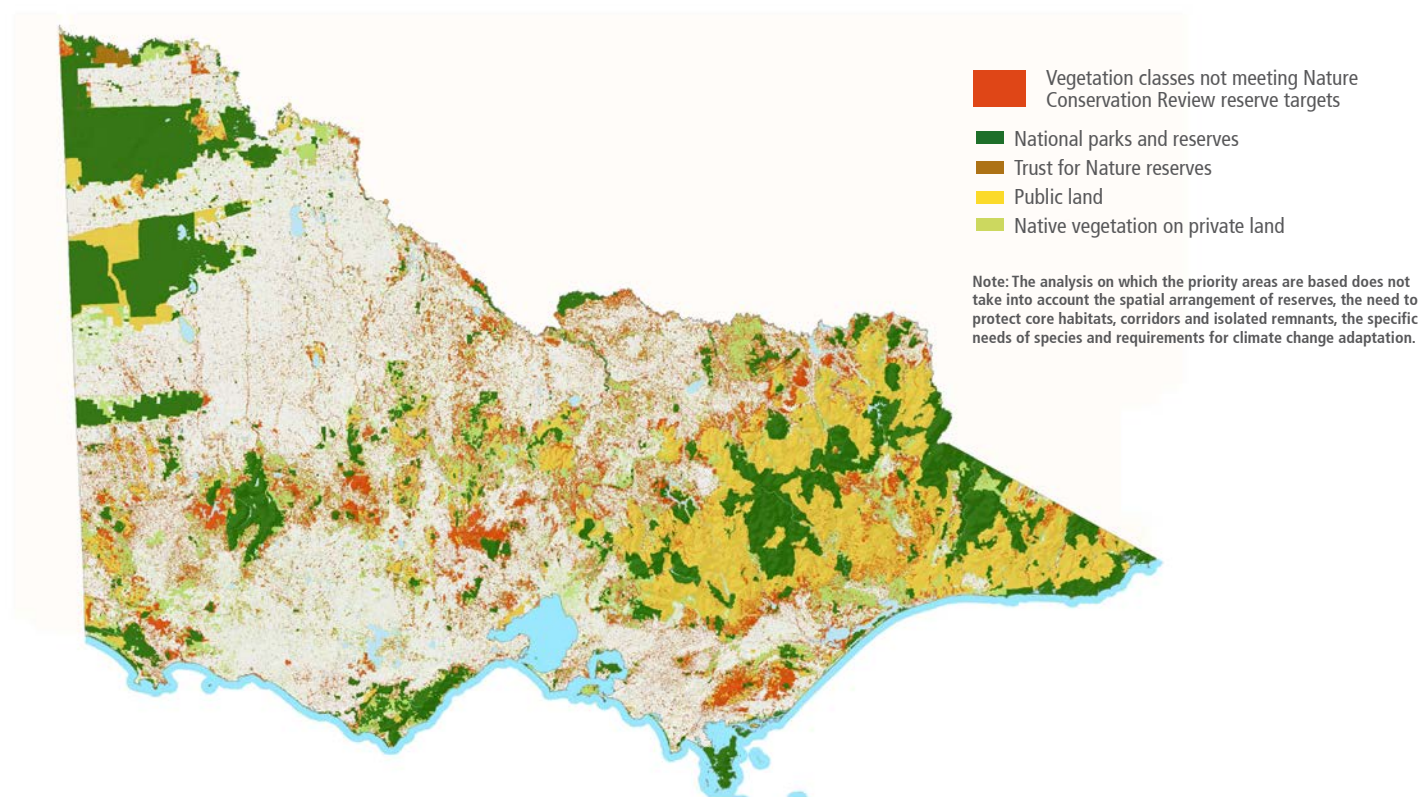


and expanded to achieve clearly articulated priorities, secured by mechanisms such as permanent conservation covenants and monitored to assess outcomes. Binding on-title covenants increase the likelihood that remnant or restored habitat will be retained and maintained in the long term.

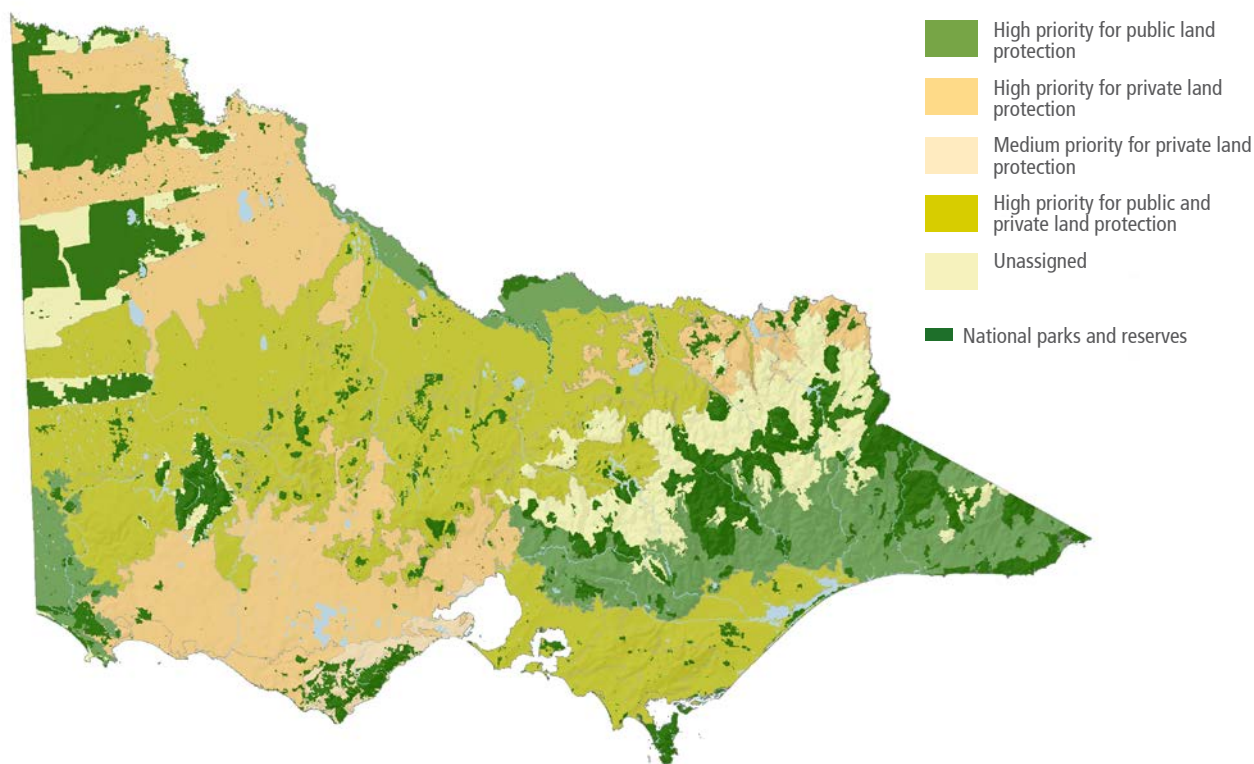
Victoria faces an immense restoration task. Natural regeneration on abandoned or little-used farmland is believed to account for most gains in native vegetation extent. Many thousands of Victorians are engaged in restoration, mostly on private property, under programs including Landcare, Bushcare and various incentive schemes. All projects should be considered 'experimental',

with evaluation of outcomes informing the design of future projects. Goals should be defined and realistic, and take into account potential future changes – such as climate change, impacts of invasive plants and animals, and alterations in hydrological and soil conditions. These issues are being addressed in recent projects that aim to create landscape-scale 'biolinks' to connect large areas of high-quality intact vegetation for multiple outcomes, including carbon sequestration and restoration of ecological functions. Biolinks have great potential as a communication and community engagement tool, fostering a positive spirit of contribution to an ambitious program and engendering partnerships across different sectors and land tenures, and they should

Priority EVCs for achieving a comprehensive, adequate and representative national park and conservation system



Priority subregions for improved protection to achieve the NCR reserve targets for a comprehensive, adequate and representative national park and conservation system





Large areas of old-growth forest warrant permanent protection under the National Parks Act.

be supported.

Forests: There are compelling conservation, economic and social reasons for Victoria to transition from logging of native forests to plantation forestry. Native forests are already much depleted, forest-dependent species continue to decline and logging compromises ecological processes. Forestry on public lands has suffered cash and investment losses and relies on cheap government loans, greatly disadvantaging plantations, which are now extensive enough to meet timber demands. Victoria could be a world-leader in protecting forest-based carbon stores that mitigate climate change. The transition to plantations should occur within five years for woodchip, pulp and paper products, and 10 years for sawn timber.

Forestry enjoys exemptions from laws and standards that apply

to other industries, with no requirements for environmental impact assessments when new areas are logged, and forestry laws are poorly enforced. A review of federal environment laws found that the process for reviewing and auditing regional forest agreements 'is neither independent nor transparent', and required reviews are often not carried out.

Recent changes to Victoria's Sustainable Forests (Timber) Act further undermine the potential for sustainable forestry. They lock in logging in native forests for the indefinite future and remove much of the government's oversight. Another major backward step is the re-opening of western forests (west of the Hume Highway) to logging, with a 2013 decision to grant a three-year licence for logging in Mount Cole State Forest. In recognition of their conservation

values, most logging in the greatly depleted and fragmented forests of western Victoria was phased out a decade ago and millions of dollars paid in industry compensation.

Large areas of old-growth forest have been protected informally and insecurely in 'special protection zones' that can be swapped for other sites and logged, mined and grazed. These areas warrant permanent and genuine protection under the National Parks Act.

The continual removal of fallen wood for firewood and the illegal removal of live and dead trees will deplete one of the critical habitat elements in native forests. Nine state-listed and three nationally listed vegetation communities, about 60 threatened plant species and several animal species are likely to be detrimentally affected. In 2011, the state government removed the need for permits to collect firewood

As well as being a major drain on public resources for no clear benefit, **the 5% annual prescribed burning is likely to cause considerable harm to biodiversity.**

from public land for private use. This decision should be reversed so that the collection of firewood and the impact on the forests can be properly monitored and controlled. Areas designated for firewood collection should at a minimum be subject to the same biodiversity criteria as other timber production methods. It is also vital to examine the impact of firewood removal on the biodiversity values of private land, where 87% of collection occurs. Much of the need for firewood could be met from plantation forests. To address the growing threat of firewood collection from forests, Victoria should support a private farm forestry program to enable collection from public lands to be phased out.

Fire management: With both human safety and biodiversity at stake, it is vital that bushfire management in Victoria is based on sound science and takes account of future climate change. The recent increased frequency and scale of bushfires under a drying climate challenge long-established tenets and require a different approach to protect human life, assets and biodiversity. There is no credible evidence that the state's minimum annual burning target of 5% of public land can achieve the goal of significantly reducing risks to life and property. Losses of houses and human lives generally occur only under severe fire conditions, when weather rather than fuel loads exerts the main influence over fire severity. A high annual target skews burn plans towards remote areas, where large burns are easier and cheaper to achieve, but the most effective burns for public safety are the smaller but more difficult ones close to communities. As well

as being a major drain on public resources for no clear benefit, the 5% annual prescribed burning is likely to cause considerable harm to biodiversity. It should be replaced with regional operational plans that focus on risk reduction for human assets in high risk areas and apply targets appropriate to particular ecosystems. Asset protection will require revised planning rules and building codes to avoid placement of assets in high-risk areas. There should be cost-benefit analysis of fuel reduction burning in relation to other life-saving measures. In some forest types, such as the tall ash forests, it is likely to be more useful and cost-effective to fund fire shelters or strategies for people to leave the fire danger area. There is also need for more public education on fire safety and fire management for conservation.

Most decision-making about ecologically appropriate fire regimes is driven by knowledge of a subset of vegetation, and a hope that the rest of the biota will follow. But the impacts of fire on most species, particularly animals (vertebrates and invertebrates), fungi and non-vascular plants, are unknown, a knowledge deficiency that will be exacerbated by climate change. Research is needed to identify ecologically appropriate fire regimes for the full range of biodiversity.

Invasive species: Victoria's already dire invasive species problems will continue to worsen unless there is substantial reform of laws, policies and programs to prevent the introduction of new harmful species, eradicate newly established species, and more effectively contain and control established threats. New standalone biosecurity legislation

based on ecological principles is needed. There also needs to be a greater focus on systematically identifying priorities for eradication, containment and control. The reactive approach also leads to lack of action on environmentally harmful invasive species with economic or social value. Feral deer, for example, are protected for the benefit of hunters rather than controlled as an environmental and agricultural threat. Effective control of entrenched invasive species requires collaboration, planning, government support and monitoring. This can be facilitated by the establishment of regional weed committees involving government, community representatives and land managers to develop strategies and allocate resources. Training is needed for all workers and contractors undertaking weed control on public lands.

Overview of future directions

This is a brief summary of some of the review's major recommendations for terrestrial ecosystems.

Victoria's national park and conservation system

- Commission the Victorian Environmental Assessment Council to investigate how to most effectively achieve a comprehensive, adequate and representative national park and conservation system in Victoria across both public and private lands.
- Upgrade protection for conservation reserves listed in schedules of the Crown Land (Reserves) Act by transferring them to the National Parks Act and commissioning the Victorian Environmental Assessment Council to assess the most appropriate future management arrangements.
- Establish a fund for the purchase of high-priority lands for addition to the national park estate.
- Engage with Indigenous landowners to develop management agreements for biodiversity conservation, provide ongoing financial support for joint and cooperative management agreements over existing national parks and reserves, and work with Indigenous representatives to determine how to better support Indigenous aspirations for conservation management.
- Commission the Victorian Environmental Assessment Council to review how private land conservation can contribute to achieving a comprehensive, adequate and representative national parks and conservation system.
- Promote conservation on private land: exempt properties with Trust for Nature (TFN) covenants from local government rates and sales of such properties from stamp duty, pay for TFN covenants in priority areas through the BushTender program, fund a base transaction fee for all new TFN covenants, establish a land improvement fund for conservation management on covenanted properties, and ban mining on TFN covenanted areas.
- Provide support for non-government organisations that manage large areas for conservation through capacity building, collaboration with Parks Victoria and other measures.
- Ensure that conservation gains on private lands secured with public funds are maintained, by mechanisms such as permanent conservation covenants, and monitored.
- Develop a strategic plan to guide the future of Victoria's national park estate that also communicates its role and importance.
- Promote conservation-compatible community uses of national parks to encourage people's physical and mental wellbeing rather than high-end tourism uses.
- Safeguard national parks and reserves from damaging activities, including cattle grazing, mineral exploration and fossicking, commercial scale logging ('ecological thinning'), and private commercial developments.
- Strengthen the focus on management planning for national parks and increase the policy development and scientific research capacity within the parks agency.
- Set up scientific advisory panels for specific national park management issues as they arise.
- Implement expanded long-term weed and feral animal control programs and monitor their effectiveness.
- Conduct ecologically based fire management with advice provided by an expert panel.
- Provide dedicated funding for management and monitoring of national parks, with a specific budget line to allow tracking of spending levels
- Review existing state charges and levies, such as the parks and waterways levy, to identify funding options for improving management of the national park and conservation system.
- Build the resilience of the national park and conservation system to climate change: improve knowledge, protect threatened species and refugia, connect the national park estate along environmental gradients and develop national park specific or regional climate adaptation plans.
- Implement recommendations by the Victorian Environmental Assessment Council to facilitate stewardship agreements with organisations and individuals for small public land reserves.

Native vegetation

- Improve protection of native vegetation with new vegetation laws to establish an independent 'native vegetation regulator' to oversee management and monitoring of native vegetation, conduct enforcement, administer offset schemes and provide expert



Fallen trees provide valuable shelter for native animals. Photo: Yasmin Kelsall

advice for assessments and policy-making.

- Strengthen the native vegetation management framework: revert to a state-wide objective of 'net gain'; reinstate the three-step hierarchical approach of avoid, minimise and offset; assess indirect impacts from agricultural activities and impacts on hydrological regimes; and develop a knowledge base to predict likely responses of vegetation types to climate change.
- Implement a systematic approach to monitoring and enforcement of vegetation rules: establish a vegetation monitoring program overseen by the native vegetation regulator, establish a public register, audit the performance of permit-holders, establish environmental monitors for developments, publish online all relevant information, and regularly audit and report on the effectiveness of the system.
- Improve the offsets framework to deliver genuine conservation gains: commission an independent audit to assess the extent to which targets are being met, their degree of permanence, and improvements needed to deliver 'net gain'; require offsets for all approved actions impacting on species on government advisory lists of threatened plants and

animals; implement a long term monitoring program; for low risk activities in low value areas, require offset payments according to a fixed rate and where the funds can be used to support existing protected areas; and support the accreditation of pooled services that can bank offset 'credits' and source the required offset outcomes.

- Develop a statewide biolinks plan to enhance landscape connectivity and manage and restore conservation values at the landscape level.
- Expand and strengthen the use of ecomarkets, such as BushTender and offsets, within a framework of delivering genuine, permanent conservation gains.
- Review the Land for Wildlife program to investigate how it can be expanded and its environmental outcomes improved.
- Commission research to determine how best to increase the ecological and evolutionary resilience of native vegetation in the face of climate change, including consideration of changes in local provenance requirements and an increased focus on interconnectedness in the landscape.

Forestry

- Transition Victoria's wood products industry from native forests to plantations. For woodchip, pulp and paper customers the transition should be completed within five years, and for sawn timber customers within 10 years. Elements of this transition include industry assistance and a regional development package, and additions to the national park and conservation system after detailed regional investigations by the Victorian Environmental Assessment Council (or similar body).
- Immediately ban logging in western Victoria and cancel the regional forest agreement applying to south-west Victoria.
- Apply the federal Environment Protection and Biodiversity Conservation Act to all relevant forestry activities by removing the exemption for forestry conducted under regional forest agreements.
- Reform forestry policies and guidelines including the regional forest agreements, the code of timber production and timber contracts to require that threatened species are protected and climate change and invasive species are properly considered.
- Establish Victoria as a world



Snow Gum Woodland on the Bogong High Plains. Photo: David Tatnall

leader in protecting forest-based carbon stores that assist the state in meeting carbon pollution reduction targets.

- Incorporate informal forestry reserves such as 'special protection zones' into the national park and conservation system by protecting them under the National Parks Act.
- Introduce a new approach to managing firewood in Victoria that ensures continued supply and protection of public lands by providing incentives to support private farm forestry growers to provide firewood, phasing out firewood collection from public land and, in the interim, requiring all collection from public land to be licensed with stringent conditions to protect conservation values.

Bushfire management

- Replace any annual state-wide target (5% or otherwise) for prescribed burning by a risk-based approach that is focused on meeting local objectives that reduce risks to life, property and biodiversity.
- Assess the need for burning programs at a local level in the context of other potentially more useful public safety measures, such as building designs and regulations and fire shelters. Do cost-benefit assessments of a range of safety measures when planning fire management. Give priority in fuel reduction programs to prescribed burns that are (a) critical for public safety and (b) beneficial to both public safety and biodiversity.
- Apply strong planning rules and building codes in bushfire-prone areas to avoid placing homes and people at risk and to reduce the

need to remove or modify native vegetation. Take into account climate change predictions for more frequent and more severe bushfire events.

- Investigate the effects of different fire regimes for Victoria's vegetation types. Establish a suitable range of age classes for each vegetation type and incorporate this into fire operations planning. Revise minimum and maximum tolerable fire intervals for each ecological vegetation type, allowing as far as possible for the full range of species likely to be affected. Develop clear guidelines for burn severity and patchiness for different vegetation types.
- Plan fuel reduction across all land tenures by methods that include slashing. Include both planned burns and wildfire, and the effectiveness of burns, in assessing whether fuel reduction aims and biodiversity protection have been achieved. Take account of the condition of vegetation (such as drought stress) at the time of proposed burning. Require protection of a sufficient number and range of hollow-bearing trees for the long-term protection of hollow-dependent fauna. Include fire-sensitive species and communities as 'assets' warranting protection from both wildfire and planned burns.
- Develop rapid monitoring methods (such as DNA sampling) for invertebrates, non-vascular plants, fungi and microbes, to assess short and long-term impacts of fires on biodiversity.
- Conduct research and monitoring to investigate high-priority issues in fire management, such as the effectiveness of fuel reduction burns in different vegetation types and the effects of different fire

regimes on biodiversity.

Biosecurity

- Develop biosecurity legislation to strengthen the approach to harmful invasive species (see Environmental Governance section).
- Establish regional weed committees across Victoria, involving local governments, other land managers and community representatives, to develop strategies and allocate resources for weed eradication and control.
- Develop training and certification systems for weed control to be required for all workers and contractors involved with weed control on public lands.
- Expand programs facilitating community engagement in pest plant and animal management and ecological monitoring.
- Reclassify feral deer, at present a 'game' species protected under the Wildlife Act, as a pest species, map current populations and implement coordinated control programs, eradicating populations where feasible.
- Undertake a control program to rapidly reduce the population of feral horses in alpine national parks and surrounding areas, primarily using aerial shooting under RSPCA-endorsed protocols.
- Develop guidelines for managing native species whose distribution is changing dramatically as a consequence of climate change or other drivers and which may have adverse impacts on biodiversity.



FRESHWATER ECOSYSTEMS

Values

Much of Victoria's landscape is densely woven with rivers and streams – the greatest concentration of waterways on Australia's mainland. They engender life-sustaining connections from mountain headwaters to coastal estuaries, laterally between waterways, riparian fringes and floodplains, and vertically between surface and subterranean habitats. Variability along these three spatial dimensions and through the fourth dimension of time has generated extraordinary diversity and complexity in Victoria's freshwater ecosystems – from cold rushing mountain streams to warm slow-moving pools in the drylands, subterranean seepages through rock pores and fractures, and a multitude of wetland types – lakes, floodplain billabongs, shallow freshwater and saline swamps, and alpine peatlands.

For the richness of life they sustain, the refugia they offer in dry times and their contributions to the health and productivity of other ecosystems, Victoria's freshwater ecosystems have immense ecological value. Variability in water flows, resulting from interactions of climate, geology, topography and vegetation, is one of the most powerful shapers of ecology. Freshwater ecosystems have exceptionally high ecological values, in part because they create ecotones (transition areas between different habitats) at multiple scales.

Riparian areas are ecologically important interfaces between terrestrial and aquatic ecosystems. Although only a very small proportion of total catchment areas, they have a major influence on the healthy functioning of river ecosystems by providing habitat, shading the water, and contributing carbon and nutrients. In largely cleared landscapes, they often contain the only native vegetation and are sites of high biodiversity.

Floodplains (lowlands bordering waterways, which are flooded when water overflows river banks) are also highly productive and ecologically important transition zones. Wetlands help maintain water quality (by filtering nutrients and sediments) and reduce the impacts of floods by slowing and holding floodwaters. The high productivity of many freshwater habitats means they are likely to be significant carbon sinks.

Groundwater-dependent ecosystems (which depend partially or completely on water from beneath the earth's surface that exists in pores and crevices) include subterranean aquifer and cave ecosystems, surface waterbodies with flows from underground sources, and ecosystems dependent on subsurface groundwater accessed by tree roots. Aquifer and cave ecosystems are characterised by darkness, environmental consistency and persistence, and low energy and oxygen availability. They are inhabited by specialised and often endemic organisms, mostly crustaceans.

Victorian freshwater habitats are known to support high species diversity: more than 100 waterbirds, 54 freshwater fish, 38 frogs, 40 crayfish and an undetermined number of other invertebrate species. Victoria's wetlands support more than 800 vascular plants. Some freshwater groups have high levels of uniqueness. South-eastern Australia is a hotspot for crayfish, with 40 species recorded, 25 of them probably unique to Victoria. Another 25 crustaceans are also known to be endemic and there are undoubtedly many more in groundwater aquifers. Eight galaxiids (fish) are endemic, and most are still to be formally described after research showing that what was thought to be one species is really a complex of 15 species. Before exotic trout were introduced, galaxiids were the top

fish predators. Little is known about Victorian stygofauna (groundwater-inhabiting organisms), but they are likely to have high levels of diversity and extremely high endemism, most species being confined to single aquifers.

Nine freshwater wetland complexes have been recognised as internationally significant, listed under the Ramsar Convention. As the state government recognises, many other Victorian wetlands also have values likely to qualify for listing under the Ramsar Convention. More than 1300 freshwater wetlands in 29 sites are listed as nationally significant in Australia's directory of important wetlands. Victoria has 18 'heritage river areas', which are segments or corridors on public land declared for significant recreation, conservation, scenic or cultural heritage values.

Threatened biodiversity: World-wide, freshwater habitats have the highest proportion of threatened plants and animals, and Victoria seems no different. The poor status of native fish is a telling indication of the pervasive deterioration of Victoria's freshwater habitats. In the Murray-Darling system (as a whole), native fish populations are estimated to be at 10% of pre-European settlement levels, and most of the fish biomass consists of introduced species. More than half of Victoria's freshwater fish are threatened, and at least three are extinct (although they survive elsewhere). Similarly, high proportions of other freshwater groups are also threatened – about two-thirds of crayfish and turtles and more than a third of frogs. Formal listings of threatened species under the Flora and Fauna Guarantee Act do not reflect the conservation status of freshwater groups, with only about half the species considered threatened (on the state government's advisory lists) formally listed.



Gaps and priorities

Freshwater management in Victoria exposes the short-sightedness of exploitation without care for the health of the system. Dead and dying river red gums, desiccating wetlands, rivers dominated by exotic fish and regular toxic algal blooms are some of the more lamentable symptoms of chronically overworking Victoria's rivers. A great many rivers, wetlands, riparian zones and floodplains

are suffering the effects of flow regulation that reverses natural seasonal patterns, suppresses floods essential for floodplain health, leaves too little water for essential ecological functions and imposes barriers to natural migrations and dispersals. Victoria's highly stressed freshwater systems lack resilience to cope with the drier future and reduced water availability predicted by climate science

Freshwater systems highlight the need for whole-of-system planning and management, for they are hyper-connected – from headwaters to estuaries, rivers to floodplains and from surface to below-ground waters. Restoring river and wetland health should be at the top of the state's priorities – and not only for ecological reasons.

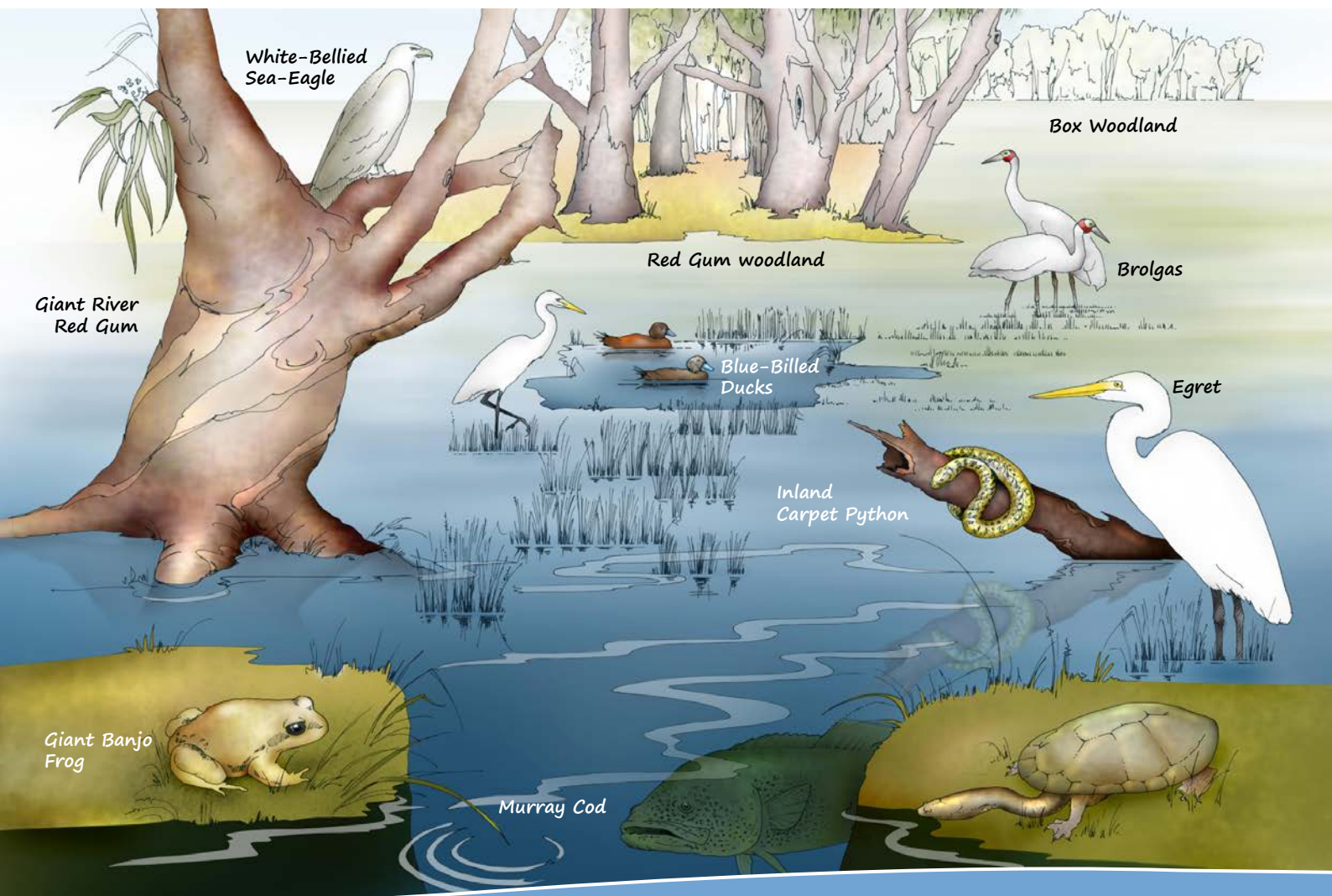
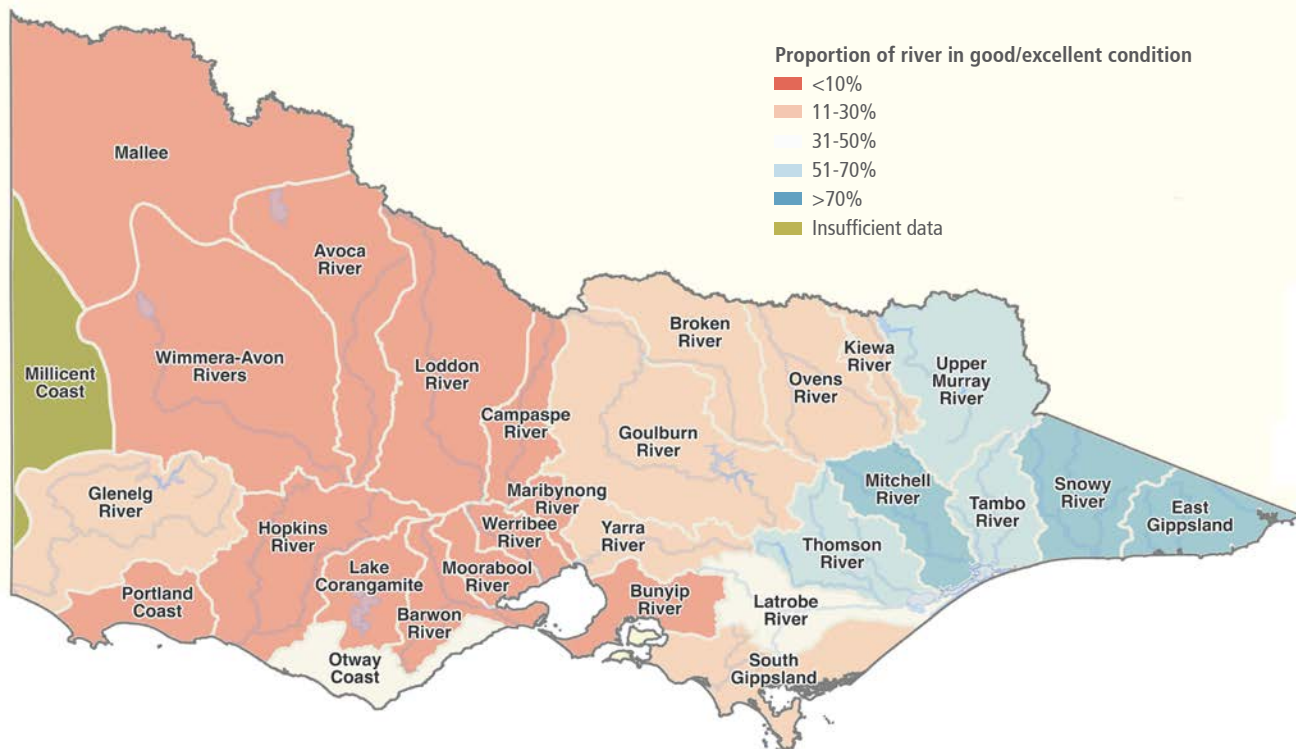


Illustration by Rhyll Plant & Jess McGeachin

River Red Gum ecosystem



The proportion of rivers in good to excellent condition in Victoria's river basins, as assessed in the 2010 Index of Stream Condition

Healthy freshwater ecosystems are needed for economic and human health and ecosystem services such as water purification, as well as for functioning landscapes and biodiversity security. To achieve this will require improving natural flow regimes and connectivity, a comprehensive network of protected freshwater areas, restoration and management of degraded habitats, action to reduce threats such as invasive species, and sympathetic whole-of-catchment management.

Environmental flows: Aquatic species have evolved life history strategies primarily in response to natural flow regimes, and changes to those regimes can dramatically alter the future of species and ecosystems through impacts on aquatic and riparian habitats, the distribution of food resources, opportunities for movement and migration, and conditions for reproduction and recruitment. Each component of a natural flow regime – from no flow to floods – facilitates different riverine functions and processes.

Natural variability between seasons and years, ranging from drought to floods, often creates essential ecological disturbance, without which these systems become more uniform, sustaining less variety of life.

Natural variability has been greatly compromised by flow regulation in the majority of Victorian rivers through the storage, diversion and extraction of water for human uses. Victoria's 70 major water storages are capable of holding more than 12 million megalitres (by comparison, annual flows in Victorian rivers over the eight years from 2003-04 to 2010-2011 averaged 26 million megalitres and ranged from 7 million to 45 million).

Although socially and economically challenging, restoring environmental flows is essential if Victoria is to arrest degradation and biodiversity decline in freshwater systems. Because of the extent of over-allocation of water and distortion of flow regimes in Victoria, this

will require a much stronger commitment to buy back water entitlements in over-allocated rivers, remove impediments to environmental flows, and return rivers to a greater degree of natural flow variability. Targets for environmental flows should be based on a range of ecological criteria and achieved by a mix of regulatory measures, market-based instruments and infrastructure improvements. The most cost-effective and efficient way to return water to the environment is by purchasing water from willing sellers.

Victoria has established an 'environmental water reserve' but it is highly inadequate for many rivers and aquifers and has low security compared to agricultural and industrial uses. During the millennium drought, environmental allocations were sacrificed in several areas to augment supplies for agricultural and urban uses. There has been limited use of environmental water reserves for wetlands.

In the past, the reserve system has been focused primarily around terrestrial values, and freshwater features have often only been incidentally and partially encompassed. Even Ramsar wetlands are not fully protected...

Extinct and threatened species

Freshwater group	Extinct (regionally)	Critically endangered	Endangered	Vulnerable	Extinct or threatened (advisory)	% extinct or threatened (advisory)	Extinct or threatened (FFG Act)
Fish	3	11	6	11	31	57%	19
Frogs	0	8	4	3	15	39%	11
Turtles	0	0	1	1	2	67%	1
Crayfish	0	3	14	8	25	66%	12

Extinct and threatened species in some freshwater groups (government advisory lists and Flora and Fauna Guarantee Act)

Restoration of flooding regimes is essential to the health of floodplain biodiversity, including 110 flood-dependent ecological vegetation classes and almost 200 rare and threatened plants and animals on the Murray River floodplain in northern Victoria. Many rivers are so heavily regulated that only rare extreme flood events result in extensive overbank flows. Victoria needs a comprehensive, systematic and transparent inventory of flood-dependent natural values as a basis for allocating water and determining priorities for infrastructure investment to protect floodplains.

Riparian protection and restoration:

As the interface between terrestrial and aquatic ecosystems, riparian areas suffer the impacts of both extensive river regulation and damaging land uses, and most in Victoria have been degraded. The worst are in the west, including in the Corangamite, Hopkins, Barwon and Moorabool basins, and the best are in forests in the Otways, the North East and East Gippsland. Despite their often poor

condition, riparian areas are highly valuable in rural areas because they represent a substantial proportion of remnant vegetation in rural districts. Nonetheless, about 30% of vegetation within a 60 metre buffer area has been cleared. The recent 2010 assessment of stream condition found that only about one-fifth of streamside vegetation was in excellent condition and about the same proportion was in poor condition.

Victoria has a great opportunity to address many significant water quality, health and conservation problems by reforming management of the 30,000 kilometres of crown water frontages (publicly owned riparian land). A high priority for conservation and public health is to limit livestock access to riparian areas. Victoria's crown water frontages should be managed in the public interest to restore the essential ecosystem services provided by healthy riparian zones for biodiversity and human health. This will require measures to halt degradation, increase biodiversity

protection, improve water quality and restore vegetation over the next five years (details are in the VNPA Riverside Rescue report). Stewardship programs are also required for privately owned frontages.

Freshwater protected areas: In the past, the reserve system has been focused primarily around terrestrial values, and freshwater features have often only been incidentally and partially encompassed. Even Ramsar wetlands are not fully protected – only about half their area in Victoria is in land tenures designated for conservation. Heritage rivers are only protected from the construction of major on-stream dams and not from other alterations to flow regimes.

Just as for terrestrial values, a comprehensive, adequate and representative system of freshwater protected areas should be a core conservation strategy. Victoria needs a standardised system for classifying freshwater ecological communities as the basis for conservation planning. Initial candidates for better protection are

freshwater ecosystems with part of their area in national parks that have the least disturbed catchments and high biodiversity values, and freshwater refugia likely to facilitate survival of organisms under climate change. Implementation of the Heritage Rivers Act has languished in recent years. To be effective, it needs reviewing and revamping to encompass wetlands and influence catchment management. As recommended by the Land Conservation Council in 1991, Victoria should create 'representative rivers' to protect the best examples of the many varieties of river in the state. The protection of high value, largely intact freshwater ecosystems should be optimised by creating freshwater reference areas under the Reference Areas Act.

Wetlands: In 1994 it was estimated that about a quarter of Victoria's original wetlands (covering 200,000 hectares) had been destroyed, mainly through drainage. Many more have been modified and damaged, and their overall extent and condition are thought to be declining. However, there is no recent information about the overall extent of loss. A 2012 index of wetland condition assessment of 587 high-value wetlands (6% of Victoria's non-alpine wetlands) from 2009-10 found that although just over half were in good or excellent condition, catchment and vegetation condition and hydrology were each poor for more than one third of them. Several wetland ecological communities have been listed as threatened under state or national laws, and more than 85% of the 145 wetland ecological vegetation classes mapped in Victoria are threatened in at least one subregion. But this does not convey the extent of threat for wetlands as their vegetation has not been comprehensively mapped at a fine scale and their status fully analysed.

About 80% of remaining wetlands are on private lands, yet protection for them under Victoria's planning framework is inconsistent, usually non-specific, and often non-existent.

There are wide-ranging exemptions under planning laws, and even when permits are required for activities damaging to wetlands, decision-makers tend to impose conditions rather than refuse applications. Planning schemes should be amended to ensure that high-value wetlands are identified and given much stronger protection. This could be achieved by a new 'wetlands overlay' for planning schemes to prohibit development that would destroy or degrade high-value wetlands. Because wetland protection in Victoria is fragmented and often ineffective, there is great need for an overarching strategy to set out goals, targets and measures for wetland protection. Victoria's 2013 waterway management strategy proposes to better integrate management of rivers and wetlands, and advances a policy for the identification of priority wetlands for environmental watering, but the strategy overall fails to specify objectives and actions to drive reforms essential to protect and restore wetland health.

Groundwater: Better management of groundwater is needed, starting with a systematic assessment of the condition of aquifers, the nature of links to surface water and comprehensive monitoring. The extent and condition of subterranean groundwater ecosystems are unknown. Groundwater resources are increasingly under pressure from extraction and a changing climate, and there is insufficient monitoring to determine whether extraction rates are sustainable. Increased extraction and reduced recharge led to drops in the level of several aquifers from the late 1990s to 2010 but they have risen since wetter conditions in 2011. Long-term declines have continued in Gippsland associated with de-watering of Latrobe Valley coal mines and off-shore oil and gas extraction. In 2010, the auditor general found that there were insufficient data and monitoring to determine the extent of groundwater reserves and whether extraction rates are

sustainable. Research is needed to address these knowledge gaps, and should take into account the riverine, wetland and floodplain ecosystems that depend on groundwater input. A recent mapping exercise by the government shows the extent of potential linkages, but more information is needed about the water requirements of groundwater-dependent ecosystems and the ecology of stygofauna.

Catchment management: All land use activities can potentially affect freshwater ecosystems and therefore matter. Effective management has to be at a catchment scale. Catchment damage has been most prevalent and intense in areas used for agricultural production, natural resource extraction and urban development, on private land. About two-thirds of the state is private land, from which over 80% of vegetation cover has been cleared. Therefore, sympathetic whole-of-catchment management requires effective partnerships between private landholders and all levels of local, regional and state institutions, backed up by effective laws, institutional arrangements and incentive programs.

To be effective, catchment management strategies have to guide all activities in Victoria, whether by private or public land managers, and be based on a more sophisticated ecosystem-based model that takes account of ecological processes, with clear targets and indicators and informed by long-term monitoring programs. As the Catchment Management Council stresses, there should be standard approaches to monitoring, evaluation and review, and a system of sharing information across sectors, organisations and communities involved in land and water management.



Growling Grass Frog. Photo: It's a Wildlife

Overview of future directions

This is a brief summary of some of the review's major recommendations for freshwater ecosystems.

Environmental flows

- Establish sustainable environmental flow targets based on ecological criteria for surface water and groundwater systems.
- Purchase water entitlements in a staged program, aiming to reliably achieve sustainable environmental flow targets.
- In over-allocated rivers, accord high security and reliability to environmental water and use this water to improve natural flow variability, including natural flood frequencies and high and low flows.
- Remove legal and other barriers to environmental watering of wetlands on private land.
- Establish a program to strategically remove barriers,

such as artificial structures, that prevent environmental water from reaching high conservation value floodplains and downstream areas.

- Undertake a systematic assessment of the condition of Victorian aquifers, including identification of linkages between groundwater and surface water, and establish base-level data for ongoing monitoring and to inform management.
- Develop watering strategies to protect and recover flood-dependent natural values on floodplains. Priority sites should include those with threatened taxa, high species richness, colonial breeding sites or corridors important for movement of biota, and sites in poor condition with the potential to recover significant natural values.

Riparian protection

- Establish a 'special offer' assistance program to crown water frontage licence holders

to fence boundaries, set up off-river watering and improve management for environmental outcomes.

- Establish a 'waterway guardians' program to offer incentives to landholders with significant conservation assets on private land adjacent to crown water frontage or with privately owned frontages with high conservation values to manage these areas for conservation.
- Strategically add riparian areas that meet conservation criteria (for biodiversity values, connectivity and management integrity) to the national park and conservation system, and manage them accordingly.
- For areas in moderate to good condition but not suitable for addition to the national park and conservation system, issue a conservation licence that specifies minimum management actions, such as fencing, stock removal or grazing regimes and weed control.
- Enforce Victoria's laws to prevent

Riparian land repair has multiple benefits



Bank erosion at Bridles Bend on the Lower Genoa River, East Gippsland in 1989.

unauthorised activities on riparian public land. Cancel licences where there is evidence of no improvement or no action to improve conditions.

- Cancel riparian grazing licences where there is evidence of significant damage or no improvement or lack of action to improve conditions.
- Provide funding of \$20 million per year for four years to accelerate the implementation of good management and assist landholders to take positive steps to repair, restore and protect riparian lands.
- Systematically identify freshwater refugia likely to facilitate survival of organisms under threat from climate change and provide them with a high level of protection.
- Create freshwater reference areas under the Reference Areas Act to optimise protection of freshwater ecosystems which are highly intact and have high biodiversity.
- Review and revamp the Heritage Rivers Act, including by extending it to wetlands, improving its capacity to prevent damaging land use changes, and requiring monitoring.
- Protect the 16 'representative rivers' recommended by the Land Conservation Council in 1991 by amending the Heritage Rivers Act or by protecting them in the conservation estate.

Freshwater protected areas

- Develop a state-wide process for classifying freshwater communities (akin to terrestrial vegetation communities) and systematically identify high priority areas for protection by applying criteria for assigning biodiversity and conservation value.

Wetlands

- Develop a Victorian wetlands strategy that sets policy goals,

targets and reporting regimes.

- Require land use planning schemes to contain wetland overlays to prohibit destruction or modification of high-value wetlands, as identified by catchment management authorities and including all Ramsar sites.
- Use the Flora and Fauna Guarantee Act to protect high value wetlands that provide habitat for threatened species by declaring them as critical habitat and, where they are under imminent threat, by issuing interim conservation orders.
- Protect all Ramsar wetland sites on public land within the national park estate.
- Amend the Water Act to include all natural wetlands on private land in the definition of 'waterway'.

Catchment management

- Strengthen catchment management strategies, including



Bridles Bend after stock removal and habitat restoration, 2009.

by adopting an ecosystem-based approach, identifying clear targets and indicators, developing a long-term monitoring program and clearly linking catchment management to the health of marine and coastal environments and the Murray River.

- Strengthen links between catchment management strategies and land-use planning.
- Revise and strengthen the Victorian waterway management strategy to define clear regional river health and river restoration indicators and targets.
- Recognise the important role played by streams and their environs in landscape connectivity and as carbon sinks by incorporating them into broader connectivity, restoration and carbon sequestration programs.
- Minimise land use impacts on rivers and streams by removing grazing from sensitive areas, promoting low impact agriculture and controlling weeds and feral

animals. Complement these measures with education to promote improved management practices.

- Ensure that public land managers lead the way in complying with regional catchment strategies and their catchment condition targets developed by catchment management authorities.

ENVIRONMENTAL GOVERNANCE

Governance failings

Victoria has the knowledge, wealth and capacity to arrest most current threats to nature and restore environmental health, and there are compelling social, economic and ethical reasons to do so. Climate change, with its likely catastrophic impacts on economic, social and environmental health, amplifies the imperative.

The current backward trajectories on multiple environmental issues in Victoria are a result of flawed governance systems as well as wilful anti-environmental choices. From this nature conservation review, and from many other analyses as well (including audits by Victoria's auditor general and state of the environment reports) emerges a consistent pattern of failure to effectively establish and implement the processes and measures needed to achieve environmental objectives.

Achieving the many essential reforms recommended in this review relies on improving the system of laws, implementation mechanisms, accountability regimes and institutional arrangements that constitute sound environmental governance to address the following deficiencies.

Lack of integration: Laws, administration, programs and plans are poorly integrated, undermining the state's capacity to pursue higher-level strategic objectives, and leading to inefficiencies and conflicting objectives. The 2009 land and biodiversity white paper, *Securing our Natural Future*, is probably the closest

a Victorian government has come to an all-of-government approach to biodiversity but it has never been implemented.

Poor leadership and coordination:

Over the past five years, the auditor general has reported many instances of inadequate leadership and coordination. For example, on marine biosecurity, there was poor coordination between the environmental and biosecurity agencies, and no evidence of an operational plan to coordinate responses to new incursions. Although the new departmental structure, which merges the environment and primary industries agencies, provides the potential for better coordination, it is likely to result in the greater subsuming of environmental priorities in favour of resource exploitation. A new structure is needed.

Weak laws: Victoria's environmental laws are complex, fragmented and outdated, and fail to mandate sufficient priority for biodiversity conservation. They have not kept pace with changes in community attitudes, scientific concepts and growing threats to the environment, and lack principles such as ecologically sustainable development and mechanisms to promote accountability, transparency and public participation. Instead of addressing these shortcomings, the state government has further weakened environmental laws, dismissing essential safeguards as 'green tape'.

Inadequate enforcement: A 2012 audit by Victoria's auditor general found major systemic failings in compliance and enforcement of environmental laws by the environmental and primary industries agencies. Neither department had a comprehensive risk-based approach to compliance.

Limited planning: The auditor general has identified many examples of planning failure, including that performance indicators are commonly activity-focused rather than outcome-focused. The state lacks a current biodiversity strategy, despite it being required under the Fauna and Flora Guarantee Act. The abandoned 2010 draft strategy acknowledged a lack of clarity regarding the state's biodiversity targets and goals. The *Catchment Condition and Management Report 2012* found that the lack of 'long-term goals and targets for land and water condition...remains a critical weakness', and the *State of Environment Victoria 2013* found that there is no clear articulation of statewide priorities, objectives and targets.

Inadequate data: Knowledge of Victorian biodiversity is deficient in many areas, including the conservation status and trends of many species, and the effectiveness of different management techniques. In several audits, the auditor general identified major deficiencies in monitoring, data collection and data management.

Limited disclosure: It is not possible

“The 2009 land and biodiversity white paper, *Securing our Natural Future*, is probably the closest a Victorian government has come to an all-of-government approach to biodiversity but it has never been implemented.”



View from The Gorge, Mount Buffalo National Park. Photo: Geoff Durham

to gain a clear understanding of the state's environmental performance from the government's public reports. In a 2013 audit, the auditor general found that the Department of Environment and Primary Industries reported on only a subset of performance indicators, and primarily on outputs and activities rather than outcomes. State agency performance measures in the annual budget papers are poor measures

of performance and not linked to environmentally meaningful measures in state of the environment or catchment condition reports.

Low commitment and priority: The preceding problems with governance are all symptomatic of a low level of political commitment to the state's environmental objectives, particularly when they are perceived to be in conflict with economic goals. There has been an increasing rollback of

environmental objectives in favour of commercial interests. Victoria has a multitude of admirable environmental objectives and has achieved much in the past half century or so but backward environmental trajectories will continue unless the environment is accorded much higher priority within government. Inadequate funding for essential environmental functions is also symptomatic of a low commitment.

Governance reform priorities

Integration and modernisation:

Victoria's complex, fragmented, outdated and weak system of laws has resulted from an incremental accumulation over the past three decades rather than systematic consideration of how to achieve the state's environmental objectives. A new consolidated law – a Victorian Environment and Conservation Act – is proposed to provide a comprehensive framework for conservation, to integrate existing laws on vegetation, biodiversity and wildlife, and to apply modern principles and tools of environmental law. The new act should:

- include principles and duties that build on ecologically sustainable development (ESD) around ecological integrity, adaptive management, evidence-based decision-making, collaborative decision-making, integrated planning and action, accountability and proportionality
- provide for processes to develop strategies and plans at appropriate temporal and spatial scales, and effective instruments for implementing them
- clarify roles and responsibilities of different agencies and organisations, and guarantee monitoring, evaluation, accountability and public participation.

Biodiversity law: Victoria's primary law to protect biodiversity – the Flora and Fauna Guarantee Act (FFG Act) – needs to be properly implemented to ensure that listed threatened species and communities and threatening processes genuinely reflect the status of biodiversity and trigger effective planning and action to reverse threats and declines. More effective tools are needed to protect critical habitats, prevent threats and assist adaptation to climate change.

As of mid-2013, 667 taxa and

communities were listed as threatened under the FFG Act. Although this is a grim figure, it does not represent a genuine measure of threatened biodiversity since listings are not systematic. The departmental advisory lists of threatened species list almost twice as many taxa (1087) and there is too little data on another 350 to advise on their status. Contrary to the promise implicit in the name of the FFG Act and in its objects, listings seem to guarantee nothing much at all. The act requires preparation of an action statement 'as soon as possible' but more than half of listed species and communities and more than two-thirds of threatening processes lack one. There are no appropriate performance measures to indicate whether action statements have been effective.

The 'flora and fauna guarantee strategy' required by the FFG Act is 17 years old; the declaration of 'critical habitat' (to protect threatened species habitat) has been used just once in 25 years; and 'interim conservation orders' to protect critical habitat have never been used. Compliance monitoring and enforcement have been very limited. The auditor general and the Environment Defenders Office (Victoria) have each made several recommendations to improve the FFG Act, which VNPA endorses. Legal reforms need to be complemented by substantial funding increases for essential functions.

Biosecurity: Victoria needs a new biosecurity law to give appropriate priority to preventing new invasive species and provide institutional structures and tools to manage existing invasive threats more effectively. Biosecurity policy has been primarily developed from an agricultural perspective and the law administered by the agricultural agency while the environmental agency attempts to manage the environmental consequences

of an increasing flow of invasive species into Victoria. The most rational institutional arrangement is a joint agricultural-environmental biosecurity unit. The environment minister and agency should have primary responsibility for decisions, policy and programs relevant to environmental biosecurity. Although Victoria's environment is already heavily burdened with invasive species, a growing problem is guaranteed by an inadequate focus on prevention. Rather than banning just a few high-priority invasive species, Victoria needs to move to a 'permitted list' approach for all non-indigenous species, which prohibits introductions and sales unless they have been assessed as 'safe' (at low risk of becoming invasive). The declaration of non-permitted species should be systematic and based on criteria consistent with ecological sustainability and advice by a scientific committee that includes ecologists. Biosecurity laws should include best practice environmental tools such as a broad duty of care requirement, use of the precautionary principle, and accountability measures.

Institutional structures and processes

Given the complexity, breadth, and social and political challenges of environmental issues, it is important to optimise governance structures to deliver high priority environmental outcomes. A new structure is needed for Victoria's environmental and sustainability agencies to better focus their work on meeting their obligations and community expectations. The following principles should apply:

- Define lines of responsibility so that each agency has clear objectives, functions and targets.

PROPOSED STRUCTURE: CONSERVATION & SUSTAINABILITY AGENCIES / ORGANISATIONS



- Separate regulatory roles from policy setting and management to avoid conflicts of interest and foster impartial and consistent decision-making.
- Maximise the independence of environmental regulators to minimise interference.
- Embed ecological sustainability and biodiversity conservation as core principles for all government departments through their enabling legislation, mission

statements and strategic plans.

- Establish accountability measures including transparency, regular reporting and independent audits of performance.

The proposed new structure, which includes existing bodies, consists of state government agencies for delivery of conservation and sustainability functions, independent regulators for native vegetation management and enforcement of environmental laws, an independent

auditor, and independent bodies for private land conservation, coastal and marine management, environmental investigations and catchment management.

These institutions need to be guided by targets that define a measurable pathway to improving the natural condition of Victoria, and their performance should be independently audited and assessed in each state of the environment report.

Local government: Although local governments have considerable environmental responsibilities under state planning laws, they often do not have access to sufficient expertise or resources to meet their obligations, and lack sufficient planning tools. For example, there is no conservation zoning available to protect land outside the national park and conservation system. There should be greater alignment with catchment management, with local government plans incorporating catchment management planning priorities. The state government should encourage the development of local biodiversity action plans by offering matching funds for implementation.

Compliance: In 2009 the Victorian Competition and Efficiency Commission found that compliance with vegetation laws was not monitored even though illegal clearing was widely assumed to occur, and a 2012 audit by the auditor general found major systemic failings in enforcement of environmental laws. Relevant agencies should develop and publish a compliance monitoring and enforcement policy for all environmental laws, and publicly report on enforcement activity and outcomes. Independence of enforcement functions from potentially conflicting roles in government, such as policy formulation and industry support, is essential for effectiveness and credibility. This is best achieved by establishing an independent Environmental Regulator.

Federal-state relations on protected areas

The federal government should play a stronger role in protected area policy and management. Well-managed protected areas are essential to fulfil Australia's international obligations under the Convention on Biological

Diversity, but the Commonwealth has no direct legal means to intervene when state governments disregard their management obligations or seek to undermine the integrity of national parks. Environment groups have recommended that national parks become a 'matter of national environmental significance' under federal environment laws. Given the biodiversity importance of protected areas, there are also good reasons for the federal government to fund special management programs in national parks. To limit the problem of cost shifting, funding should be made available under a proposed 'natural icons resilience program' for initiatives that go beyond 'duty of care' and for cross-border programs and works to foster climate change adaptation.

Planning and priorities

Planning: There has been far too little strategic planning, resulting in an ad hoc and fragmented approach to biodiversity conservation in Victoria. There is no current biodiversity strategy, no plans for about half of the listed threatened species and out-of-date management plans for many protected areas. Many existing plans lack integration across sectors, across marine, coastal and terrestrial environments, and across public and private tenures. An urgent priority is to develop a nature conservation strategy that matches aspirations for nature conservation with well-defined targets and effective measures, and harnesses the capacities of both government and community to drive conservation at landscape and seascape scales across public and private land tenures. Best practice accountability measures are required, such as independent auditing of outcomes and regular reviews. Departmental performance targets should be closely aligned to targets in the biodiversity strategy.

Climate change: With heat waves and catastrophic bushfires forewarning us of the momentous changes that climate change will bring to Victoria's environment and economy, now is the time to do our utmost to foster resilience and adaptation in nature and human society. This should be a high priority across all government agencies and programs. Victoria should be responding to the threat of climate change by:

- reducing the state's greenhouse gas emissions (mitigation), including by conserving natural carbon sinks such as forests, seagrass meadows and streams, and by preventing harmful carbon-emitting activities such as logging, land clearing, and severe burning regimes
- ensuring that responses to climate change – eg new crops, products and services, and increasing demands for resources such as water – are ecologically sustainable
- reducing current threats to nature and improving habitat quality to promote resilience to climate change
- fostering adaptation to climate change, including by protecting refugia and representative habitats.

At particular risk in the near term are alpine, moist and coastal habitats, and species with low ecological tolerances, specialised requirements, low genetic variability, long generation times, poor dispersal ability or narrow geographic ranges. The national park and conservation system has a central role to play in helping nature adapt to climate change. This includes safeguarding climate refuges for sites providing temporary refuge (during climatic extremes and ecological disturbance) and for sites providing long-term refuge for species with contracting ranges.

Funding

The failure to invest sufficient public funds to arrest environmental decline in Victoria is exacting enormous economic as well as environmental and social costs. There needs to be much greater recognition that the natural environment provides essential services, and directly and indirectly sustains the Victorian economy. Otherwise, future Victorians will inherit further loss of natural capital and spiralling costs for restoration and threat mitigation.

Only a small proportion of the Victorian budget goes to support nature conservation, and government agencies are unable to meet their fundamental environmental obligations. For example, Parks Victoria receives funding equivalent to just 0.6% of the state budget, including budget allocations and funds from the Parks and Reserves Trust (see graph, page 46). This level of funding for managing about 18% of the state's land area and 5% of marine waters budget is equivalent to that for a medium-sized local government area, and equivalent to the cost of about a cup of coffee per Victorian per month. Conservation expenditure on national parks is actually substantially less than that, for about a third of Parks Victoria's budget is for managing 5000 hectares of metropolitan parks and a considerable portion is spent on managing visitors and facilities.

Essential to environmental planning is the realistic costing of actions needed to fulfil Victoria's

environmental obligations as well as the costing of current unsustainable practices. Long-term investments are needed for long-term problems. The following principles should be applied to funding decisions.

- Establish clear links between policy and funding, so that policy is translated into actions and outcomes.
- Commit resources for ecologically realistic timeframes.
- Allocate 'core funding', with long-term security, to central elements of public land management, rather than short-cycle 'initiative' funding.
- Identify the core environmental functions of government – those required under treaties, legislation, regulation and policy – that should be funded by government, to ensure that funding obtained from external, non-public sources is used to enhance these functions and not replace them.
- Make funding decisions transparent, with details available for public review.
- Avoid funding or subsidising activities that undermine environmental objectives.
- Include realistic in-kind and volunteer contributions in programs and ensure there is sufficient budget to support, train and encourage volunteers.

Conservation in Victoria requires substantially more funding – from

both traditional and new sources. In recognition that environmental health is essential to the state's future and underpins economic and social wellbeing, a certain proportion of the state budget should be guaranteed for environmental and conservation functions, based on an audit of core funding needs to fulfil essential environmental functions that arise from national and international commitments. This review proposes the establishment of a Victorian biodiversity fund to support programs necessary to build the resilience of Victoria's ecosystems. New or expanded sources of funding should be investigated, including lotteries and levies such as a bed tax from tourism.

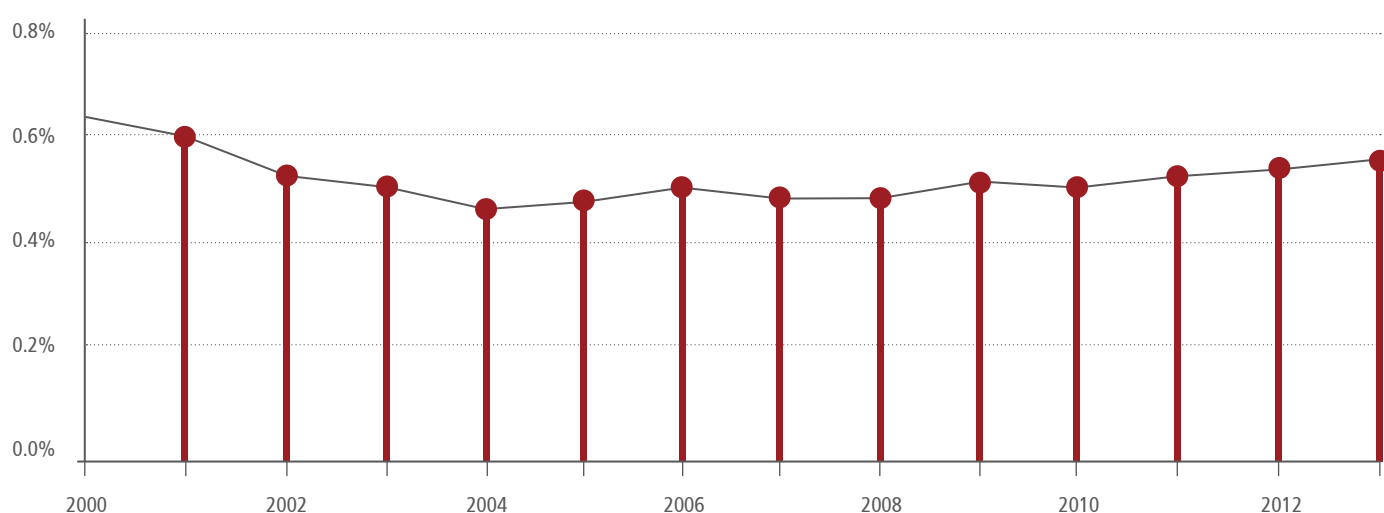
Knowledge needs

A consistent theme in this review is inadequate baseline information and insufficient monitoring to evaluate whether policies and programs are achieving their goals. Much better knowledge of Victorian biodiversity and management effectiveness is required. This in turn will require improving expertise and skills within the biodiversity sector, and conducting long-term monitoring and research programs.

Knowledge of Victorian biodiversity is very poor for (1) the conservation status and trajectories of biodiversity, particularly for neglected groups such as fungi, non-vascular plants and invertebrates, (2) ecological

4 The total cost of management of Victoria's national parks and conservation estate equates to about the cost of one cup of coffee per citizen once a month.

Funding for Parks Victoria as a percentage of the state budget



Note: Funding from state government sources as a percentage of the state budget, 2000-2013. The funding includes state government budget allocations to Parks Victoria and funding from the Parks & Reserves Trust.

requirements of taxa and the threats to them, (3) interactions between taxa, communities and abiotic elements (soil, groundwater, atmosphere) and ecological processes, (4) the effectiveness of different management techniques for different situations and (5) conservation assets on private lands.

Managing the natural environment requires high-level expertise and diverse skills. Several reviews have identified a lack of these in state and local governments that limit their capacity to fulfil their obligations. Long-term funding deficiencies have been exacerbated by recent budget and staff cuts, and organisational knowledge has declined due to outsourcing and rapid staff turnover. Losses in expertise can take a long time to reverse. There are major expertise gaps, particularly for neglected groups such as invertebrates and fungi, for neglected habitats such as groundwater, and in particular disciplines such as taxonomy

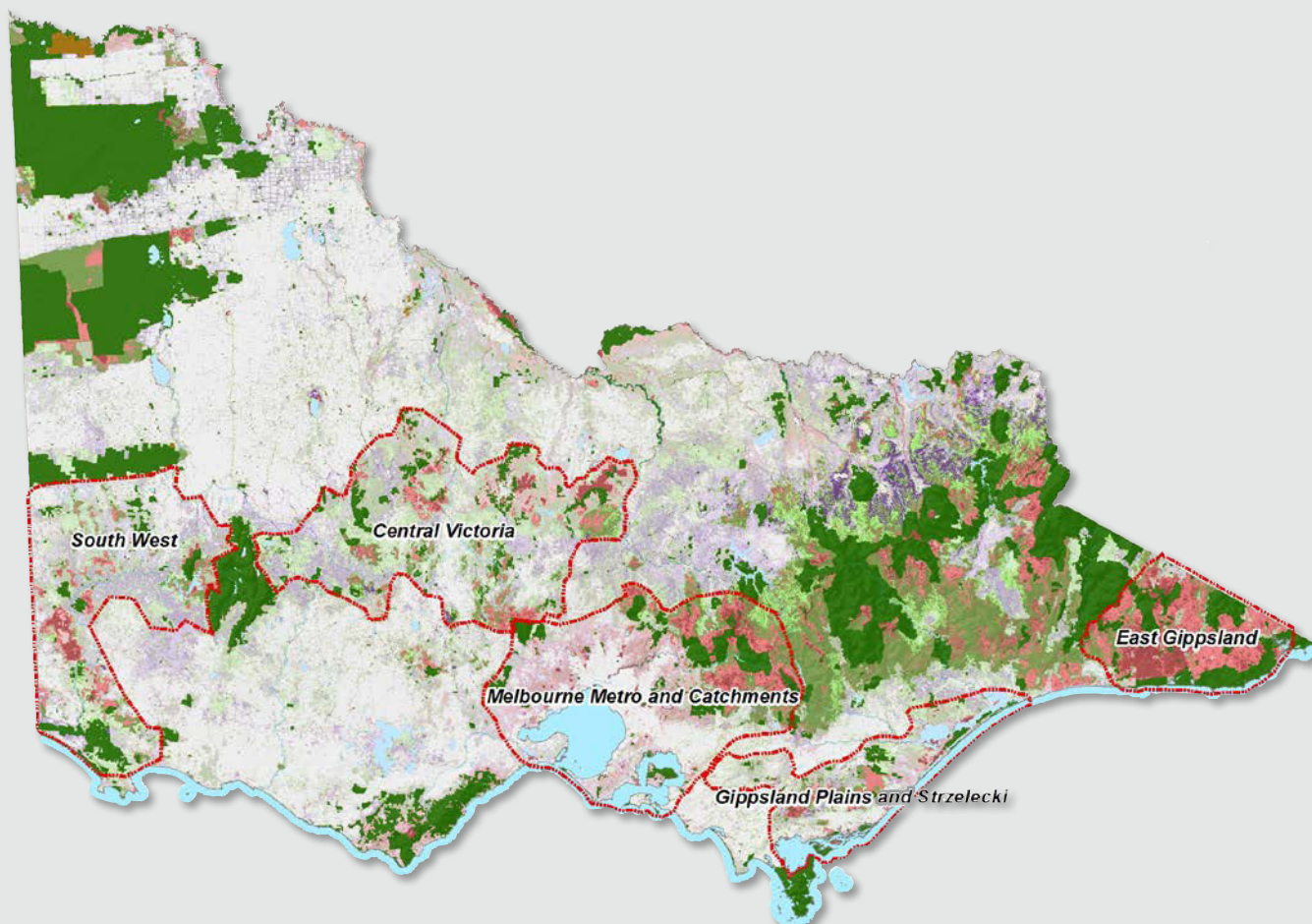
and oceanography. Emerging issues, particularly climate change, require additional skills. Some gaps can be addressed by more resources; others, such as the dearth of taxonomists, will need programs to attract and support the next generation of scientists. Environmental management also needs to be bolstered by greater use of expert advisory bodies such as for management of national parks.

More comprehensive and meaningful monitoring is essential for tracking the status of biodiversity and evaluating outcomes of management. 'It is critical that baseline monitoring is improved and a stable, long-term source of funding to support this monitoring is ensured,' said the 2013 state of the environment report. A gap analysis is recommended to identify priority monitoring needs.

Community groups and citizens have been increasingly contributing to monitoring, through programs

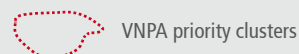
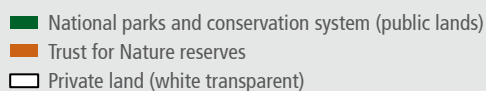
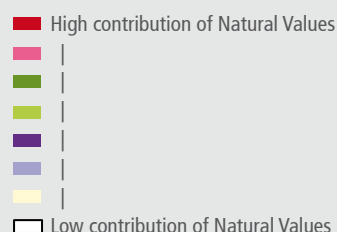
such as VNPA's Reef Watch and Nature Watch, Parks Victoria's Sea Search, and Birdlife Australia's bird atlas project. Apart from collecting valuable data, citizen science programs offer benefits that derive from meaningful involvement of people in positive environmental activities. It is important to be clear about the ways in which community science programs can help address knowledge needs, to ensure data quality and to provide resources and training.

Much of the environmental information accumulated by and for the state government is either difficult or impossible to access. A centralised reporting system and reporting protocols are needed to optimise the value and use of environmental information.



Location of VNPA five priority clusters

NaturePrint: Strategic Natural Values



Priority landscape clusters

This nature conservation review has made a large number of recommendations, and some prioritisation of focus is needed. A handful of areas in Victoria stand out as having very high conservation values and facing high threats. By grouping them into regional clusters, the case for action is made clearer and more compelling.

The five 'priority clusters' shown in the map above encompass substantial areas with high-value biodiversity and intact vegetation that have poor representation in

the national park and conservation system, as well as adjacent marine areas subject to major threats. Over the next 10 to 20 years the following outcomes are sought for each of these clusters:

- **Completion of the reserve system on public lands:** Expand the national park and conservation system to prevent threats (logging, mining, agriculture, fishing in marine areas and other intensive uses) and improve management of public lands.
- **Encourage conservation management for private lands:** Prevent further clearing or degrading uses, promote conservation management (secured by perpetual conservation covenants or similar means), enhance connectivity and restore habitats.
- **A focus for community action:** Support the community to be involved in advocacy, on-ground works and citizen science; and foster public awareness, access to information and engagement.

Overview of future directions

This is a brief summary of some of the review's major recommendations for environmental governance.

Environmental laws

- Develop new consolidated legislation – a Victorian Environment and Conservation Act – to provide a comprehensive framework for conservation of biodiversity and ecologically sustainable management of vegetation, wildlife and public lands.
- Reform the Flora and Fauna Guarantee Act, including in ways recommended by the auditor general and the Environment Defenders Office (now Environmental Justice Australia), and incorporate it into the new Environment and Conservation Act. Essential reforms include an improved and accelerated process to identify and list threatened biodiversity and threatening processes, and to develop, implement and review action plans for recovery.
- Amend the federal Environment Protection and Biodiversity Conservation Act to make national parks and other protected areas a matter of national environmental significance, requiring Commonwealth assessment of any activities likely to have a significant impact on protected areas.
- Develop new biosecurity legislation to more effectively manage invasive species that threaten the natural environment. It should include a permitted (safe) list approach to define which non-indigenous taxa can be introduced, sold, moved or kept in Victoria, and a lead role for the environment department and environment

minister in developing policy and administering regulations for environmentally relevant invasive species.

Institutional structures and processes

- Restructure Victoria's institutions for conservation and natural resource management to establish clear lines of accountability, to separate regulatory roles from policy setting and management and to maximise the independence of environmental regulators.
- Set outcome-focused and measurable targets to define a pathway for improving the natural condition of Victoria. Incorporate five-year rolling targets into state budget portfolio service delivery targets and agency director performance agreements, and independently audit agency performance against these targets.
- Embed ecological sustainability and biodiversity conservation as core principles for all departments through their enabling legislation, mission statements and strategic plans.
- Expand the role of the Victorian Environmental Assessment Council to advise on priorities for both private and public land conservation and planning.
- Strengthen the compliance framework for environmental laws by developing whole-of-department and specific regulator compliance monitoring and enforcement policies, identifying and monitoring high compliance risks, improving oversight of compliance functions and publicly reporting on activities and outcomes.

- Encourage local governments to prepare local biodiversity action plans, and offer matching funds for implementation of these plans.
- Provide a statutory mechanism under the planning system or local government laws for local governments to achieve permanent protection of council lands with high conservation values.
- Strengthen the implementation of catchment management plans by aligning local government land-use planning with catchment management priorities.

Planning and priorities

- Develop a nature conservation strategy that includes long-term measurable targets that can be adapted as conditions change or as monitoring suggests changes are required, strategies to drive conservation at landscape and seascape scales, a mixture of conservation tools including regulation and market-based initiatives, strategies across public and private land tenures, and a commitment to long-term funding.
- Provide the resources necessary for the environment department to systematically list threatened species, ecological communities and threatening processes, and develop action plans for all listed entities within five years.
- Ensure that all protected areas have up-to-date management plans and publicly accessible web-based maps and information about their values.
- For climate change mitigation, identify carbon sequestration opportunities that complement biodiversity protection and restoration.

- Investigate and implement measures to preserve the biodiversity values of the national park and conservation system under climate change, including by expanding the area and improving its management, encompassing refugia, linking up the national park estate along environmental gradients, addressing the long-term viability of threatened species, building the knowledge base about impacts of climate change, and developing national park specific or regional climate adaptation plans.
- Adopt a 'foresighting' approach to planning for climate change, and plan for possible outcomes taking account of potential interactions and worst-case scenarios.
- Conduct research into responses of species and communities to climate change, particularly management approaches and techniques to facilitate adaptation and persistence.
- Establish a natural icons resilience program at the Commonwealth level with funding for management of strictly protected areas on public or private lands that goes beyond 'duty of care' or 'baseline management' and for special programs to improve the resilience and conservation value of protected areas.
- Increase funding for conservation. To identify core funding needs, conduct an audit of essential environmental functions arising from national and international commitments, including recovery of threatened biodiversity and mitigation of threatening processes. Make long-term funding commitments to guarantee conservation management over ecologically relevant timeframes.
- In recognition that a healthy environment is essential to Victoria's future and underpins economic and social health, allocate a defined proportion of the state budget to maintaining and restoring Victoria's environment.
- Increase the transparency of funding arrangements, including for management of the public reserve system and the allocation of resources for different functions such as visitor and facility management and conservation.
- Ensure that collection, storage and management of information are subject to standard protocols and guidelines, and that the information is freely accessible to all users.
- Establish a long-term ecological monitoring network to track conditions and trends in ecosystem components and processes, especially those most susceptible to climate change.
- Identify priority gaps in information collection and monitoring through consultation with the biodiversity sector.
- Implement statewide standards to be developed by the proposed Environmental Audit Office for the collection, management and dissemination of environmental data and reports.



The full report is approximately 300 pages, is fully referenced and includes 163 recommendations across marine, coastal, freshwater and terrestrial environments. You can download it from: www.vnpa.org.au

Knowledge needs

- Conduct a training needs assessment by auditing the skills and expertise within the biodiversity sector, especially of state and local government personnel and contractors. Address skills and expertise gaps at all levels.
- Maintain a fixed proportion of departmental budgets to employ research staff and run research programs.
- Support the community to undertake scientifically robust monitoring by providing expert advice and feedback, protocols to ensure the data is effectively used and publicly accessible databases.

Funding

- Establish a Victorian biodiversity fund to improve environmental program delivery, manage public conservation reserves and build the resilience of ecosystems. Investigate potential sources of revenue, including lotteries and new or expanded charges and levies such as a 'bed tax' from tourism.



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