

Biodiversity



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Acronyms and abbreviations

Acronyms

AAS	Australian Academy of Science
AAT	Australian Antarctic Territory (Commonwealth)
ABRS	Australian Biological Resources Study (Commonwealth)
ABS	Australian Bureau of Statistics (Commonwealth)
ACF	Australian Conservation Foundation
ACT	Australian Capital Territory
AEI	Australian Ethical Investments
AGO	Australian Greenhouse Office
AHC	Australian Heritage Commission
AIMS	Australian Institute of Marine Science
ALGA	Australian Local Government Association (Local Government)
AMC	Australian Minerals Council
AMJ	Australian Marine Jurisdiction
ANZECC	Australian and New Zealand Environment and Conservation Council
ARC	Australian Research Council
ARCCD	Australian Rivers and Catchment Condition Database
ARMCANZ	Agricultural and Resource Management Council of Australia and New Zealand (Commonwealth/State/International)
AVHRR	Advanced Very High Resolution Radiometer
BAP	Bycatch Action Plan
BDAC	Biological Diversity Advisory Committee (Commonwealth)
BFC	Bushfires Council (Northern Territory)
BFMP	Bushfire Fuel Management Plan
BRD	Bycatch Reduction Devices
CALM	Department of Conservation and Land Management (Western Australia)
CAMBA	China–Australian Migratory Birds Agreement
CAP	Community Assistance Program
CAR	Comprehensiveness, Adequacy and Representativeness
CBD	Convention on Biological Diversity (International)
CBN	Community Biodiversity Network
CRC	Cooperative Research Centre
CITES	Convention on the International Trade in Endangered Species of Wild Fauna and Flora, 1973, Washington (International)
COAG	Council of Australian Governments
CSIRO	Commonwealth Scientific and Industrial Research Organisation (Commonwealth)
CYPLUS	Cape York Peninsula Land Use Study (Commonwealth/State)
DNRE	Department of Natural Resources and Environment (Victoria)
DPIWE	Department of Primary Industries, Water and Environment (Tasmania)
DRC	Democratic Republic of the Congo
EEZ	Exclusive Economic Zone (Marine)
ELZ	Extensive Land-use Zone
EMS	Environmental Management System
ENSO	El Niño–Southern Oscillation
EPA	Environment Protection Agency (Queensland)
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)
ERA	Energy Resources Australia
ERO	Environment Resources Officer
ESA	Ecological Society of Australia
ESD	Ecologically Sustainable Development
ESP	Endangered Species Program
FAA	Fire Affected Areas
FHS	Fire Hot Spots

FSC	Forest Stewardship Council
GIS	Geographic Information System
GM	Genetically Modified
GMAC	Genetic Manipulation Advisory Committee
GMO	Genetically Modified Organism
GNP	Gross National Product
IBC	Institutional Biosafety Committee
IBRA	Interim Biogeographic Regionalisation for Australia
ILZ	Intensive Land-use Zone
IMCRA	Interim Marine and Coastal Regionalisation for Australia
IMG	Interim Management Guidelines
IPA	Indigenous Protected Areas
IPAP	Indigenous Protected Areas Program
IPCC	Intergovernmental Panel on Climate Change
ISP	Independent Scientific Panel
ITTO	International Tropical Timber Agreement
IUCN	International Union for the Conservation of Nature
JAMBA	Japan–Australian Migratory Birds Agreement
LCC	Land Conservation Council
LEAF	Local Environmental Assistance Fund
LWRRDC	Land and Water Resources Research and Development Corporation
MCFFA	Ministerial Council on Forestry, Fisheries and Aquaculture
NBP	National Bycatch Policy
NEAP	Nature and Ecotourism Accreditation Program
NEGCP	Nature Ecotour Guide Certification Program
NGO	Non-government Organisation
NHT	Natural Heritage Trust (Commonwealth)
NLWRA	National Land and Water Resources Audit (Commonwealth)
NLGBS	National Local Government Biodiversity Strategy (Local Government)
NOAA	National Oceanic and Atmospheric Administration (USA)
NPFB	National Policy on Fisheries Bycatch
NPI	National Pollutant Inventory
NPWS	National Parks and Wildlife Service (New South Wales)
NOCC	North Queensland Conservation Council
NRSP	National Reserve System Program
NSCABD	National Strategy for the Conservation of Australia's Biological Diversity
NVCA	Native Vegetation Conservation Act 1997 (NSW)
NVIS	Native Vegetation Information System (Commonwealth/State)
OBP	Ord Bonapart Program (north-west Australia)
PWC	Parks and Wildlife Commission (of the Northern Territory)
QPWS	Queensland Parks and Wildlife Service
RCD	Rabbit calicivirus disease
RFA	Regional Forest Agreement
ROTAP	Rare or Threatened Australian Plants (database)
RVMP	Regional Vegetation Management Plans
SoE	State of the Environment
SPP	State Planning Policy
SRI	Socially Responsible Investment
TAP	Threat Abatement Plan
TED	Turtle Excluder Device
UNFCCC	United Nations Framework Convention on Climate Change
WBCSD	World Business Council for Sustainable Development
WONS	Weeds of National Significance
WTO	World Trade Organization
WWF	World Wildlife Fund for Nature

Abbreviations

μg	micrograms (10^{-6} grams)
μm	micrometres (10^{-6} metres)
m	metre
kg	kilogram
mm	millimetres
t	tonne

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Executive summary

Introduction

Biodiversity or *the diversity of life* is essential for the continued existence of humanity. The wellbeing of humans is intimately linked to the wellbeing of the environment. Today, unfortunately, there are innumerable examples worldwide where biodiversity depletion and loss have led to environmental, social and economic collapse. A vital challenge for all Australians in the 21st century is to put human development on a sustainable trajectory and to avoid further biodiversity loss.

The 1996 Australian State of the Environment (SoE) Report (SoE 1996) identified several areas where tangible progress had been made to enhance conservation since Australia had signed the United Nations Convention on Biodiversity (CBD) in 1992. However, the Report also outlined many areas of concern including threats (e.g. land clearance) to biodiversity that required both immediate and strategic attention by governments and society to avoid further loss.

Environmental indicators

The indicators used in the 2001 Report fall into three main categories: those that measure *pressures* on biodiversity, those that measure the *state* of biodiversity, and a third group that measures the *response* of a broad range of groups in society to both the pressures on, and status of, biodiversity. Importantly, this Report also addresses the *implications* of the trends in the different indicators for biodiversity conservation.

Structure of the report

The 2001 report on biodiversity focuses on the national level. It comprises eight sections, a glossary and considerable supporting material. Key topics covered in the sections include: meanings, significance and implications; status and trends; indicators; issues and challenges; knowledge, roles and responsibilities; and safeguarding Australia's biodiversity heritage. The status of biodiversity is considered using quantitative and qualitative data to report on the 65 indicators. These indicators are covered systematically using six themes: disturbance regimes and biodiversity; exotic species and genetically modified organisms; protecting biodiversity; increase in the knowledge of biodiversity; roles and responsibilities; and the international dimension.

Disturbance regimes and biodiversity

The clearance of native vegetation remains the single most significant threat to terrestrial biodiversity. Only four other countries exceed the rate of clearance of native vegetation in Australia. Since European settlement, most native vegetation has been removed or significantly modified by human activity. The rate of land clearance has accelerated over time, with as much cleared during the last 50 years as in the 150 years before 1945. During 1999, it is estimated that Australian governments granted permits for clearing a total area in excess of one million hectares of vegetation. The State governments of Queensland and New South Wales, alone, granted permits to clear 713 515 ha of vegetation. This pattern continued in 2000 when, for example, clearing permits for the first six months were granted for a total of 431 781 ha, of which 166 194 ha is old growth vegetation. Over 400 000 ha of native vegetation is estimated to have been cleared in 1999 and well over 500 000 ha was cleared in 2000.

Land clearance destroys biodiversity. The clearance of native vegetation results in the loss and depletion of plant species and destroys the habitat for thousands of other species. For example, it is estimated that 1000 to 2000 birds permanently lose their habitat for every 100 ha of woodland that is cleared, while the clearing of mallee for wheat farming kills, on average, more than 85% of the resident reptiles and more than 200 individual reptiles per hectare. As a legacy of this broad-scale clearance, in the next 50 years it is predicted that up to two million hectares of remnant native vegetation will be at risk from dryland salinity. Broad-scale land clearance can fundamentally change the functioning of ecosystems, including regional climate,

and in the medium to long term can undermine agricultural production and regional economies.

The pressures on biodiversity in old growth forests were identified as a major issue in the 1996 national State of the Environment Report (SoE 1996). Since 1996, regional forest agreements (RFAs) have been completed in a number of states and new guidelines for conservation reservation and intensive management of production forests have been put in place. Even so, community concerns about native forest biodiversity remain. The RFAs do not provide a comprehensive coverage of all native forest types. Within some target regions many biologically significant ecosystems and species have not been adequately protected and the efficacy of many forest management prescriptions remain to be determined.

Until recently, the focus on biodiversity conservation has been in the Intensive Land-use Zone in southern and eastern Australia where broad-scale clearing has been concentrated. There is now a growing appreciation among government and the community of the potentially significant effects of altered fire, grazing and hydrological regimes, pests and weeds and mining on biodiversity in the Extensive Land-use Zone in central, western and northern Australia. The pastoral industry covers about 70% of the continent, and grazing in arid and semi-arid regions is considered partly responsible for the extinction of many plant species and continues to threaten around one-quarter of the plant species listed as endangered.

Altered fire regimes were not listed as one of the key threatening process for biodiversity in the SoE (1996). Today, however, there is much greater awareness of the links between fire regimes (season, frequency, intensity and type) and the conservation of biodiversity. In particular, there is greater appreciation of the magnitude and importance of fires in northern Australia. The use of satellite monitoring in this region is building up a picture of changes in fire patterns over time which are being used to help inform management activities.

Threats affecting Australia's coral reefs include the effects of sediments, agricultural chemicals and nutrients, the effects of fishing and tourism, the threats of oil spills, and negative changes in habitats as a result of enhanced climate variability and climate change. Specific threats include elevated nutrients in the inner Great Barrier Reef and outbreaks of the Crown-of-thorns Starfish (*Acanthaster planci*). Tourism values of Australia's reefs are of growing importance and tourism must be actively managed to avoid the likelihood of habitat degradation and biodiversity loss.

The status of most marine species is a major concern, but limited data preclude a reliable evaluation of the true status of these resources at this time. A significant trend is that some marine species, like whales and seals, which were hunted in Australian waters until fairly recently, continue to show signs of recovery. However, the use of marine resources remains high and few fisheries have comprehensive management plans. For example, only 60 of the 144 managed marine and estuarine fisheries in Australia have management plans, and very few of these plans have indicators for monitoring non-target species.

A recent Commonwealth government report on Commonwealth fisheries demonstrates that fishing conducted by longline and dropline has increased in intensity during the 1990s, while the level of bycatch for some significant fisheries is very high. The Northern Prawn Fishery, Southern Bluefin Fishery and South East Trawl Fishery have high levels of bycatch that result in a significant, detrimental effect on marine biodiversity. Bycatch figures of 95, 83 and 50 to 86% are reported for these fisheries, respectively. Some 30 000 to 60 000 t of marine life might be discarded to land around 10 000 t of northern prawns. This 'discard' may involve over 500 species including turtles, snakes, sawfish, sharks and seabirds. The effect of fisheries such as the Bass Strait Central Scallop fishery on the biodiversity of sea-bottom communities is also likely to be high, but cannot be quantified at this time. The effects of harvesting on marine invertebrates are also unable to be quantified, but are likely to be significant.

The continued degradation of freshwater aquatic ecosystems is also of major concern. Declines of several species of frog, aquatic tortoise and lizard continue and are primarily the result of continuing declines in wetlands, riverine systems and water quality.

Climate change remains a key issue confronting Australia. The response of the Australian government to the Kyoto Protocol has significantly changed the way climate change is viewed and the amount of resources directed to this issue. In terms of the climate change policy of the present Commonwealth government, emphasis has been placed on the mitigation of greenhouse gases emissions through processes such as the Greenhouse Challenge, with the direct and indirect effects of climate change on biodiversity receiving much less attention. This situation must change if the potential impacts of climate change on terrestrial (e.g. alpine

and arid zone) and marine (e.g. Great Barrier Reef) biodiversity are to be adequately researched, better understood and managed. The important role of native vegetation in carbon sequestration and the mitigation of climate change is well known. Despite this, some Australian jurisdictions continue to permit high rates of land clearance.

Several new initiatives since 1996 have helped to increase the representativeness of Australia's system of conservation reserves. These include the National Reserve System Program and related state and territory programs, the RFAs, the Indigenous Protected Area scheme, new multitenure management schemes, and the enormous growth in contributions from the non-government sector (e.g. the Victorian Trust for Nature and the Australian Bush Heritage Fund).

Even so, many anomalies exist. For example, some regions have relatively high levels of reservation (e.g. South-East Tasmania; Australian Alps; Cape York Peninsula), while other regions that have been subject to extensive modification and species loss have relatively low levels of reservation (e.g. where agriculture dominates in southern continental Australia and relatively productive regions of the Australian rangelands). The RFAs rarely tackled conservation and management needs outside of the public forest estate. Hence, many biologically significant forest ecosystems, including old growth forests, remain poorly conserved and are considered under threat.

Some recent initiatives, which fall into two groups, advance capacities for bioregional planning: those directly concerned with biodiversity; and a much larger array of other 'regional' arrangements which may or may not integrate biodiversity issues. Difficulties remain in matching existing, and often very useful, jurisdictional and planning boundaries with regionalisations such as the Interim Biogeographic Regionalisation for Australia (IBRA). Data matching is a particular issue, with many relevant data sets as yet unavailable at the scale of IBRA or the Interim Marine and Coastal Regionalisation for Australia (IMCRA). The efficacy of implementation of recent bioregional planning mechanisms will need to be closely monitored.

Exotic species and genetically modified organisms

Exotic organisms were identified as a major threat to biodiversity in SoE (1996), and remain so. 'Sleeper' weeds (species that have established, but are yet to become a widespread problem) are now recognised to be of major concern, as are exotic organisms that might find their way through Australia's quarantine barriers as a result of trade, tourism and other human activities. Since 1996, a National Weeds Strategy has been released, 20 weeds of national significance identified and another 28 species listed that pose a potential threat to biodiversity. Threat abatement plans have also been developed for the fox, rabbit, cat and goat. At the national level, two Cooperative Research Centres (CRCs) fund most of the research into the ecology and management of exotic plants and animals that threaten biodiversity. Considering the magnitude of the issue, however, considerably more funding could be allocated to these areas. The effects of genetically modified organisms (GMOs) on biodiversity could also be significant. Comprehensive investigation of the potential effects of GMOs in Australia is a priority.

Protecting biodiversity

Biodiversity encompasses the variety of life at the gene, species and ecosystem levels. Consequently, protection of biodiversity must consider all of these elements. Management strategies, for example, should aim to conserve species across a broad range of climatic regions and to conserve all races, variants and subspecies. This will ensure that any genotypes fixed because of local adaptation will be conserved and available to counter future climatic changes. Overall, the recommendations on genetic indicators by Brown et al. (1997) and Saunders et al. (1998) may generate some useful statistics for monitoring species but most current genetic studies of Australian species do not provide sufficient information for the relevant variables to be calculated.

The ABRS provided the most recent summary of our knowledge of species diversity in Australia (summarised in Table 46). The estimated total number of Australian flora (plants and fungi) species is 290 000. The estimated total number of Australian fauna species is 200 000, about 192 000 invertebrate species and 8 000 vertebrate species. For many groups,

particularly the invertebrates, it is estimated that more than 50% of species remain to be described.

The Australian continent is recognised as a centre of endemism of global significance (Major 1988). Because of its size, age and geological and evolutionary isolation, over 80% of mammal, reptile, flowering plant, fungi, mollusc and insect species in Australia are endemic (Table 46).

It appears that the number of nationally endangered and vulnerable species has increased in several groups over the last seven years (Table 50). In some instances, the numbers of species in these categories may change over time because there have been changes in the abundance or distribution of species. But in many cases, the changes are due to taxonomic revisions resulting in either the creation or loss of new species. There are 1451 species and 27 ecological communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in February 2001, as either endangered or vulnerable at the national level. The categories 'critically endangered', 'conservation dependant' and 'extinct in the wild' have been added to the previous categories of endangered, vulnerable and extinct for threatened species and 'critically endangered' and 'vulnerable' have been added to the previous category of endangered for ecological communities.

As of May 2000, there were 37 adopted Recovery Plans in place under the EPBC Act (Table 51) covering 44 species, 18 of which are plants. This means that around 3% of nationally listed species and communities have recovery plans. In early 2001, another 100 recovery plans, covering in excess of 130 species were being considered for adoption by the Threatened Species Scientific Committee. State and territory governments also prepare recovery plans under their legislation, but documenting these plans was beyond the scope of this report. There are many more plans in preparation, many without any funding support from the ESP.

Bioprospecting (the chemical prospecting for pharmaceuticals in natural organisms) is a growing industry in Australia, with potential in both terrestrial and aquatic environments. If managed appropriately, bioprospecting has the potential to have minimal impact. The ability to capture new biotechnological benefits will rely on maintaining biodiversity in its natural environment because the exploitation of metabolites usually depends on observing the interactions between organisms where they normally live.

The 'ecosystem services' (indirect utilitarian values) provided by biodiversity have received increasing attention but the economic value of these services is often difficult to calculate. One estimate in 1997 valued terrestrial Australian ecosystems at US\$245 billion per year and US\$640 billion per year for marine ecosystems (Jones & Pittock 1997). While these figures are relatively coarse, they emphasise the major contribution that biodiversity makes to healthy and functioning landscapes.

Increase in the knowledge of biodiversity

The diversity of life found in Australia is highly significant by world standards and contributes enormously to the Australian economy and way of life. Many plants and animals are found only in Australia and this is something the country is renowned for. Our understanding of the diversity of vascular plants, mammals and birds is reasonably good, but when it comes to groups such as the invertebrates, fungi and bacteria the situation is very different. There is a mismatch between effort and the amount of outstanding work needed to describe the hundreds of thousands of unnamed species in Australia and its territories. Fungi in particular are underresourced, relative to other taxa, when the total numbers of undescribed taxa are taken into account. Fungi are important in ecosystem services and biogeochemical cycles, making them just as important as vascular plants from a utilitarian perspective.

Whereas only a small proportion of the species in Australia has been described and named, it is still possible to identify areas of biological significance such as those with high species diversity or levels of endemism. The ability to report on genetic diversity, however, is extremely restricted and we are just starting to appreciate the role of biodiversity in the provision of ecosystem services and important products that support the economy.

The conservation status of many components of terrestrial biodiversity remains disturbing. For example, some 8% of Australia's higher plants, 14% of birds, 23% of marsupials, 8% of reptiles, 18% of amphibians and 9% of freshwater fish are extinct, endangered or vulnerable at the national level. Australia's record of mammal species extinctions is the worst of any country. In the 1800s and 1900s, Australia has lost ten species

of the original marsupial fauna of 144 species and eight of the 53 species of native rodents. Serious concern also exists for the conservation status of many invertebrate groups and non-vascular plants as a result of the alarming extent of habitat destruction and modification that has occurred since 1996. The condition of many ecosystems remains uncertain and of concern as a result of the lack of biological surveys and inadequate reservation.

Australia's territorial waters cover a large geographical area extending from the shores and wetlands along the coastline to the abyssal deeps, and from the coral reefs of Torres Strait in the north to the pack ice of Antarctica in the south. As a result of the diversity of marine environments, Australia's fish fauna is one of the richest in the world. While understanding of marine biodiversity has improved during the 1990s, knowledge of most ecosystems and their dynamics remains inadequate for proper understanding and management.

Australia has the largest area of coral reefs of any nation and the largest coral reef complex, the Great Barrier Reef. Major areas of coral reefs are also present in Torres Strait, the Coral Sea Territories, and central and northern Western Australia. Shallow water habitats around emerged reefs have received the most research attention in Australia. There is a major gap in scientific knowledge of deep reef habitats, inter-reef habitats and submerged reef habitats, while the nature of biotic communities of the continental slope, which drops from a depth of 150 to 4000 m and is at least two million square kilometres in area, is largely unknown to science.

Roles and responsibilities

Perceptions of the role of all sections of Australian society in biodiversity conservation have developed since 1996. Today, there is much greater awareness of the important role of local governments in managing biodiversity, whereas previously the focus had been largely on state and Commonwealth governments. There is also now a much greater emphasis on the potential role that philanthropists, industry and the broader community can make to conservation.

As the attitudes of the Australian public to environmental issues change, so do those of industry. Several corporations and industry sectors have begun to adopt ethical and environmental codes of practice that can support biodiversity conservation. This is a positive change to that reported in 1996. For example, Visy Industries was recognised recently as Australia's most environmentally conscious corporation. Overall, however, 'corporate Australia' is yet to fully recognise and fulfil its environmental obligations.

Studies of the urban environment and biodiversity in urban settings are important if these components of biodiversity are to be sustained. Improved understanding of urban biodiversity can help improve the quality of life of many citizens and also provide a basis to enhance community education about biodiversity and its management. Because most Australians live in urban environments, increasing the awareness of biodiversity and the role of individuals in conserving it is essential.

Some important reforms supporting biodiversity conservation have been adopted in the agricultural sector. Farmers comprise the bulk of the membership of many community groups such as Landcare. Some parts of the sector now routinely incorporate nature conservation objectives into their resource and landscape management strategies, and commercial programs. Even so, much more can be done by the agricultural sector to improve its contribution to biodiversity conservation. Many cases exist where industries have failed to respond of their own accord to pressures on biodiversity and have only acted in response to government legislation and enforcement.

Today, the involvement of Indigenous peoples in land management has a much higher profile, with repeated calls for Indigenous issues to be fully integrated into policy and program management. This is essential to the future of biodiversity in Australia because by 1996 about 15% of the country was managed by Aboriginal and Torres Strait Islander people and this area continues to expand. Furthermore, the extensive body of Indigenous ecological knowledge that could be used to improve understanding of biodiversity and its management is yet to be adequately harnessed. Exchange of this knowledge and learning would be assisted by a more comprehensive and interactive involvement of Indigenous people in land management.

Most of the remaining land in Australia is either freehold or leasehold, managed for commercial use. It is encouraging, therefore, that increased attention is being paid to the integration of biodiversity conservation with production objectives across landscapes. This goes together with greater recognition of the vital contribution that areas outside of the formal reserve system make to biodiversity conservation. The significance of ecosystem services to

humans and the 'value' of biodiversity is also now more widely appreciated. This is reflected in the increasing use of native species for commercial purposes (e.g. bioprospecting and the bush food industry) and recent discussions on the potential role of biodiversity credits and other mechanisms aimed at incorporating environmental values into market decisions.

Many community groups regularly monitor the environment and undertake field activities to either protect or restore biodiversity. The Landcare movement and related groups have become a key mechanism for integrating conservation of biodiversity into agricultural and pastoral production. A challenge for Landcare and many similar developments is to put their activities on a stronger scientific footing to maximise the longer-term biodiversity benefits that might arise from their hard work.

There has been an increased emphasis on the need for active management of landscapes and aquatic and marine ecosystems, and that this be done at the regional level if effective natural resource management is to be achieved. This rationale has led to the development of numerous regional processes and plans. Nonetheless, there has been only limited success in achieving active and integrated management at the regional level whereby different people, groups and the full range of land tenures are involved.

The Natural Heritage Trust has provided a major focus for funding of environmental management and biodiversity conservation measures by the Commonwealth government since 1996. The EPBC Act came into operation in 2000 and covers a range of key areas of biodiversity conservation including Australia's obligations under the Convention for the Protection of World Cultural and Natural Heritage. A major concern expressed about the Act has been the absence of land clearance as a trigger for invoking Commonwealth action. In early 2001, however, land clearing was listed as a key threatening process. It is premature to comment on the effectiveness of the Act, with various amendments made or proposed.

In 2000, concurrent with the preparation of this Report, the Commonwealth government reviewed the implementation of the National Strategy for the Conservation of Australia's Biodiversity (NSCABD). The review identified some signs of significant progress as well as many areas where pressures on biodiversity continue and responses remain inadequate.

The international dimension

At the international level, biodiversity conservation policy and legislation have become more complex since 1996. Australia is active in many international forums including the United Nations Convention on Biodiversity (CBD). Australia is well regarded for its support of sustainable natural resource management in partner countries, although overseas development aid funding for biodiversity-related projects has fallen.

Two international instruments can be expected to assume greater significance for biodiversity conservation. The United Nations Framework Convention on Climate Change (UNFCCC) is likely to be a significant international instrument since the effects of climate change on Australia's biodiversity are likely to be highly significant, and strategies for carbon sequestration have major significance for land management and thus for biodiversity conservation. The World Trade Organization (WTO) and related processes governing international trade are becoming more important to environment and biodiversity management.

Australia traditionally has been one of the most active participants in the Antarctic Treaty System. Australia's domestic policy and scientific research presence continue to exceed that of most other nations. Australia has been active internationally in the promotion and development of the Protocol on Environmental Protection to the Antarctic Treaty (the Madrid Protocol), which provides for comprehensive protection of the Antarctic environment. Australia is pursuing with other Treaty Parties further measures such as rules relating to liability for environmental damage, and the entry into force of Annex V which provides for area protection and management.

Conclusions

The destruction of habitat by human activities remains the major cause of biodiversity loss. Land management issues such as the clearance of native vegetation, control of exotic weeds and pests, provision of environmental flows in rivers, geographical expansion of dryland salinity, changed fire regimes and intensification of resource use in sectors such as forestry,

fisheries and agriculture are well known and widely reported. Many attempts to address these issues have been inadequate or have stalled. This situation must change if the future of Australia's biodiversity is to be safeguarded. Failure to reverse these trends will not only guarantee further loss of biodiversity, but also will diminish the quality of life enjoyed by Australians and ultimately undermine the Australian economy.

Governments are fundamental and critical to biodiversity conservation in Australia. However, policies relating to biodiversity conservation have not been commonly matched by effective policy implementation and good biodiversity outcomes. During the 1990s, Australia's biodiversity has experienced continued degradation and decline. Clearly, the sustainable management of Australia's resource base will not be possible unless many more financial and human resources are directed to support improved understanding and management of the nation's terrestrial and marine ecosystems. The recently released *Coordinating Catchment Management* report, from the bipartisan House of Representatives Standing Committee on Environment and Heritage, recommended that a National Environment Levy be put in place for the next 25 years to help fund programs to address this need. Additional mechanisms may be required to ensure that the funding is adequate, and comprehensive in its coverage of ecosystems and biota.

Introduction

The diversity of living organisms we observe today is the product of billions of years of evolution. This biodiversity is, however, now threatened by humanity. Global trends show that human activities are destroying and degrading a diverse range of ecosystems and result in the extinction of thousands of species annually. Wilson (1992), among other leading commentators, calls this a great spasm of extinction—caused entirely by humans.

Australia has a diverse and often unique environment that represents a priceless heritage that should be a source of pride to all Australians. The Australian government is a signatory to the United Nations CBD, and Australia has a national strategy for safeguarding its biodiversity heritage. Some aspects of the Australian environment were in relatively good condition by international standards (SoE 1996) and the approach to environmental management had international recognition in some areas. The 1996 Report also demonstrated that Australia has some very serious environmental problems, the cumulative consequences of human population growth and distribution, lifestyles, technologies and demands on natural resources over the last 200 years and more. The Report suggested that changes were needed in government policies and programs, corporate practices and personal behaviour.

The estimated population of Australia when Europeans arrived varies greatly, from 300 000 to 1.5 million. Seventy years later, the European population had reached one million. By 2001, the total population approaches 20 million. These citizens and their governments, industry and community organisations have responsibility for Australia's biodiversity.

State of the Environment reporting and the 2001 national report

Progress towards sustainability is difficult, if not impossible, without adequate and accessible information about the environment. State of the Environment (SoE) reporting can be a powerful tool for providing this information—to the public, industry, non-government organisations (NGOs) and all levels of government. As such, SoE reporting is being embraced at the local, regional, state and national levels. It allows regular reports on agreed sets of indicators of changes and trends in environmental conditions, in much the same way as well-accepted economic indicators are used to report on the state of the economy. It describes the effects of human activities on the environment, and their implications for human health and economic wellbeing. It also provides an opportunity to monitor the performance of government policies against actual outcomes. Thus, SoE reporting can act as a report card on the condition of the environment and natural resource stocks.

For the 2001 national SoE Report, a suite of agreed biodiversity indicators have been developed (Saunders et al. 1998) and these are used to describe and evaluate conditions and trends in biodiversity (see *Biodiversity status, trends and indicators*, page 19).