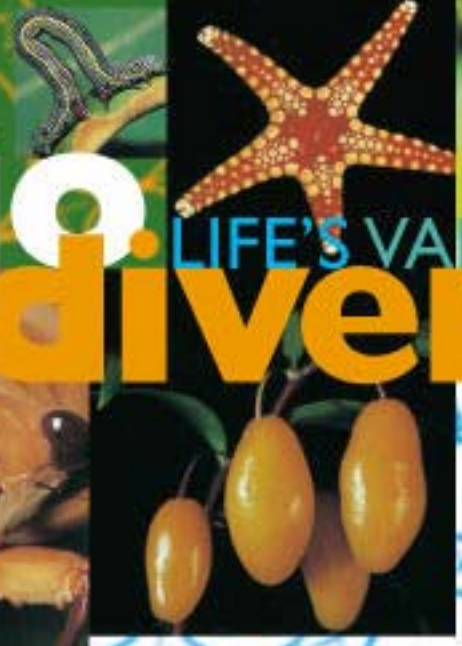
NSW Biodiversity Strategy



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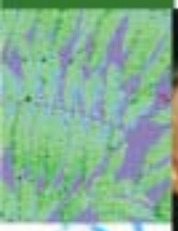

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NSW National Parks and Wildlife Service
43 Bridge St
(PO Box 1967)
Hurstville NSW 2220
Telephone: (02) 9585 6444 or 1300 361 967
Fax: (02) 9585 6555
website: www.npws.nsw.gov.au

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Cover photography by: Bill Rudman (Australian Museum), Phillip Green

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Foreword

Biodiversity is the variety of all living organisms, including all species, the genes they possess and the ecosystems they form. Biodiversity is vital in supporting all life on Earth. It provides all of our food and many industrial products and medicines. Biodiversity also ensures clean air and water and fertile soils, provides opportunities for recreation, tourism, scientific research and education, and is a source of cultural identity for many Australians.

We all benefit from the conservation of biodiversity and the products and services biodiversity provides. The NSW Government strongly believes that it is our collective responsibility to ensure that future generations are able to enjoy these same benefits.

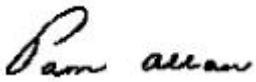
Conserving the biodiversity of NSW is a major challenge. Population growth, settlement patterns and our consumption of resources are exerting major stresses on our natural environments.

The NSW Biodiversity Strategy proposes a collaborative approach to biodiversity conservation. With the cooperation and support of the people of NSW, the Government is committed to protecting the native biodiversity of NSW and to maintaining ecological processes and systems.

Many NSW Government agencies already have policies and programs in place that are addressing issues relevant to biodiversity conservation.

These include initiatives relating to water reform, vegetation management, and development of a comprehensive, adequate and representative reserve system as part of the Government's forestry reform agenda. Additionally, many community groups and individuals are also contributing to the conservation of NSW biodiversity.

This Strategy proposes a framework for coordinating and integrating government and community efforts, ensuring that available resources are efficiently and effectively applied. The actions in the Strategy detail a balanced response for the integration of ecological, social and economic objectives and will establish a model for other States. The Strategy outlines proposals to protect the high quality natural environment of NSW and enable the benefits of biodiversity to be shared by all.



Pam Allan, MP
Minister for the Environment

Bob Carr, MP
Premier, Minister for the Arts and Minister for Ethnic Affairs

Introduction

What is biodiversity?

Biological diversity (or biodiversity) is defined for the purposes of this Strategy as:

The variety of life forms, the different plants, animals and micro-organisms, the genes they contain, and the ecosystems they form. It is usually considered at three levels: genetic diversity, species diversity and ecosystem diversity (see Box 1).

(Commonwealth of Australia 1996a)

Box 1:
The Three Levels of Biodiversity

Genetic diversity

Genetic diversity refers to the variety of genetic information contained in all individual plants, animals and micro-organisms.

Species diversity

This refers to the variety of species on Earth. Species diversity is usually a measure of the number of species (richness) and their relative abundances for a given area at a given point in time.

Ecosystem diversity

Ecosystem diversity refers to the variety of habitats, biotic communities and ecological processes. An ecosystem consists of plant, animal, fungal and micro-organism communities and the associated non-living environment interacting as an ecological unit.

Ecosystem diversity has two inter-related components: the diversity of communities of species; and the diversity of interactions between community members (processes).

Values of biodiversity

Biodiversity has many values. At the most fundamental level, biodiversity is the basis for healthy, functioning ecosystems that are necessary to maintain essential ecosystem services. These include: soil formation, nutrient storage and cycling, plant pollination and pollution breakdown and absorption. Put simply, biodiversity provides all the critical processes that make life possible.

Biodiversity also provides all food and the raw materials for a wide range of products, including clothing and medicinal goods and the means to control pest plants, animals and diseases. In addition, biodiversity is highly valued by many Australians for aesthetic, scientific, recreational and cultural reasons (particularly for Aboriginal and Torres Strait Islander people). Indeed, recent research indicates that over 92% of people agree that maintenance of biodiversity should be a priority for conservation programs in NSW (NPWS 1997). Further, there is a growing community recognition of the intrinsic values of biodiversity, such as the right of all species to exist.

While it is never possible to place a precise financial estimate on the value of biodiversity, it is clear that the conservation of biodiversity is essential to many industries and commercial activities. A successful agriculture sector, for example, relies on biodiversity to provide healthy soils, clean water and mechanisms to combat weeds and pests. In 1995–96, the gross value of Australian agricultural commodities was $27.6 billion (Industry Commission 1997). Conserving biodiversity will assist in maintaining the viability and productivity of agricultural and other activities.

At the broadest scale, the short-term economic benefits of ecosystem services have been valued at **US$33 trillion annually** (Costanza et al. 1997). This is almost twice the global gross national product. The economic benefits and values of biodiversity are also clearly evident in a number of specific areas:

- the contribution of koalas to the tourism industry is estimated at $1.1 billion per year, or around 9,000 jobs (Australia Institute 1997);
- whale-watching is a $50 million a year industry in Australia, while on a global scale whale and dolphin-based tourism is worth US $550 million (Montgomery 1997);
- the annual economic value of Dorrigo National Park is $5.4 million, contributing 8.4% of regional employment (Powell and Chalmers 1995);
- in Queensland, it has been estimated that the average hectare of mangrove habitat is worth $8,000 annually in fish production (ACF 1997);
- the financial benefit of water supplied to Melbourne from forested catchments has been valued at $250 million a year (DEST 1993);
- the Australian commercial fishing industry

produced catch worth $1.7 billion in 1994/95 (Commonwealth of Australia 1996b); and

- Australian and international studies indicate a high benefit-to-cost ratio for money spent on the environment. This includes benefits from enhanced tourism opportunities, improved land values and public health and reduced costs of land management and agriculture (Commonwealth of Australia 1996b).

Biodiversity conservation is both a time and resource intensive process. However, the costs of not protecting biodiversity are likely to be substantial and in many cases the loss of biodiversity will be irreversible. The impacts of failing to maintain healthy, functioning ecosystems are already obvious in many areas:

- approximately 72% of NSW is affected by some form of land degradation (EPA 1997);
- dryland salinity costs $243 million per year in lost agricultural production (Industry Commission 1997);
- soil structure decline is costing Australian farmers around $200 million annually (Industry Commission 1997); and
- the cost to Australia of lost agricultural production, decreased quality and control measures due to weeds is estimated at $3.3 billion per annum (Commonwealth of Australia 1997).

Efforts to conserve biodiversity are essential to maintain the full range of values and benefits that biodiversity provides. In this sense, biodiversity conservation can be compared to an insurance policy, providing a preventative mechanism to safeguard life-support systems, provide opportunities for sustainable use of biological resources and to reduce the potential costs caused by ecological degradation.

This Strategy provides the framework for addressing the complex challenges of biodiversity conservation and outlines new actions that will protect its diverse values. In addition, the Strategy will add value to a whole range of related initiatives already underway in NSW, such as the water reform process and programs for native vegetation conservation, that together provide a comprehensive approach to the conservation of biodiversity and the pursuit of ecologically sustainable development.

What biodiversity do we have?

Australia is one of only 12 'megadiverse' countries and its native biodiversity is of global significance. It is estimated that there are more than one million species of plants and animals in Australia, of which less than 15% have been scientifically described (Commonwealth of Australia 1996b).

Of particular significance is the high percentage of Australian species which are endemic (that is, they are found only in Australia) (see Table 1). For example, about 84% of mammals and 93% of frogs are found nowhere else in the world (Commonwealth of Australia 1996b). There are also families, that is whole groups of species, which exist only in Australia. For instance, there are six mammal, four bird and 14 flowering plant families which are endemic to Australia (Commonwealth of Australia 1996a). There are also likely to be many species and families of invertebrates and fungi which are endemic to Australia, but knowledge of such organisms is incomplete, even though they represent over half our species diversity and play a critical role in maintaining ecological processes.

Australia also possesses a great diversity of ecosystem types, ranging from alpine environments to coastal, estuarine, wetland, arid and semi-arid, woodland, grassland and forest landscapes to name only a few. At the broadest level, 80 terrestrial biogeographic regions representing major environmental units have been described across Australia. However, many different ecosystems exist at a finer scale within each of these regions, characterised by unique environmental features, physical processes and flora and fauna.

Over the past 200 years of European settlement, the natural environment of Australia has been modified dramatically and, in many cases, the rate of extinctions and modification of ecosystems is accelerating. Since 1788, more than 100 plant and animal species are known to have become extinct in Australia. There has also been a significant decline within ecosystem diversity. For example, 75% of Australia's rainforests have been removed and native vegetation continues to be cleared at a rate of more than 600,000 hectares a year. Already more than 70% of native vegetation has been removed or significantly modified by human activity (Commonwealth of Australia 1996b). Of Australia's 80 terrestrial biogeographic regions, only five are considered to be in a largely natural state.

In NSW the scale of biodiversity loss has been substantial. Over 80 species of plants and animals are extinct in this State and more than 600 species

are considered either endangered or vulnerable (see Table 2). In addition, a conservative estimate suggests that the current native vegetation clearing rate in NSW is approximately 150,000 hectares per year and land clearing is considered to be the biggest single threat to biodiversity (EPA 1997). In total around 61% (48.9 million hectares) of woody native vegetation has been cleared or thinned, or substantially or significantly disturbed in NSW (EPA 1997). Biodiversity also continues to be lost in the marine environment, for example, many major NSW estuaries have lost as much as 85% of their seagrass in the last 30–40 years, while the health of aquatic environments adjacent to many urban and industrial areas is generally regarded as poor (EPA 1997).

Progress in Biodiversity Conservation

There are a wide range of government and community initiatives already underway that seek to protect and restore the native biodiversity of NSW. At the community level this includes projects being undertaken by Landcare groups, Catchment Management Committees, Aboriginal Land Councils, Local Government and individual landholders. Key initiatives being undertaken by the NSW Government include the Comprehensive Regional Forest Assessments. The Eden and Upper and Lower North East Regional Assessments were completed in 1998, and the resulting Regional Forest Agreements included major additions to the formal reserve system. This includes the reservation of 134,000ha of forested land as the South East Forests National Park near Eden, and the creation of 85 new national parks and reserves in the upper and lower north east, totalling 380,000ha. Legislation was passed in late 1998 to give effect to the Regional Forest Agreements and to implement ecological sustainable forest management, ensuring a viable and sustainable forest industry under the Regional Forest Agreements. Regional Forest Assessments are continuing for the western and southern areas of NSW.

Establishment of a protected area system is an ongoing priority for the NSW Government. More than 151 new national parks and reserves have recently been created and approximately 430,000 hectares of new wilderness areas have been protected. In recognition of the achievements made in this area the World Wide Fund for Nature (WWF) in 1996 awarded NSW the best overall grade of any Australian State or Territory in its annual Protected Areas Report Card. NSW was also awarded in 1996 with Reserve of the year for Culgoa National Park. In addition, a *Marine Parks Act* was introduced in 1997 and marine parks have been established at Jervis Bay, Solitary Islands and Lord Howe Island. This initiative marks the commencement of the development of a comprehensive system of marine parks for NSW.

However, biodiversity conservation cannot be achieved solely by the creation of national parks and other protected areas. Protection of biodiversity requires an approach based on ecologically sustainable management across the entire landscape, incorporating scientific knowledge of ecological relationships in combination with the social and economic framework of communities.

For this reason, the NSW Government is also introducing new approaches and mechanisms to manage the conservation of native vegetation and water. Major initiatives include the introduction of the *Native Vegetation Conservation Act* and an accompanying incentives package to encourage the development of property agreements as tools for vegetation management. In addition, the Government's water reform package provides the basis for improving the health of our rivers and groundwater whilst delivering greater security for water users and regional communities. In both cases community involvement and leadership is fundamental to the success of these initiatives and the conservation of biodiversity.

The Biodiversity Strategy will facilitate the coordination of these and other existing on-going conservation initiatives and ensure that biodiversity considerations are addressed as a high priority. In this context, the Strategy provides the basis for whole-of-government action to conserve biodiversity across NSW and to ensure opportunities for direct community involvement.

Background to the Strategy

The loss of biodiversity is of national concern and has been identified as perhaps Australia's most serious environmental problem. The impetus for the NSW Biodiversity Strategy is the continuing decline and loss of the State's biodiversity.

The preparation of a NSW Biodiversity Strategy also illustrates the Government's commitment to the National Strategy for the Conservation of Australia's Biological Diversity, the agreed national approach on ecologically sustainable

development, and the *NSW Threatened Species Conservation Act 1995* (TSC Act).

National Strategy for the Conservation of Australia's Biological Diversity

The National Strategy has been endorsed by the Commonwealth, State, Territory and Local governments. It aims to bridge the gap between current activities and the effective identification, conservation and management of Australia's biodiversity. The National Strategy also seeks to fulfill Australia's commitment to the International Convention on Biological Diversity (see Appendix).

Action 7.3.1 of the National Strategy calls upon State and Territory Governments to develop complementary biodiversity strategies.

Ecologically sustainable development

Ecologically sustainable development (ESD) means the effective integration of economic, ecological and social considerations in decision-making processes. ESD recognises that development which improves the total quality of life, both now and in the future, requires the maintenance of essential ecological processes.

This Strategy builds on the principles of ESD set out in the *Protection of the Environment Administration Act 1991* and recognises the core objectives of the National Strategy for Ecologically Sustainable Development, which has been endorsed by the Commonwealth, State and Territory governments:

- to enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations;
- to provide for equity within and between generations; and
- to protect biological diversity and maintain essential ecological processes and life-support systems.

NSW Threatened Species Conservation Act 1995

The TSC Act, which came into effect on 1 January 1996, establishes the framework for development of this Strategy. The TSC Act provides NSW with the most comprehensive legislation in Australia for the conservation of threatened species. The TSC Act also incorporates measures to ensure that the socio-economic impacts of conservation initiatives are considered as part of the overall approach to protect threatened species.

The TSC Act specifies that a Biological Diversity Strategy be prepared which includes proposals for:

(a) ensuring the survival and evolutionary development in nature of all species, populations and communities of plants and animals, including appropriate protection under the *Wilderness Act 1987* or the *National Parks and Wildlife Act 1974*;

(b) preparing or contributing to the preparation of strategies for ecologically sustainable development in NSW, including the integration of biological diversity conservation and natural resource management;

(c) implementing an education program targeted at the community and public authorities;

(d) developing a biological diversity research program; and

(e) encouraging greater community involvement in decision-making affecting biological diversity.

As the provisions of the TSC Act do not apply to fish species and marine vegetation, the NSW Government moved in late 1997 to amend the *Fisheries Management Act 1994* so that it incorporates similar principles and processes for the conservation of threatened fish and marine vegetation species. More specific objectives, performance targets and actions related to the conservation of fish and marine vegetation biodiversity will be incorporated into the NSW Biodiversity Strategy in 1999.

Goal, Core Objectives and Guiding Principles

Implementation of this Strategy, guided by the National Strategy for the Conservation of Australia's Biological Diversity and the Convention on Biological Diversity, is a matter of urgency.

In committing to implement this Strategy the Government recognises that there is a pressing need to strengthen and improve current activities, policies, legislation, practices and attitudes to achieve the conservation of biodiversity.

STRATEGIC GOAL

To protect the native biological diversity of NSW and maintain ecological processes and systems.

Core Objectives

The core objectives of the NSW Biodiversity Strategy are to:

1. Ensure the survival and evolutionary development of species, populations and communities of plants, animals and micro-organisms native to NSW.
2. Strengthen management of biodiversity on a bioregional basis while using existing catchment level networks to focus on specific actions, including the integration of biodiversity conservation and natural resource management, consistent with the principles of ecologically sustainable development.
3. Identify, prevent or attack at-source the threats to biodiversity through timely implementation of targeted actions.
4. Build on the success of existing initiatives to develop a coordinated and cost-effective biodiversity conservation program involving the community, industry and all levels of government and ensure that the rights, knowledge and values of local and Aboriginal communities are properly recognised and reflected.
5. Strengthen actions to inform, motivate and achieve the support of the community including local and Aboriginal communities, industry, State Government agencies and Local Government, in conserving biodiversity.
6. Increase our understanding of the ecological systems and processes required to conserve biodiversity through scientific research, survey and monitoring, taking into account the knowledge and values of Aboriginal and local communities.

Principles for biodiversity conservation

The following principles will guide the implementation of the Strategy:

- Biodiversity is best conserved in situ (that is, in its natural environment) and at all levels: genetic, species, and community.
- Collective responsibility is essential. Although all levels of government have clear responsibilities, biodiversity conservation will ultimately require the cooperation and support of the whole community, together with acknowledgment of the skills and knowledge of local and Aboriginal people.
- Protecting biodiversity requires management of threatening processes by identifying, preventing and mitigating the causes of biodiversity loss.
- Efficient, equitable and transparent processes for the allocation of resources and environmental planning and management are essential.
- Lack of full knowledge should not be used as an excuse for postponing action. In applying the precautionary principle, public and private decisions should be guided by careful evaluation to avoid, wherever possible, serious or irreversible damage to biodiversity through an assessment of the risk-weighted consequences of various options.
- Better knowledge of biodiversity will provide an improved basis for environmental planning and biodiversity conservation.
- Central to biodiversity conservation is the establishment of a comprehensive, adequate and representative reserve system in conjunction with actions to conserve biodiversity across the entire landscape.
- Commitment to intra and inter-generational equity requires the conservation of biodiversity for current and future generations.
- The close, traditional association of Aboriginal people with components of biodiversity is recognised, as is the desirability of equitably sharing benefits from the innovative use of traditional knowledge of biodiversity.

Biological diversity and Aboriginal peoples

The National Strategy for the Conservation of Biological Diversity, to which the NSW Government is a signatory, explicitly recognises the important linkages between Aboriginal peoples and biodiversity conservation.

That Strategy states (p.14):

"As a consequence of their long history in Australia, Aboriginal and Torres Strait Islander

peoples have developed a special knowledge of biological diversity and have a particular interest in the conservation status of indigenous species and environments.

Traditional Aboriginal and Torres Strait Islander law and cosmology establishes intimate connections between people, land and other species, with ritual, custodial and management responsibilities for the land and other species being passed down through generations.

These traditional approaches and outlooks persist in many parts of Australia; in other areas, despite the historical undermining of indigenous structures, contemporary Aboriginal and Torres Strait Islander cultures maintain a lively interest in, practical knowledge of, and concern for the wellbeing of the land and natural systems.

Although Aboriginal and Torres Strait Islander peoples may be willing to share some of their cultural knowledge, aspects of that knowledge may be privileged and may not be available to the public domain.

Traditional Aboriginal and Torres Strait Islander management practices have proved important for the maintenance of biological diversity and their integration into current management programs should be pursued where appropriate.

The maintenance of biological diversity on lands and waters over which Aboriginal and Torres Strait Islander peoples have title or in which they have an interest is a cornerstone of the wellbeing, identity, cultural heritage and economy of Aboriginal and Torres Strait Islander communities."

Structure of the Strategy

The Strategy is divided into six sections:

1. Community consultation, involvement and ownership;
2. Conservation and protection of biodiversity;
3. Threatening processes and their management;
4. Biodiversity conservation and natural resource management;
5. Improving our knowledge; and
6. implementation.

Sections 1–5 contain a series of objectives and performance targets, and detail specific actions related to each objective. These reflect the principles for biodiversity conservation and will ensure the goal and core objectives of the Strategy are achieved.

Section 6 details the framework for implementation, including management structures, resourcing and mechanisms for monitoring, reviewing and adjusting the Strategy.

Strategy priorities

Implementation of the Strategy will focus on the achievement of a core set of priority actions by 2001. The priority actions are primarily targeted at addressing the major threats to biodiversity and maximising conservation benefits. They are also intended to meet NSW commitments under the National Strategy for the Conservation of Australia's Biological Diversity and emphasise a strategic and integrated approach to biodiversity conservation that is built on a solid basis of community participation.

Priority actions and performance targets for each of these are detailed and highlighted in bold text throughout the Strategy. Together, the priority actions and performance targets provide direction to lead and supporting organisations in implementing the Strategy to ensure the efficient and effective allocation of resources for biodiversity conservation. Priority actions are complemented by a number of supporting actions identifying the broad package of initiatives that need to be undertaken to conserve the biodiversity of NSW. (Lead agencies for the priority actions are not necessarily the lead agencies for the supporting actions.)

The degree to which Strategy priorities are followed in any particular year, or years, will depend on a number of factors including overall expenditure limits, NSW Government budget and program priorities and broad economic circumstances. The fundamental aim is to balance the full range of ecological, economic and social objectives to achieve the best overall outcome for NSW. Nevertheless, the Government clearly acknowledges the urgency of addressing the complex challenges of biodiversity conservation and is committed to ensuring that adequate resources are made available for this purpose.

Abreviations and acronyms are used throughout the strategy in reference to agencies, legislation etc. Please refer to the glossary at the back of the strategy for expanded titles.

Table 1 Status of Australian Species and level of Endemism

Group	Estimated total no of species	Estimated % endemic to Australia	No. & % of extinct species^	No. & % of "threatened"* species
Amphibians	203[1]	93%[1]	3[1] (1.5%)	29[1] (14.3%)
Birds	777[1]	45%[1]	20[1] (2.5%)	50[1] (6.4%)
Mammals	268[1] (terrestrial)	84%[1]	19[1] (7.0%)	43[1] (16.0%)
Reptiles	770[1]	89%[1]	0[1]	51[1] (6.6%)
F/water fish	195[1]	90%[1]	0[1]	17[1] (8.7%)
Marine fish	4 – 4500[2] (approx)	25%[2] (approx)	0[1]	0[1]
Invertebrates	328,900[1a]	N/A	3[1b] (<1%) (non–marine invertebrates only)	118[1b](<1%) (non–marine invertebrates only)
Vascular plants	18 – 20,000[3] (approx)	85%[3] (approx)	76[1d] (<1%)	1,009[1d] (5.0%)
Algae	22,000[1a]	N/A	at least 1[4] (<1%)	1[1c](<1%)
Fungi (excluding lichens)	250,000[5] (approx)	N/A	N/A	N/A
Mosses	900 (approx)[5]	N/A	3[5]	8[5] (<1%)
Liverworts	500 (approx)[5]	N/A	9[5]	6[5](<1.2%)
Lichens	2,500[5]	38%[5]	2[1c] (<1%)	168[1c] (6.7%)
Micro-organisms (excluding fungi)	105,000[1a]	N/A	N/A	N/A

N/A – unknown or reliable data not available

*Includes endangered and vulnerable species

^Extinct species are those that have not been seen in the wild for 50 years

Note: may be some differences in figures due to different sourcing of the data

Source:

1 Commonwealth of Australia 1996b, *Australia: State of the Environment* 1996, Table 4.9, p.4–34

1a ibid, Table 4.8, p.4–30

1b ibid, Table 4.13, p.4–35

1c ibid, Table 4.14, p.4–35

1d ibid, Table 4.15 p.4–35

2 Department of the Environment, Sport and Territories 1995b, *Our Sea, Our Future: major findings of the state of the marine environment report for Australia*, p.17.

3 Department of the Environment, Sport and Territories 1994, *Australia's Biodiversity: an overview of selected significant components*, p.19 (Internet version, updated 1996).

4 Listed in Schedule 1 of the *Commonwealth Endangered Species Protection Act 1992*, as at July 1998.

5 Scott G, Entwisle T, May T and Stevens N 1997, *A Conservation Overview of Australian non-marine lichens, bryophytes, algae and fungi,* Canberra: Environment Australia.

Table 2 Status of Animal and Plant Species in NSW

Group	Estimated number of species at time of European settlement	Presumed extinct in NSW	Threatened in NSW	Species existing in NSW and classified as threatened nationally
Amphibians	70[1]	0[3]	22[6]	2[7]
Birds	474[1]	12[3]	102[6]	16[7]
Mammals	174[1]	27[3]	60[6]	8[7]
Reptiles	209[1]	1[3]	31[6]	14[7]
F/water fish	84[2] (approx)	0[4]	4[9*]	4[4a]
Marine fish	N/A	0[4]	0[9*]	1[4a]
Invertebrates	N/A	N/A	7[6]	N/A
Vascular plants	15,930[1]	390	435[6]	307[7]
Algae	N/A	1[5]	N/A	N/A
Fungi	25,000[8] (approx.)	N/A	N/A	N/A
Mosses	N/A	N/A	N/A	N/A
Liverworts	N/A	N/A	N/A	N/A
Lichens	N/A	N/A	N/A	N/A
Micro-organisms (excluding fungi)	N/A	N/A	N/A	N/A
Communities of plants	N/A	N/A	11[6]	1[7]
Communities of animals	N/A	N/A	1[6]	0[7]

N/A – unknown or reliable data not available

Note: not all the figures in all the tables match exactly due to different sourcing of the data

*TSC Act 1995 does not list threatened fish, aquatic invertebrates or marine vegetation

Source:

1 Environment Protection Authority 1997, *NSW State of the Environment 1997*, p.330.

2 Harris, J 1995, in *Australian Journal of Ecology*, 20, pp.65–80 (figure includes "alien species", presumably introduced after European settlement)

3 Listed in Schedule 1 of the *NSW Threatened Species Conservation Act 1995* (updated October, 1998).

4 Jackson, P 1998, in *Australian Society for Fish Biology Newsletter*, 28 (2), – there are no recorded extinctions of any Australian fish

4a ibid

5 Commonwealth of Australia 1996b, *Australia: State of the Environment 1996*, p.8–27

6 Includes endangered and vulnerable species and populations listed in Schedules 1 and 2 of the *NSW Threatened Species Conservation Act 1995* (updated October, 1998).

7 Listed in Schedule 1 of the *Commonwealth Endangered Species Protection Act 1992* as either endangered or vulnerable, as at July 1998.

8 May, T (National Herbarium of Victoria) 1997, personal correspondence.

9 Listed under the *NSW Fisheries Management Act 1994* (as at January, 1999).

Figure 2 Simplified Context for the NSW Biodiversity Strategy*

Local Policies and Programs	State of the Environment Reports (SoEs), Local Environmental Plans, Development Control Plans, Plans of Management for Community Land, Local Approvals Policies, Annual Management Plans, Property Management Planning, local council biodiversity policies.
State Legislation	**Threatened Species Conservation Act, 1995** National Parks and Wildlife Act, 1974; Wilderness Act, 1987; Crown Lands Act, 1989; Soil Conservation Act, 1938; Western Lands Act, 1901 (as amended); Catchment Management Act, 1989; Water Administration Act, 1986; Forestry Act; 1916; Fisheries Management Act, 1994; Rural Lands Protection Act, 1989; Noxious Weeds Act, 1993; Protection of the Environment Administration Act, 1991; Local Government Act, 1993; Environmental Planning and Assessment Act, 1979; Heritage Act, 1977; Coastal Protection Act, 1979; Native Vegetation Conservation, Act 1997; Marine Parks Act, 1997.
State Policies	**NSW Biodiversity Strategy;** NSW Coastal Policy, NSW Forest Policy; Total Catchment Management; State Soils Policy; State Rivers and Estuaries Policy; NSW Wetland Management Policy; State Environmental Planning Policies; NSW State Groundwater Policy; NSW Weirs Policy; Draft Nature Tourism Strategy.
National Agreements, Strategies and Programs	**Inter Governmental Agreement on the Environment (IGAE); National Strategy on Ecologically Sustainable Development; National Strategy for the Conservation of Australia's Biological Diversity;** National Reserve System Co-operative Program; National Forest Policy Statement; National Greenhouse Response Strategy; Decade of Landcare; Ocean Rescue 2000; National Weeds Strategy; National Water Quality Management Strategy; National Strategy for Rangeland Management (draft); MDBC Basin Sustainability Program; National Strategy for the Conservation of Australian Species and Communities Threatened with Extinction (draft).
Commonwealth Legislation	**Endangered Species Protection Act, 1992;** National Parks and Wildlife Conservation Act, 1975; Australian Heritage Commission Act, 1975; Environment Protection (Impact of Proposals) Act 1974; World Heritage Properties Conservation Act, 1983.
International Agreements	**UN Convention on Biological Diversity; Agenda 21;** World Heritage Convention; Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); Bonn Convention; Ramsar Convention, Japan Australia Migratory Bird Agreement (JAMBA); China Australia Migratory Bird Agreement (CAMBA).

*indicative only, not all relevant agreements, legislation and policies are shown – key policies and legislation are highlighted

1. Community consultation, involvement and ownership

Conservation of biodiversity requires the support of the entire community. In many cases it is the community that is leading the way in driving efforts in biodiversity conservation through grassroots initiatives such as Landcare. Given that much of the State's land-based ecosystems are managed by private landholders it is clear that successful implementation of this Strategy will require a community that is both informed about biodiversity issues and encouraged and supported to participate in conserving biodiversity.

While it is clear that implementation of the Strategy will have major benefits for NSW there will be some costs along the way. The NSW Government will seek to achieve the objectives of the Strategy with minimal social and economic impact and will ensure that the costs and benefits of biodiversity conservation are shared equitably.

The Government acknowledges that in some circumstances consideration may need to be given to providing incentives to achieve biodiversity conservation. Already the NSW Government has a program in place to encourage private landowners to become involved in conservation measures (see Box 2).

Box 2: Voluntary Conservation Agreements

Voluntary Conservation Agreements are negotiated between a landowner and the NSW Minister for the Environment. Such agreements are aimed at preserving the conservation values of private land. Management plans may also be prepared for land covered by Conservation Agreements to provide more detail relevant to management of the particular area. Once finalised, the Agreement is a legally binding covenant which also binds future landholders. Approximately 45 agreements have been completed in NSW and about 100 more are being actively negotiated.

Under recent amendments to the Local Government Act 1993, councils are empowered to offer rate rebates on land subject to a Voluntary Conservation Agreement.

The Government will consider other incentive options for conserving biodiversity, including educational and economic incentives together with appropriate planning and regulatory mechanisms. The introduction of economic incentives will require the collaboration and cooperation of the Commonwealth Government in many instances.

This chapter outlines the Strategy's approach to achieving full and complete involvement of all sectors of the community in managing and protecting the biodiversity of NSW.

Much of the impetus for this approach flows from the TSC Act, which requires that the Strategy:

- include an education program for community and public authorities; and
- encourage greater community involvement in decision making affecting biodiversity.

Objective 1.1
Promote awareness and support, disseminate knowledge and ensure meaningful community participation

The achievement of biodiversity conservation goals requires community awareness, understanding, ownership and support. In particular, there is a clear need to promote biodiversity conservation as more than just the protection of threatened animal and plant species. Community awareness of the role of micro-organisms and other lesser known organisms such as invertebrates is especially lacking as is understanding of the functioning of ecosystems. Emphasis also needs to be given to the benefits of biodiversity conservation. Many landholders and land managers, particularly in the rural sector, are already aware of the benefits of biodiversity to productivity and will continue to play a pivotal role in disseminating knowledge. Clearly, however, much more needs to be done to ensure that information on biodiversity is relevant to local communities and readily accessible.

Effective educational and motivational programs are needed to achieve informed community support, and participation in biodiversity

programs is a particularly effective form of education. This in turn will require a multi-media approach to the provision of up-to-date, accessible and understandable information. If the Strategy is to have long-lasting impacts it will also require existing and new knowledge to be disseminated widely and applied effectively on an ongoing basis.

A draft whole-of-government NSW Natural Resources Information Management Strategy (NRIMS) was endorsed by natural resource agencies in 1997. The objectives of the NRIMS relevant to the NSW Biodiversity Strategy are:

- *to create the natural resources information infrastructure needed to support the environmental, economic and social interests of NSW;*
- *to maximise access to natural resources information; and*
- *to implement the national standards and guidelines necessary to enable the effective use and integration of natural resources information.*

A Steering Committee has been set up and efforts are under way to develop appropriate frameworks, metadata protocols and standards to support natural resource data usage across government and into the community. The NRIMS Steering Committee is taking an increasing role in linking NSW agencies to ensure maximum benefit is derived from the use of existing data and that new data collections are focussed on closing identified data gaps. Examples are the Biodiversity Strategy, National Land and Water Resources Audit, Australian Coastal Atlas, Australian Spatial Data Infrastructure and the National Spatial Data Directory. The NRIMS Steering Committee has prepared a report on the information and systems aspects of the State Biodiversity Strategy. The report focuses on the need to take a multi-agency approach to data access and use of a decentralised data sharing mechanism.

A NSW NRIMS Biodiversity Information Working Group was established in May 1998 to develop a scoping report and brief for a feasibility study for a whole-of-government approach to the biodiversity information management and to ensure that the community's needs to acquire and access biodiversity information are defined and addressed. The Steering Committee is chaired by NPWS and includes representatives from State Forest of NSW, DLWC, Australian Museum, Royal Botanic Gardens, EPA and DUAP.

Priority action

1. Improve the accessibility of biodiversity

Improve the accessibility of up-to-date, reliable and locally and regionally relevant biodiversity information to the community and all spheres of government. Emphasis will be given to the collation and integration of relevant biodiversity and natural resources data into computer-based information systems that are accessible and provide practical information to both land managers and government at a reasonable cost.

Information will be provided on:

a) the benefits of biodiversity and how individuals and communities can

   i. conserve,

   ii. survey,

   iii. monitor, and

   iv. sustainably use biodiversity;

b) data sources;

c) resource and funding opportunities;

d) documented case studies of successful initiatives; and

e) threatened species, populations and ecological communities, identifying known locations and management implications for landholders.

Information and education services will be developed in consultation with the community and tailored to deliver the broadest possible range of information using the most accessible sources. In regional NSW, this will particularly involve use of the rural media (radio, newspapers and industry journals), Landcare, Farming for the Future, Catchment Management Committees, agricultural field days and extension services. Information will also be provided through environment resource centres, public libraries and schools.

Performance targets – Targeted community information programs and packages developed and accessible on a bioregional basis. Agency databases linked and compatibility enhanced to provide user-friendly computer information systems, with community access to information facilitated through linked Internet sites. Biodiversity information kits prepared and distributed by 2000.

Lead organisations – NPWS, DLWC

Support organisations – AM, RBG and all natural resource agencies (NRAs)*, Aboriginal Land Councils (ALCs)

* NSW Agriculture (AG), Australian Museum (AM), State Forests (SFNSW), NSW Fisheries, NPWS, DUAP, Royal Botanic Gardens (RBG), EPA, Zoological Parks Board (ZPB)

Supporting actions

2. Produce biodiversity manuals and directories aimed at providing practical information to the community and provide appropriate training in biodiversity conservation and monitoring throughout the government and community.

3. Improve awareness of the functioning of ecosystems, particularly the role of lesser-known organisms (invertebrates, fungi, algae, etc), incorporating both Aboriginal and non-Aboriginal knowledge.

Objective 1.2
Establish community partnerships

Creating and maintaining community support and involvement in implementing the Strategy requires the assistance of the entire community. Many individuals, companies and other organisations are already involved in programs aimed at assisting in the conservation of biodiversity, such as Landcare, CouncilNet and the Community Biodiversity Network. A feature of such programs is that they are typically driven by the community rather than government agencies. Recent initiatives in native vegetation conservation and water management also focus on a more grassroots approach to biodiversity conservation.

The Strategy will build on these efforts to harness the energy, knowledge and skills of local communities and will ensure that the necessary support to further develop grassroots approaches to biodiversity conservation is provided. Emphasis will be given to establishing strong linkages with key stakeholders from industry, farming and conservation groups, Local Government, Aboriginal communities and developing more general community support for biodiversity conservation.

Priority action

4. Provide opportunities and incentives to the community to conserve biodiversity

In consultation with the community, develop and introduce a range of opportunities and incentives to promote the conservation of biodiversity to landholders, the community and local government in both urban and rural areas and to encourage biodiversity conservation actions. Efforts will also be taken to minimise and eliminate disincentives to biodiversity conservation. Emphasis will be given to both financial and non-financial incentives, such as training and education programs for landholders and the community, recognising that lack of information is often a major impediment to conservation.

This action will include ongoing support for existing programs, such as Voluntary Conservation Agreements and Farming for the Future. Under the Native Vegetation Management Fund, $15 million over three years has been committed to help landholders who enter into property agreements to protect and maintain native vegetation and to encourage revegetation of land with native species. In addition, recent amendments to the *Local Government Act 1993* provide for land subject to a conservation agreement to be exempted from rates and charges.

New options will also be investigated such as training and education, economic incentives, field extension services, property management plans, property agreements, the Land for Wildlife scheme and joint management arrangements. Particular emphasis will be given to developing incentive options that reflect the varied needs and preferences of landholders and building on successful initiatives that foster partnerships with landholders.

Commonwealth and Local Government support for biodiversity conservation incentive schemes will be sought.

Performance targets – Information provided to landholders and the community on benefits and opportunities for biodiversity conservation. Complete consultations with the community on appropriate incentive options in 1999. In collaboration with other states (through the Australia New Zealand Environment and Conservation Council [ANZECC]), examine

opportunities to implement biodiversity conservation incentive programs. Implement a range of incentive programs for biodiversity conservation by 2001, targeting the most critical areas.

Lead organisations – NPWS, DLWC

Support organisations – AG, local government

Supporting actions

5. Implement the NSW Biodiversity Strategy as a broad-based package of on-going initiatives, emphasising opportunities and benefits and actively involving the entire community.
6. Work with local communities and existing conservation networks, including established Landcare and Total Catchment Management groups, Local Government, Aboriginal Land Councils and other Aboriginal groups, to protect, repair and restore biodiversity.
7. Support and encourage the incorporation of biodiversity conservation considerations into catchment management strategies and integrate these with the outcomes of the bioregional conservation assessments (see Chapter 2).
8. Integrate community-based biodiversity survey and monitoring activities into Total Catchment Management, bioregional planning and State of the Environment reporting and reduce duplication of effort in data collection by the community and Local and State Government.
9. Support community and school groups involved in bushland rehabilitation and regeneration initiatives, including through increased training opportunities.
10. Continue to explore and develop options for efficiently funding, resourcing and administering programs for biodiversity conservation. This will include opportunities for private sector and community-led biodiversity programs, in addition to initiatives by all spheres of government.

Objective 1.3
Expand biodiversity studies in educational curricula

Priority action

11. Incorporate biodiversity components into education courses

In collaboration with the Board of Studies and syllabus writing teams, incorporate biodiversity components and content into relevant primary and secondary school syllabuses and develop new units of work to support appropriate key learning areas. Emphasis will be given to the integration of biodiversity across key learning areas and through the teaching of environmental education in schools. Action will also be undertaken to develop components for relevant tertiary, industry, professional and continuing education courses, with a focus on educational opportunities for the rural community.

This action will also include strengthening material on the value of Aboriginal and local knowledge in biodiversity conservation and promoting 'hands on' educational programs that are integrated with community initiatives at the catchment and bioregional level, particularly in non-metropolitan areas of NSW.

Performance targets – Relevant primary school syllabuses and associated curriculum support material enhanced to incorporate components by 2000.

Relevant secondary school syllabuses and associated curriculum support material enhanced to incorporate components by 2001.

Curriculum resources, including teaching kits and teacher training programs, targeting biodiversity issues relevant to the rural community developed by 2000.

Home-study packages focusing on educational opportunities for the rural community developed by 2000.

Lead organisations – NSW Board of Studies, Department of School Education, NPWS, TAFE

Support organisations – State Forests, DLWC, RBG, AM, ZPB, AG

Supporting actions

12. Support and encourage further professional development activities to equip teachers with the skills and understanding needed to include the scientific, economic and social aspects of biodiversity conservation, as well as Aboriginal perspectives and interests, in education programs.

2. Conservation and protection of biodiversity

Biodiversity is affected by nearly all human activities, either directly or indirectly, through the complex flow of impacts that such activities have on natural processes. Given these impacts and recognising the lack of full information on biodiversity, determining priorities for biodiversity conservation is essential to the success of this Strategy. This chapter emphasises the need for a balanced approach, incorporating conservation measures for areas outside the reserve system ('off-park' conservation) with the protection of ecologically significant areas and processes including evolutionary processes ('on-park' conservation). Emphasis is also given to methods to assist in the recovery of species and habitats and the conservation of biodiversity throughout NSW. The objectives of this chapter are closely integrated with the objectives for achieving ecologically sustainable use of natural resources (see Chapter 4).

Objective 2.1
Implement bioregional assessment and planning throughout NSW

Bioregions are areas defined for management by geographical and ecological characteristics rather than administrative or economic criteria. The purpose of bioregional management is to ensure that biodiversity is protected and maintained on a regional basis and all human activities, such as forestry, fishing, agriculture, mining and urban development, are planned and managed in an integrated manner to take into account the protection of unique regional flora and fauna, waterways, soil, climate and the identity and needs of human communities.

An integrated bioregional approach to management of the natural resources of NSW is an essential part of progress towards fulfilling the goal of ecologically sustainable development. Integration will be achieved through cooperative and consultative mechanisms and through effective planning and decision-making processes to refine land use on the basis of capability and suitability. It also depends on an adequate information base, something that is currently lacking.

At present there is no standardised system for defining bioregions, although considerable work has been undertaken in the development of the Interim Biogeographic Regionalisation of Australia (IBRA) and the Interim Marine and Coastal Regionalisation of Australia (IMCRA). It has recently been determined that the bioregions defined by IBRA are appropriate for use in relevant provisions of the TSC Act and the *Environmental Planning and Assessment Act 1979*.

Priority action

13. Bioregional planning

The aim is to adopt a standardised, integrated, whole-of-government approach to the collection, analysis and distribution of biodiversity data for use in assessing the conservation significance of land areas throughout NSW (see Box 3). This will ensure cooperative, coordinated and cost-effective data collection and dissemination on a whole-of-landscape basis for biodiversity conservation across all land tenures.

A feature of this approach will be conservation assessments undertaken on a bioregional basis, focusing on the provision of biodiversity information. A priority will be to ensure systematic and cost-effective collection and distribution of biodiversity information across bioregions, removing unnecessary duplication of effort and enabling gaps in information to be identified and addressed.

The primary objective of the conservation assessments is to identify areas and features of high biodiversity significance and to advise on appropriate conservation measures. Outcomes of the conservation assessments will be fed directly into the development of the full range of natural resource plans and strategies, including Regional Vegetation Management Plans and Water and River Flow Management Plans, enabling biodiversity issues to be addressed in an integrated, consistent way. The information from the assessments will also ensure bioregional conservation issues are addressed in the development of regional and

local environmental plans. In addition, it will enable priorities for future development of a comprehensive, adequate and representative reserve system to be identified and establish the foundation for implementation of a 10-year plan for long-term development of the reserve system (Action 18).

As the undertaking and implementation of bioregional assessments will occur over several years, there is a need in the interim to provide bioregional and state-wide information for immediate use in conservation planning. To address this urgent need **two key projects** will be undertaken. The first will involve development of a database on the conservation status of all plant communities within each NSW bioregion which will be regularly updated. The second is the development of a course level State-wide GIS system to provide guidance on areas of conservation significance, in mapped format. Both of these projects will be undertaken in consultation with the NSW NRIMS Biodiversity Information Working Group. This will provide conservation planners, local government, landowners and NSW agencies with the basic information to set priorities for biodiversity conservation both within and across bioregions and provide a basis for monitoring progress of conservation initiatives. These projects will build on the Western Regional Assessment currently being

Box 3: Integrated Biodiversity Conservation Assessment (IBCA) Program

The basis for the package of projects under the proposed IBCA Program is that:

- for many, if not most, of the priority programs under the State Biodiverstiy Strategy there is a **common need** for information about the current status of biodiversity throughout NSW;
- there is a **common set** of information 'layers' (eg. vegetation, soils, geology, catchments, drainage lines, terrain, cadastral boundaries, tenure, native fauna and rare plant distribution and occurrence, etc.) needed by most programs identified in the State Biodiversity Strategy; and
- in the past, gathering information about the environment and biodiversity has been undertaken for a variety of purposes or in an *ad hoc* manner by Federal, State, and Local governments leading to **duplication and inconsistency in some areas** and critical gaps in our information in others.

The IBCA Program recognises that there are many existing and planned projects throughout NSW which are also undertaking collection of data and generating information needed by the IBCA assessments. The proposal has factored this into its planning. What the IBCA approach seeks to achieve is not to duplicate these efforts but to utilise these data where possible and to fill the 'gaps' in data collection to ensure the integrated whole-of-bioregion coverage of common data-layers which would not be achieved through the individual outcomes of each of these projects.

This program seeks to move NSW into an era where biodiversity conservation programs at all levels are serviced by a common, consistent high quality set of guiding information which forms the basis for setting high order conservation priorities within and between programs. In addition, it will allow for regular, objective and quantitative measurement of the progress of various conservation initiatives.

Clearly each conservation program will have individual data needs for finer resolution (ie more detailed) data than is proposed in the IBCA package but IBCA will provide a critical national, State-wide and bioregional context for this more detailed information.

The IBCA action package will inform priorities for biodiversity action and planning that form a key part of broader conservation plans and programs in NSW. These include:

- *Native Vegetation Conservation Act, 1997*: IBCA will provide ecosystem based regional and State-wide biodiversity information which will assist the Native Vegetation Advisory Council in drafting the NSW Native Vegetation Conservation Strategy, and Regional Vegetation Committees in developing Regional Vegetation Management Plans;
- Catchment Management Strategies under the Total Catchment Management Act;

…continued

Box 3: Integrated Biodiversity Conservation Assessment (IBCA) Program cont.

- Land for Wildlife: a program of voluntary participation in wildlife management for landholders across NSW comprising Land for Wildlife property registration, Wildlife Refuges, Voluntary Conservation Agreements and an accompanying extension program of ongoing high quality information on wildlife management for participating landholders;
- Farming for the Future (a joint Commonwealth-State program of integrated farm business planning skills program). In NSW this program is a partnership of NSW National Parks and Wildlife Service, NSW Agriculture, Department of Land and Water Conservation and NSW Farmers Association;
- Bushcare and in particular the development of regional plans by regional organisations under the terms of the National Heritage Trust;
- C.A.R. Reserve System Program (NPWS);
- Local and Regional Environmental Plans under the *Environmental Planning and Assessment Act, 1979*; and
- Threatened Species Recovery Plans and information to the broader community which will assist the implementation of the Threatened Species Conservation Action Plan.

undertaken in western NSW, involving an extensive data audit and gap analysis and examining the potential to use land systems as surrogates for biodiversity.

The assessments will build on the achievements and experiences of the CRA process for NSW forests and the bioregional planning projects already underway in the Cobar Peneplain and Riverina bioregions (see Box 3), and sub-regional projects underway for the southern Mallee region, south-west slopes, Cumberland Plain, mid-Lachlan and northern floodplains. The Biodiversity Survey Program (see Chapter 5) will play a key role in ensuring the consistency of data gathering and management.

Performance targets – Framework for undertaking bioregional conservation assessments across NSW and for using it in natural resource plans and strategies established by early 1999.

Audit of data and information gaps for western NSW completed by 1999.

Completion of project on land systems as surrogates for biodiversity.

New bioregional assessments commenced in four priority bioregions, targeting bioregions in central-western NSW and the Sydney Basin by 1999.

Accelerate the implementation of the outcomes of the Cobar Peneplain and Riverina bioregional assessments and the southern Mallee, northern floodplains and mid-Lachlan sub-regional planning projects.

Audit of the conservation status of NSW plant communities completed and information accessible by 2000.

State-wide map-based GIS system developed and widely accessible by 2000.

Lead organisations – NPWS, DLWC

Support organisations – RACAC, SFNSW, AG, RBG, AM, RLPBs, local government and Regional Organisations of Councils, CMCs, Landcare groups, RVCs, River Management Committees, ALCs.

Supporting actions

14. Develop and apply methodologies to undertake comprehensive regional assessments on the allocation and use of land and water (freshwater and marine).
15. Negotiate cooperative agreements with adjoining States for the protection and management of contiguous areas of native vegetation and habitat, river systems, migratory and nomadic species and shared threatened species, populations and ecological communities. These agreements should be developed in consultation with Aboriginal and other community groups.
16. Provide mechanisms for the protection of high conservation value wetlands, grasslands and other vegetation and habitat types outside of the reserve system, through implementation of the *Native Vegetation Conservation Act* and related initiatives.

Objective 2.2
Establish a comprehensive, adequate and representative reserve system

The reserve system provides a fundamental, secure and long-term mechanism for biodiversity conservation. The central purpose of the reserve system is to ensure that representative and viable samples of all major ecosystems are protected. There are also special cases, such as grasslands and wetlands, that in view of their high significance and immediate threats to their existence require urgent protection. At the broadest level, the reserve system includes not only national parks, nature reserves, wilderness and other areas established under the *National Parks and Wildlife Act 1974*, but also Crown Reserves, Flora Reserves and other areas that contribute to the conservation of biodiversity.

While efforts to establish reserve systems have in the past focussed on 'islands' of habitat left over after habitat clearing, or on land not suitable for agriculture or other productive activities, it is now clear that biodiversity conservation requires a broader approach. Comprehensiveness, adequateness and representativeness are the guiding principles for reserve systems (see Box 5) and bioregional planning (Objective 2.1) provides the basis for identifying and selecting areas for inclusion in the reserve system. Work is ongoing to develop objective measures for these principles and to identify areas requiring reservation or other effective protection as a high priority. These principles are also the basis of the Comprehensive Regional Assessment process for NSW forests (see Box 4).

Ongoing work to progress establishment of a comprehensive, adequate and representative reserve system also provides significant opportunities for the involvement of Aboriginal communities in biodiversity conservation and reserve management. Through the *National Parks (Aboriginal Ownership) Act 1997* the Government has already recognised the right of Aboriginal peoples to own national parks lands that are of cultural significance to them. This will also provide scope to incorporate Aboriginal knowledge of biodiversity into park management.

Box 4: Forest Policy Framework

In keeping with the National Forest Policy Statement (NFPS – see Appendix), the NSW Government's Forestry Policy commits to the establishment of detailed Comprehensive Regional Assessments (CRAs) and joint State/Commonwealth Regional Forest Agreements (RFAs). RFAs will be based on regional assessments covering all forest values – environmental, heritage, economic and social. The RFAs will provide for the establishment of a comprehensive, adequate and representative (CAR) reserve system while also putting in place long-term arrangements for ecologically sustainable forest management.

The establishment of a CAR reserve system will be a primary method for the protection of forest biodiversity and will safeguard endangered and vulnerable species and communities.

Under the NSW Government's Forest Policy $120 million will be provided over five years for industry restructuring and retraining. The Government has also committed $47 million to double the area of land under hardwood plantation and will restructure timber supply agreements to promote value-added forest products.

Priority actions

17. Establish a CAR forest reserve system

The priority is to continue to implement the framework under the National Forest Policy Statement for the establishment of a comprehensive, adequate and representative reserve system for native NSW forests, in consultation with the community.

The NSW Government is currently undertaking comprehensive regional assessments (CRAs) in a number of areas and finalising Regional Forest Agreements for the Eden and Upper and Lower North East Forest Regions. These agreements will determine future conservation and management of the State's major forested areas, and include mechanisms for monitoring progress towards the achievement of ecologically sustainable forest management. The NSW Government's policy is to establish

both a comprehensive, adequate and representative reserve system of forests and an ecologically sustainable sawlog industry. The regional assessments are examining the full range of forest values and uses including conservation, Aboriginal and cultural heritage, water and soil quality.

Performance targets – By 2001, complete Comprehensive Regional Assessments (and Regional Forest Agreements where appropriate) for NSW forests. Provide on-going opportunities for community involvement in ecologically sustainable forest management.

Lead agency – RACAC

Support organisations – NPWS, SFNSW, DLWC, ALCs

18. Expand the protected area system in NSW

Expand the protected area system in NSW, targeting central and western NSW as they contain ecological features currently poorly represented in the reserve system, as part of the ongoing development of a comprehensive, adequate and representative reserve system. This will include the establishment of new parks and reserves as well as additions to existing parks. The emphasis will be on priority bioregions and targeting poorly conserved ecosystems which are most under threat of serious decline.

In the first instance this will involve identification of biodiversity data and information gaps for western NSW, particularly in priority areas, and developing an agreed listing of ecosystems for all bioregions. Existing and proposed bioregional assessments (Action 13) will provide the fundamental mechanism for establishing the priorities for expansion of the reserve system. In addition, a 10-year plan will be developed to guide the long-term process of developing the CAR reserve system.

Opportunities for active community involvement in bioregional conservation and assessment planning, as part of the process for developing the reserve system, will also be explored and developed.

Performance targets – 10-year plan to guide establishment of the CAR reserve system developed by 1999. Percentage of land reserved in priority bioregions increased, especially poorly represented and threatened ecosystems.

Lead organisations – NPWS, RACAC

Support organisations – DLWC, SFNSW, ALCs

Box 5: Reserve Planning Principles

Comprehensiveness – the degree to which the reserve system encompasses the full range of biological/biophysical diversity and other values.

Adequacy – the capability of the reserve system to maintain biodiversity and ecological patterns and processes and other values, given both natural and human-influenced disturbances.

Representativeness – the extent to which the areas selected for inclusion in the reserve system sample known biological/biophysical diversity and other values.

Design – reserve shape, size, location and proximity to other reserves, are also important considerations in reserve selection.

19. Continue establishment of a comprehensive system of marine parks

Continue establishment of a comprehensive system of marine parks to conserve marine biodiversity and provide protection for unique and representative areas. This process has already begun with the creation of marine parks at Coffs Harbour (Solitary Islands), Jervis Bay and Lord Howe Island.

Management arrangements for the marine parks system will be developed in consultation with the community. Local Advisory Committees will be established for each marine park to advise on management plans and to ensure ongoing involvement in park management. An Advisory Council, including representatives from commercial, recreational, scientific, conservation and Aboriginal communities, will also be established to advise the Government and the Marine Parks Authority (MPA).

To guide further development of the system of marine parks, a process will be developed by the Marine Parks Authority for the identification and assessment of new marine park proposals and additions. This will build on the work being

undertaken at the national level to develop a consistent, ecologically-based framework for a system of marine protected areas.

Performance targets – Marine parks at Solitary Islands, Jervis Bay and Lord Howe Island established. Zoning and operational plans prepared for Solitary Islands and Jervis Bay through a comprehensive community consultation process to be completed by the end of 1999 and for Lord Howe Island by the end of 2000. Initial assessment of Julian Rocks, Byron Bay completed by the end of 1999.

Lead agency – MPA

Support organisations – AM, RBG, DLWC, ALCs

Objective 2.3
Effectively manage protected areas

The effective management of protected areas will require the assistance of all levels of government and the community. The NSW Government will use its legislative responsibilities under the *National Parks and Wildlife Act*, *TSC Act, Wilderness Act, Marine Parks Act, Crown Lands Act, Environmental Planning and Assessment Act* and other statutory controls, to guide the appropriate management of reserves.

Local Government can play an important complementary role through Local Environmental Plans and development control processes by ensuring that the use of land adjoining reserves is compatible with the objectives of reserve management, and through plans of management for community land.

The private sector also has an important role to play through land management, research and technical expertise. Individual landowners, with appropriate support, can make a major contribution to the protection of areas identified as important for conservation through sustainable land management.

Priority action

20. Develop, implement and review management plans for protected areas

Develop, implement and regularly review the relevance and effectiveness of management plans for protected areas and reserves to maintain and enhance biodiversity values and to rehabilitate degraded areas. This will include multi-reserve management plans prepared for reserves that have a biogeographical linkage (for example, reserves that are located close to one another and share similar ecological characteristics). The process for developing and reviewing management plans will involve extensive public consultation with local and Aboriginal communities. In addition, the plan of management process will continue to be progressed for Flora Reserves, building on the outcomes of the CRA process for NSW forests, and for Crown Reserves.

Management plans provide the basis for a holistic approach to biodiversity conservation within the reserve system, including the conservation of critical habitat and threatened species, populations and ecological communities. They also detail mechanisms to manage the appropriate use of reserves by the community for a range of educational, scientific, cultural and recreational purposes that are compatible with the conservation of biodiversity.

Performance target – Prepare and publicly exhibit 36 new plans of management for areas protected under the *National Parks and Wildlife Act 1974*, by 2001.

Lead organisations – NPWS, DLWC, SFNSW

Support organisations – ALCs, RLPBs

Supporting actions

21. Periodically prepare a comprehensive "State of the Parks" report which:

    (a) identifies deficiencies and threats to conservation values that need to be addressed;

    (b) provides standard performance measures for park management; and

    (c) provides an analysis of the overall state of the park system.

22. Undertake a review of National Parks and Wildlife reserves in all categories to ensure consistency in their operation and application, and alignment with IUCN classifications where necessary.

23. Effectively plan, manage and maintain recreational, tourist and educational facilities within and adjacent to protected

areas to minimise possible impacts on biodiversity. This will require managing visitor use of protected areas, such as national parks and other reserves on an ecologically sustainable basis. Key elements of this approach are outlined in the draft Nature Tourism and Recreation Strategy which provides the framework for striking a balance between tourism and recreation opportunities and the conservation of biodiversity.

Objective 2.4
Implement mechanisms for the identification, recovery and rehabilitation of threatened species, populations and ecological communities and protection of critical habitat

As a result of past management practices and because some species are intrinsically rare and in need of special protection, many NSW species are in danger of extinction and many ecosystems have experienced significant degradation. Providing for the effective rehabilitation (ecosystem restoration) of such areas and assisting in the recovery of threatened species are major long-term challenges. In addition, less well known taxonomic groups, such as invertebrates and fungi, pose a special challenge and may require specific attention.

The NSW Government has moved quickly to address these challenges and, through the TSC Act, has made provision for the protection of threatened native biota (except for fish and marine vegetation, which are addressed through recent amendments to the *Fisheries Management Act 1994*). Under the TSC Act, recovery plans are to be prepared to promote the recovery of threatened species, populations or ecological communities to a position of viability in nature.

Many species, populations and ecological communities are also reliant on very specific or localised habitat conditions for their continued survival and evolutionary development. As a result, what may often seem very inconsequential changes to such habitats can have extreme and dire consequences for biodiversity. Mechanisms for identifying and declaring critical habitat are also outlined in the TSC Act (see Box 6). The willing participation of landholders is important in this process, and the TSC Act provides for an extensive consultation process.

Priority actions

24. Prepare, implement and review recovery plans

Prepare, implement and review recovery plans for threatened species, populations and ecological communities in accordance with the provisions of the TSC Act.

This process will include landholder involvement where appropriate and make provision for broad community consultation as specified in the TSC Act. It will also involve consultation with the Scientific Committee to determine priorities for the preparation of plans, with the highest priority to be given to species, populations and ecological communities that are endangered nationally.

The recovery planning process will be developed and implemented within the context of wider biodiversity conservation planning and management to achieve integration with other mechanisms for natural resource management, particularly at the regional level. This will include the making of voluntary conservation agreements, establishment of joint management agreements and the identification of critical habitat for endangered species, populations and ecological communities. Once declared, the location of critical habitats will be identified in principal environmental planning instruments (such as Local Environmental Plans administered by local government) as soon as practicable after they are identified.

Opportunities will also be identified for the preparation of multi-species recovery plans for species utilising similar habitats and under threat from similar processes at a bioregional or regional scale. This will ensure effective use of resources in the recovery planning process.

Performance targets – 144 recovery plans prepared by 2001.

Critical habitats declared and identified in environmental planning instruments.

Lead organisation – NPWS

Support organisations – all NRAs, landholders, ALCs, local councils

Supporting actions

25. Review the Schedules of the TSC Act every two years to ensure that species, populations, ecological communities and threatening processes are appropriately listed. (SC lead)

26. Establish recovery teams to prepare and coordinate the implementation of recovery plans. Where appropriate, these will include independent scientific experts, members of local and Aboriginal communities with relevant knowledge, local government representatives, land managers, landowners, and other agencies.

27. Inform the community of mechanisms and assistance available for the recovery and rehabilitation of threatened species, populations and ecological communities and seek active community participation in developing, implementing and resourcing recovery plans.

28. In conjunction with the development and enhancement of biodiversity information systems, develop databases and programs to monitor the conservation status of threatened species, populations and ecological communities, assess the viability of populations and regularly report on progress.

Box 6: Critical Habitat

Under the TSC Act, critical habitat is the whole or any part or parts of an area or areas of land comprising the habitat that is critical to the survival of an endangered species, population or ecological community. The TSC Act provides for the identification of critical habitat and has made a number of amendments to the *Environmental Planning and Assessment Act (1979)* to ensure that the assessment of proposed developments takes account of critical habitat concerns. In some cases, areas of critical habitat will also require active management to protect the ecological processes that need to be maintained.

The Director-General of National Parks and Wildlife is responsible for identifying land that comprises the critical habitat of endangered species, populations and ecological communities. Recovery teams will assist in the identification of critical habitat. Before preparing a recommendation for the identification of critical habitat, the Director-General must consult with the independent Scientific Committee established under the TSC Act and consider the Committee's advice. Recommendations for the identification of critical habitat must be publicly notified and public submissions on the recommendation invited.

Objective 2.5
Support ex-situ conservation

The most important way of conserving biodiversity is 'in situ', that is, preservation of the species, population or ecological community in its natural environment. This can be achieved in most cases by reservation and appropriate management of areas of high importance. In some cases, however, the processes threatening the species cannot be managed well enough for the species to survive in the wild and/or the total population size of the species is so low that deleterious genetic changes are likely to occur in the absence of careful genetic management. In these cases ex-situ conservation measures might be considered. These might take the form of translocation to areas removed from critical threats, captive breeding and/or establishment of 'seed banks'. Zoos, botanic gardens and museums are some of the institutions already playing a major role in the development and successful implementation of ex-situ conservation measures. Any proposals for ex-situ measures should recognise that success is likely to be influenced by several considerations (see Box 7).

Box 7: Ex-situ Conservation

In considering the need for ex-situ measures to be applied in an integrated approach to the conservation of any species, it is recognised that:

- many ecological processes can only function effectively in large areas and protected areas may not be large enough to contain all species/communities (which may be dynamic) in perpetuity;
- there is a need to conserve ecological communities outside of the reserve system;
- high priority areas are often on private lands and may remain so;
- although some threatening processes are minimised or negligible in protected areas, inappropriate management of adjoining lands may threaten the viability of biodiversity in protected areas;
- tools, techniques and resources for management of some threatening processes may be inadequate to achieve desired goals for the present, but this situation may improve in the future; and
- ex-situ conservation measures are the last line of defence and are often very expensive.

Priority action

29. Implement ex-situ conservation measures

Implement measures to provide for the ex-situ conservation of species, focusing on those that are threatened or potentially threatened.

This will include the continued development, expansion and maintenance of ex-situ collections (such as rare plant and animal species, seeds, sperm, eggs and embryos). It will also involve enhanced research and training in ex-situ conservation and an integrated and coordinated approach to species re-introductions and re-stocking.

This action recognises that ex-situ conservation is both a difficult and resource-intensive process. Ex-situ conservation remains one of the last lines of defence and efforts should always primarily focus on conserving biodiversity in-situ, that is the protection of species, populations and ecological communities in their natural environment.

Performance targets – Techniques developed for enhancing reproductive output and storage of reproductive tissues, sperm, eggs, embryos and seeds of threatened species and populations.

Lead organisations – RBG, ZPG

Support organisations – AM, NPWS

Supporting actions

30. Include ex-situ conservation options in recovery plans for threatened species, populations or ecological communities where appropriate, and incorporate the input of both Aboriginal and local communities.

31. Further develop training programs for specialists and all sectors of the community in captive management of threatened species, wildlife caring and rehabilitation, and wildlife injury and disease.

32. Improve coordination between agencies involved in ex-situ conservation and species reintroduction/restocking, under protocols such as the Guidelines for the Translocation of Threatened Plants in Australia developed by the Australian Network for Plant Conservation.

3. Threatening processes and their management

Threats to biodiversity conservation come from many sources and the cumulative effect of such processes can lead to ecosystem modification and significant losses of biodiversity. On a global scale, humans are the dominant influence on biodiversity and human population growth. This, together with increasing resource consumption and socio-cultural change, continues to have a deleterious effect on biodiversity. In Australia, the following broad categories provide an indication of the types of threats that exist:

- loss and fragmentation of habitat through clearance of native vegetation;
- human impacts on water and forest resources;
- salinity and soil degradation;
- degradation of the marine environment, including dredging and trawling;
- increasing population growth and resource use, including expanding urban and rural residential development;
- introduced species, diseases and genetically modified organisms;
- collection and illegal trade in threatened species;
- inappropriate fire regimes; and
- climate change and air pollution.

Under the TSC Act, an independent Scientific Committee has ultimate responsibility for listing key threatening processes in NSW. The issues addressed below represent only selected broad and generally recognised examples of threats currently facing NSW. The range of threats facing NSW will be described and addressed in greater detail once listed by the Scientific Committee. As with all aspects of this Strategy, the management of threats will require a concerted and cooperative effort on the part of all spheres of government and the community.

Objective 3.1
Implement mechanisms for identifying and managing threatening processes

The TSC Act defines a threatening process as a "process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, populations or ecological communities."

Under the TSC Act, the Scientific Committee has been given responsibility for determining which processes should be listed as threatening. The TSC Act also requires that threat abatement plans be prepared for each key threatening process to abate, ameliorate or eliminate the adverse effects on threatened species, populations or ecological communities. The preparation of threat abatement plans must involve a consideration of social and economic consequences and consider options for community involvement. The successful implementation of Threat Abatement Plans will require community participation.

Priority action

33. Identify threatening processes and prepare and implement threat abatement plans

Through the work of the Scientific Committee and in consultation with the community, identify and list the key processes that are likely to jeopardise the survival of threatened species, populations and ecological communities.

Once listed, threat abatement plans will be prepared, implemented and reviewed for each key threatening process within three years in accordance with the provisions of the TSC Act. Priorities for the preparation of threat abatement plans will be determined in consultation with the Scientific Committee.

Threat abatement plans will be developed and implemented within the context of wider biodiversity conservation planning and management with efforts focused at the regional scale. Particular emphasis will be given to integration with the recovery planning process and the identification of critical habitat.

Performance target – Compliance with the provisions of the TSC Act.

Lead organisations – Scientific Committee, NPWS

Support organisations – all NRAs, RLPBs, ALCs, local councils

Objective 3.2
Minimise the modification of natural ecosystems, habitat loss and fragmentation

There are very few recognised ecosystems in Australia that have not suffered depletion and simplification. The protection of habitat is crucial. The destruction, fragmentation and modification of habitat resulting from vegetation clearance to support urban development, agriculture and transportation, is the biggest threat to biodiversity in NSW. It has resulted in widespread changes in the distribution and abundance of biota and wrought profound ecological changes. Much of NSW is affected by some form of land degradation, such as erosion and salinisation. In many locations, particularly urban and agricultural areas, only isolated remnant habitats remain and these are under considerable stress from human activities. The aquatic environment has also been affected, especially by coastal development and declining water quality, as a result of human activities.

Priority action

34. Conserve and sustainably manage native vegetation

Implement the provisions of the *Native Vegetation Conservation Act 1997* to ensure a consistent and comprehensive state and regional approach to the conservation and sustainable management of native vegetation.

The Native Vegetation Conservation Act, 1997 sets up a Native Vegetation Advisory Council to draft a Native Vegetation Conservation Strategy for NSW and enables the development of regional vegetation management plans. The Plans will address issues related to biodiversity conservation and be prepared by regional vegetation committees comprising representatives from the community and government. A Native Vegetation Management Fund has been established to provide incentives to landholders who enter into Property Agreements.

In addition, the extent and condition of native vegetation will be monitored following the development of agreed methodologies.

Performance targets – The first Native Vegetation Conservation Strategy for NSW completed. Regional vegetation committees established and Regional Vegetation Management Plans developed and implemented. Baseline information developed to enable on-going monitoring of the extent and condition of native vegetation. Native vegetation decline progressively reduced.

Lead organisation – DLWC

Supporting organisations – NPWS, AG, DUAP, RVCs, ALCs, local government, RLPBs, NSW Farmers' Association

Supporting actions

35. Develop and promote standards and guidelines on ecologically sustainable grazing and other minimum impact agricultural practices.

36. Ensure that environmental planning instruments and strategies, Catchment Plans, Regional Vegetation Management Plans, council plans of management for community land and property plans, identify and protect significant native vegetation, wildlife corridors and other environmentally sensitive areas such as waterways and wetlands.

37. Consistent with available resources, continue research, with involvement and advice from relevant community groups, to evaluate the effects of fragmentation and the benefits of wildlife corridors on the viability of species and populations of native biota.

38. Strengthen mechanisms for the protection of urban bushland, particularly the provisions and implementation of State Environmental Planning Policy 19 – Urban Bushland, and other mechanisms such as plans of management for community land prepared by local councils.

Objective 3.3
Effectively manage weeds, pest animals and introduced species

The intentional transfer and the accidental introduction of non-indigenous species into NSW continues. Introduced species can threaten indigenous terrestrial and marine life directly by predation or competition, or indirectly by altering their natural habitat. Increasingly, threats to native biodiversity also

come from introduced pathogens, diseases and parasites that are not detected by quarantine controls and through genetic contamination of native species. In addition, some native species indigenous to NSW have also become pest species, largely as the result of human modifications to the natural environment that have favoured some species over others.

Priority action

39. Improve cooperative approaches to weed and pest management

Building on the NSW Weeds Strategy, the threat abatement planning process and the on-going work of the NSW Pest Animal Council, continue and expand cooperative and strategic management programs for weeds and pest animals to reduce their impacts on the biodiversity of natural and agro-ecosystems. Greatest emphasis will be given to introduced vertebrate pests (including foxes, cats, rabbits, pigs, goats) and environmental weeds (such as bitou bush, privet, exotic forest vines, serrated tussock, blackberry and scotch-broom) some of which are also agricultural weeds.

This action will include ongoing research on methods to control pest animals and weeds. Biological control methods are a part of this process.

It will include the closest practical involvement of landholders, relevant research organisations such as the CSIRO and Cooperative Research Centres, the horticultural industry and the community in implementing pest animal and weed control programs, particularly targeting areas with threatened species. The impacts of control programs on biodiversity and threatened species will be minimised. In addition, community information on pest animals and weeds will be improved and widely distributed.

Performance targets – Key knowledge gaps in pest management filled. Control plans, including threat abatement plans, for pest animals and weeds developed and implemented. Distribution and impacts of weeds and pest animals on biodiversity reduced.

Lead organisations – AG, NPWS, RLPBs, local government

Support organisations – DLWC, CRCs for Weeds and Vertebrate Control, Noxious Weeds Advisory Committee, NSW Pest Animal Council, NVAC, State Catchment Management Coordinating Committee (SCMCC), Landcare, community groups

Supporting actions

40. Implement new legislation and management mechanisms to promote responsible ownership of companion animals such as dogs and cats. This will minimise the potential impact of companion animals on native species while also recognising the benefits they provide.

41. Improve mechanisms for the control of accidental and/or illegal introductions of non-indigenous species, particularly focusing on preventing their release into natural ecosystems (pet fish, for example).

42. Continue to investigate options and, in light of new knowledge, adapt the management of ballast water to assist in controlling the import of non-indigenous marine organisms. This will include implementation of the Australian Ballast Water Management Strategy.

Objective 3.4
Improve fire management regimes

Prior to European contact, Aboriginal people influenced the frequency and intensity of fires in the Australian bush. When Europeans arrived further changes occurred. Fire can have different impacts on biodiversity depending on factors such as frequency, intensity, duration and timing. In many Australian ecosystems periodic fire is necessary to maintain important ecological functions. Fire can therefore be both beneficial and a threat to biodiversity. It is under inappropriate fire regimes that fire most threatens biodiversity. Apart from managing fire to achieve conservation, other objectives such as protecting human life and property and the protection or enhancement of natural resources harvested or exploited by humans (eg. timber, water, pasture, etc) need to be considered. Hence, fire is a natural process, but one that requires special management in recognition of its wider impacts.

Priority action

43. Manage fire in accordance with ESD Principles

Ensure that actions to manage bush and other fires provide for the protection of the environment and are undertaken with regard to the principles of ecologically sustainable development (ESD).

This will be achieved primarily through the provisions of the *Rural Fires Act 1997* which includes mechanisms to ensure that the principles of ecologically sustainable development are considered as part of the bush fire management process. A major focus will be the development of Bush Fire Risk Management Plans in consultation with the community. It is important that a process is established to ensure that these Plans are integrated with relevant Regional Vegetation Management Plans. Fire Control Officers will also be provided with training in ecological principles and longer-term options for training volunteers will be developed.

In addition, emphasis will be given to improving research and monitoring the impacts or lack of fire on biodiversity, particularly threatened species, populations and ecological communities. This will include cooperative mechanisms to improve the accessibility of information and data necessary for use in bush fire management and planning.

Performance targets – Bush Fire Risk Management Plans developed in consultation with the community, incorporating the principles of ecologically sustainable development. Ecological training provided to Fire Control Officers. Research on the impacts of fire on biodiversity undertaken and outcomes incorporated into bush fire management programs.

Lead organisations – Rural Fire Service (RFS), NPWS, NSWFB

Support organisations – SFNSW, DLWC, RLPB, local government

Supporting actions

44. Improve the consideration of fire threat in land-use planning and incorporate the results of applied fire research, including the knowledge and experience of Aboriginal and local communities, in land management and land-use planning.

45. Continue a research program to examine the effects of fire on biodiversity.

Objective 3.5
Assess and minimise the impacts of pollution on biodiversity

Pollution resulting from human activities is a major and growing threat to biodiversity. Pollution of river, estuarine and marine systems, including salinity, siltation, nutrient enrichment, sedimentation, algal blooms and chemical pollution, is of particular concern. Maintaining adequate flows, both quantity and variability, is essential for water quality (see Objective 4.7). The combined and long-term cumulative effects of pollution are also of concern as they cause substantial problems for the management and protection of biodiversity.

Supporting actions

46. Continue applied research examining the effects of pollution on biodiversity.

47. Improve pollution monitoring, including that undertaken by community and Aboriginal groups, and promote the further development of pollution indicators.

48. Improve the prevention, reduction and control of pollution through options including incentives and strengthened legislation.

49. Promote the further development of techniques for re-using and recycling pollutants and other waste products.

Objective 3.6
Assess and manage the potential impacts of climate change

Current scientific evidence suggests that the Earth's climate is gradually changing, above what may be expected through natural change, as a result of human activities. Although the extent and timing of climate change remains uncertain, we need to be prepared for the variety of predicted long-term impacts. Global climate change has the potential to significantly affect biodiversity. It may cause changes in population sizes and the distribution of species, modify the species composition of habitats and ecosystems and alter the geographical extent of habitats and ecosystems.

Supporting actions

50. Continue to monitor the rate and impact of climate change on biodiversity at global and regional scales, incorporating information from community and Aboriginal groups where appropriate.

51. Undertake research into the potential impacts of climate change on species, populations and ecosystems and secondary effects, such as altered fire regimes and conditions that may favour spread of pathogens or introduced species, and identify practical options for addressing such impacts.

52. Modify conservation strategies and practices to compensate for changing climatic conditions and their effects on biodiversity, noting in particular the importance of native vegetation retention and revegetation as a means of preserving existing carbon sinks.

53. Determine priorities for the management of species and ecological communities which are likely to be threatened by climate change.

54. Investigate the capacity of protected areas to sustain their biodiversity in the event of climate change and, where possible, ensure that altitudinal and latitudinal buffer zones or corridors exist to allow for the movement of organisms in the event of shifts in climatic zones. This will require careful consideration of reserve design principles in conjunction with conservation planning and management implications.

4. Natural resource management

Natural resource use makes a significant contribution to the generation of Australia's wealth and well-being. Agricultural and pastoral industries, for example, contributed 3% of Australia's gross domestic product and 22% of exports of goods and services in 1995-96. The agricultural sector also employs around 400,000 people or over 5% of employed persons (Industry Commission 1997). Apart from economic benefits, the natural resources of NSW, including air, water, flora and fauna, land, soil and energy, also support life and social systems.

Yet the benefits of the resource-based component of our economy have not come without costs. Across all industries and sectors, from primary production to infrastructure and urban development, there is a pressing need to develop and apply ecologically sustainable management practices. In many respects, the problems of natural resource management are linked to high per capita levels of consumption and resource-intensive lifestyles, particularly in urban areas. NSW residents, for example, are comparatively high consumers of resources and extremely high producers of waste (EPA 1997).

Conservation of our biodiversity requires more than simply dedicating new reserves and protecting threatened species. Rather, to ensure that land and resource use is not detrimental to essential ecological processes and does not contribute to a further loss of species, biodiversity considerations need to become an integral and accepted part of all natural resource management decision-making frameworks. The environmental planning system plays a major role in this process, through mechanisms such as environmental impact assessment (EIA) and evolving long-term planning tools such as strategic environmental assessment (SEA) and bioregional planning (see Priority Action 13).

By encouraging and facilitating this integration, the Strategy will provide the conditions necessary for protecting the biodiversity of NSW, while at the same time enabling the continued development of strong, competitive and diverse natural resource industries. Industry and corporate involvement is necessary to both fund and implement biodiversity conservation programs. The following objectives highlight key areas for integrating biodiversity conservation and natural resource management.

Objective 4.1
Develop and implement policies and management practices to achieve ecologically sustainable development and conserve biodiversity

The achievement of ecologically sustainable development (ESD – see Boxes 8 and 9) will require that our natural resources be managed for the benefit of present and future generations. It will also require that management of natural resources be integrated with biodiversity conservation objectives. Already the NSW Government has in place a wide range of policies aimed at the ecologically sustainable management of natural resources. A prime example is the suite of Total Catchment Management (TCM) policies that together provide the basis for an integrated approach to the management of lands and catchments (see Box 10). The NSW Government is also developing a Natural Resources Policy Directions Statement which will ensure that ESD principles are explicitly incorporated into the development and review of natural resource policies.

Local government also plays a crucial, but often unheralded role, in the achievement of ESD. Increasingly, much of the responsibility for implementation of environmental initiatives rests with local councils, who manage large areas of land and water, undertake major infrastructure projects (such as road construction) and oversee the assessment and approval of a wide range of development activities. Local government is responding to the challenges of environmental management and biodiversity conservation through the development of local policies and strategies (such as local environmental plans), management plans for community land, State of the Environment reporting and by educating and involving local communities.

Recent amendments to the *Local Government Act 1993* further increase the role of councils in achieving ESD, and provide the framework for councils to prepare local State of the Environment reports.

This Strategy will support local government in responding to the challenges at hand.

Box 8: Ecologically Sustainable Development

Ecologically sustainable development (ESD) seeks to meet the needs of present generations while ensuring that ecological processes are maintained and the quality of life, both now and in the future, is improved. The core objectives of ESD are:

- to enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations;
- to provide for equity within and between generations; and
- to protect biological diversity and maintain essential ecological processes and life-support systems.

Box 9: Agenda 21

Agenda 21, developed at the United Nations Conference on Environment and Development in 1992, sets out a number of processes important to the achievement of ESD. Significantly, Agenda 21 notes that, because many problems and solutions have their roots in local activities, the participation and cooperation of Local Government will be a determining factor in achieving the objectives of ESD. Local councils construct, operate and maintain economic, social and environmental infrastructure, oversee planning processes, establish local environmental policies and regulations and assist in implementing national, State and regional environmental policies. Local Government also plays a vital role in educating, mobilising and responding to the community to promote sustainable development.

Priority action

55. Review legislation relevant to biodiversity conservation

Through the work of the NSW Biological Diversity Advisory Council (BDAC), and in consultation with all relevant agencies and the community, complete an initial review by the end of March 1999 of legislation relevant to the implementation of biodiversity programs and legislation that may result in the loss of biodiversity. The review will also advise on the necessity for future legislative action.

Performance targets – Compliance with the provisions of the TSC Act. Completion of review within targeted time-frame.

Lead organisation – BDAC

Support organisations – all NRAs

56. Develop local biodiversity action plans

Councils will prepare biodiversity action plans with the advice and assistance of relevant State agencies. A new Local Biodiversity Fund will be established to provide for the development of the plans.

Biodiversity action plans will assist with the identification and mapping of biodiversity components at the local scale and provide guidance for local planning policies, strategies, development controls, annual management plans and management plans for community land, and identify training and information needs. Preferably action plans should be prepared at a regional scale through joint projects undertaken by neighbouring councils or through the work of Regional Organisations of Councils.

Development of biodiversity action plans will be undertaken in consultation with the full range of stakeholders. These action plans should also be integrated with relevant catchment management strategies and native vegetation, estuary and water management plans.

Through the development of biodiversity action plans, councils will also be encouraged to establish broader Local Agenda 21 programs in collaboration with local and Aboriginal communities and to increase community awareness of, and participation in, the achievement of ecologically sustainable development.

Performance targets – Local Biodiversity Fund established by 1999. Guidelines for the development of biodiversity action plans prepared by 1999. Biodiversity action plans developed and implemented by councils by 2001.

Lead organisation – NPWS, Regional Organisations of Councils, Local Government and Shires Association

Support organisations – all NRAs, local councils, ALCs

Supporting actions

57. Apply ecologically sustainable development principles in policy-making and in community decision-making processes at all levels. Policies to achieve ESD will be developed and implemented through improved coordination and cooperation between all spheres of government, the private sector, local and Aboriginal communities and non-government organisations.

58. In addition to non-regulatory approaches, investigate extension of the application of the beneficiary-pays, user-pays and polluter-pays principles to the degradation of biodiversity on all land tenures.

59. Encourage relevant NSW Government agencies and the private sector to develop and implement policies for environmental management and public reporting that seek to minimise the impacts on biodiversity from their activities and detail efforts to protect or restore elements of biodiversity under their control. This process should incorporate input from local and Aboriginal communities where appropriate.

60. Develop best management practice guidelines to assist land managers adopt sustainable management practices.

61. Implement ecologically sustainable development policies through measures including regulatory arrangements, legislation, standards, economic instruments and formal management agreements.

62. Encourage industry to develop, market and produce environmentally sensitive technologies and utilise processes that reduce the impact on the environment of human activities.

63. Provide for the ongoing evaluation of the ecological, social and economic benefits and costs of conserving biodiversity, focussing on the local and regional level and ensuring the wide dissemination of this information.

64. Develop guidelines for local councils on how to incorporate sustainable resource management activities and biodiversity issues into their planning processes (for example, guidelines related to management of riparian lands and wetlands and for the management of threatened species).

65. In accordance with the *Local Government Act*, councils should identify in their Management Plans all activities they will undertake to protect environmentally sensitive areas and to promote ecological sustainability.

Box 10: Total Catchment Management Framework

Total Catchment Management (TCM) is aimed at achieving the coordinated and sustainable use management of land, water, vegetation and other natural resources on a water catchment basis, to integrate resource use and conservation. In most cases TCM uses the natural boundaries of catchments as the logical framework for identifying the issues and solutions for the whole range of natural resource issues. TCM provides an overall vision for natural resource management in NSW and recognises that the management of the natural environment is complex and broadscale.

Because TCM encompasses a wide range of issues, it integrates the activities of government agencies and local councils, communities, industries and individuals. TCM therefore seeks to coordinate resources, knowledge and effort towards healthy, productive and biologically diverse waterways and catchments. TCM recognises that each local area has its own sets of conditions and issues and is a bottom-up approach to natural resource management.

Total Catchment Management (TCM) is an umbrella policy under which a number of other natural resource management initiatives fit. For example, the NSW Vegetation Forum of the State Management Coordinating Committee has assisted in the development of the *Native Vegetation Conservation Act 1997*, and mechanisms for native vegetation management that will be effectively integrated into catchment planning. The State Rivers and Estuaries Policy and the Coastal Policy are also key components of the overall TCM framework.

Objective 4.2
Implement ecologically sustainable agricultural management practices

Agriculture is Australia's most extensive form of land use, occupying 60% of the total land area. In comparison, national parks and reserves cover just over 5% of the land area and urban areas less than 1% (Industry Commission 1997). In NSW arable land totals 104,000 km^2, although in 1993–94 the actual area under crops, pastures and grasses was only 41,000 km^2 or 5% of the State.

Land degradation continues to be a major issue in NSW costing at least $700 million a year in lost production and having substantial impacts on biodiversity and ecological functions (EPA 1997).

Individual landowners, with appropriate support, can take the lead in sustainable land management, improving productivity and protecting biodiversity at the same time. A NSW Policy on Sustainable Agriculture is currently being developed, in consultation with all relevant government agencies, in partnership with the NSW Farmers' Association and the Nature Conservation Council. The Policy will aim to facilitate a coordinated approach to achieving an ecologically and economically sustainable agricultural sector in NSW. One of the key goals of the Policy will be to protect the State's biological resource base. The Policy will encourage nature conservation on farms, recognising the sector's crucial role in off-park conservation. The Policy will also identify those agricultural activities which will often benefit from the retention and management of native vegetation.

Supporting actions

66. Collate, develop and distribute information on the benefits of biodiversity conservation for agriculture and other types of land use, targeting the local and regional scale.

67. Continue to assist and advise local and Aboriginal communities on ecologically sustainable development, the conservation of biodiversity and its long term benefits for agricultural productivity. This will include the continued implementation of cooperative programs, such as Farming for the Future.

68. Promote farming practices that either avoid the use of chemicals or reduce the impact of chemicals. Information will also be provided to landholders and agricultural contractors on the environmental effects of agrochemicals and alternatives to their use, including documented examples of best practice that benefit both conservation and production.

69. Implement programs to collect outdated and unwanted agrochemicals, building on plans developed by ANZECC and ARMCANZ, to prevent inadvertent use and environmental impact from inappropriate disposal.

70. Promote best practice farming techniques that address cultivation and stocking rates, control of weed species, grazing regimes, positioning of watering points, irrigation practice and salination prevention.

71. Promote property management planning, through programs such as Farming for the Future, as a means of implementing sustainable agricultural management and, where relevant, to also satisfy TSC Act requirements.

72. Continue to identify and promote opportunities for agroforestry, including the preparation of adequate guidelines, especially when land protection and production objectives can be achieved concurrently. A priority will be the preparation of a Farm Forestry Strategy for NSW to promote the establishment of farm forestry on agricultural land.

73. Through the *Native Vegetation Conservation Act* and other relevant mechanisms, continue to develop and implement procedures for limiting the impacts of clearing and cultivation on biodiversity conservation values.

74. Promote locally indigenous or endemic plant species as a basis for sustainable grazing in the management of pastoral lands.

75. Improve management strategies for Travelling Stock Routes (TSR) to maintain biodiversity values, particularly the contribution of TSRs as wildlife corridors and as sources of revegetation seed stock. Roadside Vegetation Plans may provide a suitable model for the future development of TSR management plans.

76. Ensure that biodiversity conservation principles are incorporated into rural restructuring programs, such as West 2000.

77. Continue to develop and promote guidelines for resource users, councils and resource management agencies aimed at the conservation and protection of the soil environment, and ensure compliance with guidelines as a condition on development consent.

78. Develop Total Grazing Pressure agreements in the pastoral regions and link outcomes to incentives to control feral, pest and animal herbivores (DLWC lead agency).

79. Continue to work cooperatively with the apiary industry to improve the management of introduced bees to minimise their potential impact on native flora and fauna. (NPWS, Beekeeping Industry Consultative Committee)

Objective 4.3
Implement ecologically sustainable mining and industry management practices

Mining leases in NSW currently cover an area of approximately 400,000 ha, less than 0.5% of the State, and are focussed mainly on the edges of the Sydney Basin. Mining is of considerable social and economic importance. In NSW, the industry employs 19,500 people and the total value of mineral production in 1994–95 was $5.3 billion (EPA 1997).

However, mining also has the potential to have significant environmental impacts i.e. the ecological footprint is greater than the actual area of the mine. Evidence suggests, for example, that extensive mining operations, such as open-cut coal mines, have caused long-term changes to biodiversity despite the introduction of more stringent requirements and greater rehabilitation efforts (EPA 1997).

Supporting actions

80. Minimise the potential adverse impacts on biodiversity associated with mining and petroleum extraction conducted on lands of all tenures, through universal application of Environmental Management Plans and through appropriate mining lease conditions and security deposits sufficient to guarantee satisfactory rehabilitation.

81. Continue to undertake actions to rehabilitate abandoned mine and extractive sites on lands of all tenures.

82. Ensure the comprehensive environmental assessment of mineral, extractive and petroleum exploration activities.

83. Support the investigation and expansion of the use of biological technologies in mining and industry management.

Objective 4.4
Implement ecologically sustainable forestry management

Ecologically sustainable forest management (ESFM) involves the management of forests so that they are sustained in perpetuity for the benefit of society by ensuring that the values of forests are not lost or degraded for current and future generations. The development and implementation of ESFM is an integral component of the CRA/RFA process for NSW forests which will modify forest land-use patterns on the basis of objective information and negotiations with all major stakeholders.

ESFM applies to all forest tenures and the primary goals are to restore, maintain or enhance:

- forest ecological processes (such as soil, energy flows and carbon, nutrient and water cycles);
- forest biodiversity at the ecosystem, species and genetic level;
- natural and cultural heritage and indigenous forest values;
- social and economic benefits on an ecologically sustainable basis;
- intangible benefits of forests and maintaining options for the future; and
- other identified forest values.

ESFM will require a variety of mechanisms, including establishment of a CAR reserve system and complementary off-reserve initiatives, such as appropriate codes of forest practice and management plans.

Supporting actions

84. The full range of forest values will be maintained or increased across the NSW native forest estate by:

    (a) implementation of ESFM at the regional and local level through ecologically appropriate planning and operational practices;

    (b) establishment of ESFM targets and monitoring and public reporting of performance indicators;

    (c) increased production of plantation grown timber, shifting the reliance away from native forests and providing significant social and economic benefits;

    (d) ensuring public participation in decision-making processes at all levels, together with access to information and accountability, openness and transparency in the delivery of ESFM;

    (e) ensuring that legislation, policies, institutional frameworks, codes, standards and procedures related to forest management require and provide incentives for ESFM;

    (f) applying precautionary principles in native forest management to prevent environmental degradation; and

    (g) applying the best available knowledge and adaptive management techniques, seeking continuous improvement based on best science, expert advice and further targeted research to fill critical gaps in knowledge, monitoring and evaluation of forest values.

85. Develop realistic and meaningful indicators for forest biodiversity, health and condition through continued progress of the Montreal Process (an international program to advance the development of agreed criteria and indicators for the conservation and sustainable management of forests).

Objective 4.5
Implement ecologically sustainable tourism management practices

The natural environment is of great significance to the tourism industry. In 1994 alone, approximately 22 million people visited national parks and reserves in NSW. That figure is expected to grow to at least 27 million by 2005. Visitor use of protected areas needs to be managed on an ecologically sustainable basis. Overuse or inappropriate use can, and has, adversely impacted on the reserve system and on biodiversity. In NSW the draft Nature Tourism and Recreation Strategy provides the framework for balancing the need to conserve biodiversity with demands for recreational and tourism opportunities.

Supporting actions

86. Under the NSW Tourism Masterplan develop, in consultation with Aboriginal and other community groups, programs to promote best environmental practice in tourism infrastructure and operations, the conservation of natural environments and ecosystems used for tourism and address tourism-related environmental issues.

87. Develop, in conjunction with Aboriginal and local communities and the tourism industry, regional strategies for improving the protection of biodiversity values and the presentation of information to tourists about biodiversity and the traditional Aboriginal use of native flora and fauna.

88. Investigate opportunities for the tourism industry to contribute to the protection of biodiversity from which the industry benefits.

89. Through the work of the Nature-based and Ecotourism Task Force develop consistent guidelines, with full public consultation, for commercial tourism operators and other users of public lands.

90. Support the development of environmental codes of practice and professional accreditation systems by the tourism industry, with appropriate consultation with Aboriginal and other community groups.

Objective 4.6
Implement ecologically sustainable urban and coastal management practices

The vast majority of Australians live in cities and towns along the coast and most people's

appreciation of biodiversity is often through experiences in an urban setting, such as encounters with native wildlife. The conservation of urban biodiversity is a critical issue and requires the adoption and implementation of sound urban management practices across all levels of government and in the urban development industry. Maintaining urban biodiversity provides opportunities to both protect and improve the quality of urban areas and functioning of urban and coastal ecosystems, while developing broader community understanding of the value and significance of biodiversity. In addition, there is a need to recognise that the impacts on biodiversity in non-urban areas are often generated by the resource-intensive lifestyles of urban populations.

Supporting actions

91. Improve the integration of strategic planning and infrastructure provision to protect and enhance urban biodiversity and to promote the retention of habitat in urban areas.

92. Continue to establish new regional open space parks, in consultation with the whole community, to provide protection for bushland in close proximity to existing urban areas and ensure that existing urban bushland areas are sustainably managed and protected.

93. Implement processes to incorporate the principles of ecological sustainability at all urban planning levels and facilitate maximum public participation throughout the planning process.

94. Encourage, promote and improve the provision of public transit facilities in all future transport plans.

95. Support research into the development and application of alternatives for sewage disposal and re-use.

96. Strengthen the protection and management of transport corridors and adjoining lands to promote the conservation of biodiversity.

97. Implement the NSW Coastal Policy with the cooperation and participation of the whole community, including Aboriginal Land Councils and other community groups.

Objective 4.7
Effectively manage water resources to conserve biodiversity and meet environmental, economic, social and community needs

Water is the most critical and highly variable natural resource in NSW. However, expanding human activities are affecting the health of NSW rivers and coasts. Algal blooms are increasingly common, salinity remains a major concern, artesian basins are under stress and wetlands are shrinking. To halt this decline in water quality and biodiversity and to help preserve the State's rivers and wetlands, several reforms have been introduced (Box 11). These include:

- preparation and implementation of management plans for rivers, groundwater and wetlands;
- promoting the cost-effective provision of rural water and projects to improve water quality and implementing community action programs;
- improving flow of quality water into wetlands to maintain or restore their natural processes;
- introduce water transfer schemes that, among other things, reduce the stress of water extraction on rivers; and
- development of objectives and management initiatives for water quality and river flows for all major valleys.

The NSW Biodiversity Strategy will build upon and expand these reforms.

Priority action

98. Develop and implement a comprehensive framework for sustainable water management

Working in collaboration with the community, develop and implement a comprehensive framework to achieve long term sustainable water resource management and clean, healthy, productive river systems, lakes, groundwater and wetlands (see Box 11).

Valley-based River Management Committees are being established across the State, including representatives from government and the community, to develop and implement plans for river flow and water quality management. Through these community-based mechanisms,

environmental flows to river systems will be determined and the social and economic needs of the community addressed.

Box 11: The Government's Water Reform Agenda

The NSW Government's water reform package announced in mid-1997 involves initiatives in three key areas:

(i) Redefining how water is shared between competing uses

Key actions include the development of environmental rules for each valley; maintenance of the embargo on new licences and the cap on total diversions in the Murray-Darling Basin; and assessment of the level of stress of unregulated rivers to assist the development of management plans.

(ii) Developing investment strategies for infrastructure, planning and management

Key actions include clarifying water access and use rights by 1999; and enhancing Government investment in rural communities via a five year adjustment package.

(iii) Reshaping the way communities and government interact on water issues

Key actions include the expedited establishment of representative Management Committees to plan the desired approach for each major valley and ongoing consultation over the implementation of the reform package.

Coordination of the Government's approach on water issues is to be managed by a special taskforce comprised of the CEOs of DLWC, EPA, NPWS, AG, NSW Fisheries and DUAP.

In addition, mechanisms for the protection and management of wild and scenic rivers are being strengthened, building on the special recognition of high conservation value rivers in the water reform package.

Monitoring of water quality, impacts on biodiversity and socio-economic effects of the water management reform process will be undertaken to assess the implications for on-going management and to provide a basis for long-term water management.

Performance targets – River Management Committees established for major regulated river systems in 1998 and for stressed unregulated rivers in 1998/9.

Appropriate water quality and river flow objectives for NSW rivers identified and agreed on by River Management Committees.

Groundwater Management Plans and River Flow Management Plans prepared and implemented and outcomes monitored.

Provisions to restore and protect river corridors, giving effect to water quality and river flow objectives, incorporated into catchment and land-use plans.

The Council of Australian Government water reforms implemented.

Lead organisations – DLWC, EPA

Support organisations – NPWS, AG, NSW Fisheries, SFNSW, ALCs, local government, water supply authorities

Supporting actions

99. Review mechanisms for the protection of wild and scenic rivers.

100. Identify and, if appropriate, designate floodplains of high environmental value and ensure that floodplains receive, as a priority, their required environmental flows.

101. Increase research into environmental flow requirements and continue development and application of computer based support systems, linking operation flow decisions to their ecological response on riparian lands, floodplains and wetlands.

102. Governments, with the assistance of the Murray-Darling Basin Commission, ensure that water harvesting for irrigation is ecologically sustainable.

103. Review and enhance the effectiveness of management mechanisms for the protection and improvement of water quality, including measures to control and reduce the impacts of salinity, nutrients and pesticides.

104. Further develop and apply biological indicators of water quality.

105. Seek opportunities to reduce the impact of artificial water sources on biodiversity, particularly in rangeland areas.

Objective 4.8
Adopt ecologically sustainable management practices for native wildlife utilisation

The products of biodiversity have long provided many essential and non-essential goods. However, there is growing concern over the appropriateness of commercial activities and the adequacy of existing management programs for wildlife* utilisation, including problems related to the illicit trading of wildlife. Any harvesting and commercial exploitation of native plant and animal species must be undertaken on an ecologically and economically sustainable basis, utilising the strictest conservation criteria and management practices. Importantly, wildlife management must recognise that not all species will be available for exploitation and the utilisation of wildlife must not be detrimental to the survival of species, populations and communities or the functioning of ecosystems. Similarly the utilisation of wildlife must not be detrimental to the lives, culture and values of Aboriginal people and other sections of the community.

*in this context 'wildlife' does not include timber resources

Priority action

106. Review the commercial and non-commercial uses of native flora and fauna

Undertake a State-wide review, examining the full range of commercial and non-commercial uses of native flora and fauna. The focus of the review will be on flora and fauna likely to be threatened or suffer negative impacts as a result of exploitation or use. The review will provide the basis for developing, updating and implementing policies for the ecologically sustainable use of native species that ensure that NSW shares in the benefits from genetic materials and products obtained from native species.

The review will be undertaken in consultation with the community and include consideration of the attitudes and values of Aboriginal and local communities.

Performance targets – Policies and programs to achieve ecologically sustainable use of biological resources developed and implemented.

Lead organisations – NPWS, AG

Support organisations – SFNSW, NSW Fisheries, ALCs, community groups

Supporting actions

107. Strengthen, in consultation with the community, programs to control the illegal collecting of, and trade in, native wildlife and review the adequacy of existing penalties.

108. With community input, including input from Aboriginal and other community groups, develop and implement wildlife management programs for utilised species and establish management teams to oversee and report on their implementation.

109. Ensure that NSW industries based on the harvesting and farming of native wildlife (including those based on flora species) operate on an ecologically sustainable basis and adequately contribute to biodiversity research, development and monitoring programs.

110. Provide advice and assistance to industry and local and Aboriginal communities to establish management programs for the ecologically sustainable harvesting of wildlife.

111. Participate in the development of complementary international and interstate management plans for wildlife and their habitats whose ranges are shared with neighbouring countries, States and Territories.

Objective 4.9
Ensure NSW receives social and economic benefits from the use of genetic material and products

Continuing advances in biotechnology and genetic manipulation are creating new avenues for the utilisation of genetic resources in a wide variety of commercial applications. Examples of advances in biotechnology include the development of new pharmaceuticals and new strains of disease-resistant, fast-growing agricultural crops. As a megadiverse nation, Australia possesses a vast storehouse of genetic information that has the potential to be applied in innovative ways. We should promote the appropriate use of genetic material and, by

careful management of our genetic resources, ensure that the benefits flowing from the use of genetic material are shared in a fair and equitable manner.

Supporting action

112. Develop and implement management arrangements to ensure that the utilisation of genetic resources is undertaken with adequate conservation and commercial safeguards. These arrangements should build upon the work of the Commonwealth/State Working Group on access to biological resources, government agencies and Aboriginal and other community groups.

5. Improving our knowledge

The key to achieving the conservation of biodiversity in NSW lies in the acquisition and application of well founded knowledge and understanding of species, populations, habitats, essential ecological processes and threatening processes. This means acknowledging our lack of information in many important areas. Research and related activities need to be well planned, well executed and adequately resourced if their outputs are to provide useful and timely guidance for the development of new policies and practices.

In many instances, actions need to be undertaken immediately if biodiversity is to be conserved. Where this is the case, lack of knowledge should never be used as a reason for postponing appropriate measures to prevent environmental degradation.

This section outlines a series of actions that will facilitate an improvement in our understanding and knowledge of biodiversity. The actions emphasise the need to be clear about the role of research, the knowledge we already have, the knowledge that is missing, and the need for training and education.

Objective 5.1
Review and apply existing knowledge

Although a large proportion of the vertebrates and higher plants of Australia are known, knowledge of many invertebrates, fungi and other non-vascular plants and micro-organisms is inadequate. There are also significant gaps in knowledge about the basic ecological and physical processes underpinning biodiversity. The first step in improving our knowledge of biodiversity is to identify the knowledge that already exists. A review and evaluation of existing scientific knowledge is necessary to indicate key areas requiring further investigation.

There are also opportunities to learn from the experiences and knowledge of Aboriginal and local communities and land managers. Tapping into this knowledge is also an effective way to promote community support for biodiversity conservation.

Supporting actions

113. Prepare and maintain a census of the flora and fauna of NSW to the finest taxonomic level possible and contribute to the development of national inventories.
114. Review existing data for gaps in knowledge on the distribution and abundance of native biota, focussing on threatened species, populations and ecological communities.
115. Review and consolidate existing knowledge of the processes which threaten biodiversity.
116. Continue the databasing of animal and plant collections (including all relevant herbarium and museum collections) and, as part of a review of existing data, establish the accuracy and reliability status of existing information.
117. As an outcome of the above reviews, identify gaps in existing knowledge to guide future surveys, monitoring and research (see also Objectives 5.3 and 5.4).
118. Support the work of the Scientific Committee in identifying and listing threatening processes, threatened species, populations, and ecological communities, as well as in advising on the identification of critical habitat, in consultation with the community as required by the TSC Act (see Objective 2.4).
119. Continue to develop processes to facilitate the application of scientific knowledge in resource and land management.
120. Develop, through cooperative ethno-biological programs, processes to facilitate the application of Aboriginal biological knowledge.
121. Evaluate and use, where appropriate and with the support of Aboriginal and other community groups, the knowledge and practices of Aboriginal and local communities in biodiversity research and conservation programs.

Objective 5.2
Improve the management and dissemination of knowledge

Biodiversity information is diverse in quantity and quality. To enable a collaborative approach to the conservation of biodiversity in NSW, relevant information held by the various government and non-government agencies must be better managed and more readily accessible.

This is a major task. Over the past 20 to 30 years there have been significant advances in technology which have enabled vast amounts of information to be collected, analysed and stored in ways not previously possible. There are now numerous databases containing information pertinent to biodiversity conservation in NSW. Often there are problems of compatibility between these. Much information is also increasingly linked to Geographic Information Systems (GIS) that allow the storage, analysis and display of environmental spatially referenced data.

Ensuring biodiversity information is available and disseminated in ways accessible to all relevant parties, in both the public and private sectors, is a basic requirement for improving knowledge and understanding of biodiversity issues. A NSW Natural Resources Information Management Strategy is being developed with these issues in mind, and will provide a whole-of-government approach to the management of natural resource information (see Objective 1.1).

Priority action

122. Enhance taxonomic research

Enhance fundamental research into the taxonomy of targeted invertebrates (such as insects), non-vascular plants (algae, mosses and liverworts) and fungi, and their role in maintaining ecosystem functions and health. Emphasis will be given to targeting research efforts towards groups that are threatened or potentially threatened.

This will involve greater focus on surveying and monitoring these specific components of biodiversity, which are essential for providing ecological services such as nutrient recycling, pollination and pest control. A priority will be to identify selected groups that are appropriate for use as broader biological indicators and are important for conservation. Action will be taken to support the provision of training in taxonomy, genetics, ecology, biology and other scientific disciplines necessary to improve the knowledge base in this area.

It will also involve ensuring that conservation and resource management strategies and bioregional planning mechanisms provide appropriate opportunities for the identification and conservation of these lesser-known and poorly understood components of biodiversity. This may include opportunities for long-term survey and monitoring projects arising from the Regional Forest Agreements.

This action recognises that invertebrates, non-vascular plants and fungi account for over 75 per cent of global species diversity but that there is grossly inadequate knowledge of their taxonomic relationships. The lack of information on these species inhibits the development of comprehensive approaches to biodiversity conservation.

Performance target – In addition to ongoing research efforts, an extra 50 new invertebrate species and 25 new non-vascular plant species will be described each year in NSW.

Lead organisations – AM, RBG

Support organisations – NPWS, SFNSW, universities

Supporting actions

123. Continue to develop and maintain standardised biodiversity databases for storing and analysing biodiversity data, incorporating information from Aboriginal and other community groups wherever possible, and make accessible all collection-based data while safe-guarding information that may lead to exploitation of threatened species.

124. Continue to develop meta-data directories on natural resources information and disseminate these as widely as possible.

125. Support the development of computer assisted description and identification techniques, such as those being developed by the Australian Museum and the Royal Botanic Gardens.

126. Encourage formal interaction between the scientific community and other stakeholders in the development and implementation of research projects and participation in workshops, symposia and conferences.

127. Continue development and training in the use of computer support systems for

biodiversity research, particularly systems for modelling.

128. Ensure that the results of biodiversity research are communicated and applied in conservation planning and natural resource management.

Objective 5.3
Implement a program of inventory and monitoring of biodiversity

The adequate conservation of biodiversity in NSW will be a long-term and ongoing process. Similarly, the collection of information on biodiversity and the success of biodiversity management initiatives will also take time. Efforts to improve our knowledge need to be undertaken within this context and with a clear understanding that the benefits of strategic research programs may take months or even years to come to fruition. The recently introduced Biodiversity Survey Program (BSP) (see Box 12) will ensure the development of a coordinated approach to biodiversity inventory and monitoring in NSW.

Box 12: The Biodiversity Survey Program (BSP)

The NSW Biodiversity Survey Program (NSW BSP) is an initiative of the NSW government aimed at encouraging cooperation and agreement between a wide range of organisations which have an interest in studying, surveying and understanding biodiversity.

The NSW BSP is the key step in establishing a comprehensive, coordinated, and cooperative suite of biodiversity inventories and monitoring projects that make best use of existing data and studies, and avoid duplication. The NSW National Parks and Wildlife Service is the lead agency.

The short-term aims of the BSP include:

- the establishment of survey standards and guidelines as an important first step towards a coordinated approach to survey;
- encouraging the collection of new data in ways which makes it compatible for comparison with existing data and other new studies, so that it can be used more effectively for conservation planning on a regional scale;
- ensuring that information is widely available to scientists, the community and all levels of government decision makers;
- ensuring that biodiversity information can be used to inform land management and planning for the conservation needs of NSW;
- fostering the development of tools to enable more survey for invertebrates and non-vascular plants;
- development of approaches to studying the genetic and ecosystem levels of biodiversity; and
- encouragement of a coordinated approach to monitoring biodiversity and other long-term studies.

Priority action

129. Establishment of mechanisms for long term biodiversity monitoring

Undertake long-term monitoring of biodiversity and complementary research to identify and interpret the causes of biodiversity change, focusing on priority areas including threatened species, populations and ecological communities, and threatening processes and their impacts. Emphasis will be given to enhancing research into best practice in biodiversity survey and monitoring techniques to ensure cost-effectiveness and comprehensiveness (covering a wide range of organisms and ecosystems), particularly through the work of the NSW Biodiversity Survey Program (see Box 12).

Implementation of this action will be closely integrated with existing and proposed bioregional assessments (Action 13) and build on existing monitoring sites and baseline biodiversity information. In addition, opportunities will be provided for community involvement in biodiversity monitoring, enabling the expertise and knowledge of local and Aboriginal communities to be utilised.

Monitoring of biodiversity provides the necessary information for the sustainable management of natural resources and assessment of the impacts of human activities. Regional forest agreements in NSW, for example, may develop mechanisms for

monitoring biodiversity to enable assessment of the achievement of ecologically sustainable forest management (Action 84). In this context, biodiversity monitoring can provide an early warning system for the detection of threats to biodiversity. It also establishes a basis for broader State of the Environment reporting by all levels of government.

Performance targets – Identify and select standardised, best practice approaches for monitoring biodiversity. Provisions for biodiversity monitoring incorporated within Regional Forest Agreements. Undertake long-term biodiversity monitoring covering a broad range of species and ecosystems.

Lead organisations – AM, RBG, NPWS

Support organisations – SFNSW, DLWC, EPA, RFS, universities, CMCs and Trusts, Landcare groups, RVCs, Water Management Committees, ALCs

130. Implement biodiversity survey program

Implement the NSW Biodiversity Survey Program (BSP) to coordinate the collection of biodiversity information, standardise biological survey methodologies and activities, and ensure the collation of data into appropriate biodiversity information systems.

The BSP will facilitate the establishment of a comprehensive, coordinated and cooperative suite of biodiversity inventories and monitoring projects, making best use of existing studies and avoiding duplication. The BSP will support both immediate needs for biodiversity information and longer-term survey and monitoring of biodiversity status for use in strategic management and decision-making.

Performance targets – Publication of Biodiversity Survey Program Action Plan, detailing a program of prioritised studies and timeframes.

Agreed standards, methods and protocols for the collection and management of biodiversity data established.

A wider taxonomic range of organisms included in biodiversity studies.

Studies and products from the BSP published and widely promoted and disseminated.

Greater community involvement in biodiversity studies achieved.

Lead organisation – NPWS

Support organisations – all NRAs

Supporting actions

131. Continue to undertake systematic regional flora and fauna surveys and mapping at appropriate scales across NSW.

132. Through the NSW Biodiversity Survey Program, and in collaboration with the Commonwealth and other States, support a national coordinated program of survey and long-term ecological monitoring to detect declines in biodiversity and, where possible, eliminate the causes of such declines.

133. Monitor the extent (composition and structure) and condition of native vegetation as part of the implementation of the *Native Vegetation Conservation Act*.

134. Encourage and support community-based biodiversity research programs, including the involvement and participation of local and Aboriginal communities and school students.

Objective 5.4
Undertake biodiversity research and develop research infrastructure

Biodiversity assessment is both a resource and time intensive activity and, in addition to longer term biodiversity research, there is often a need to support research that may require more immediate attention. In some cases such research may be urgently required to assist in the decision-making process for particular development or resource management proposals, while in other instances research may be needed quickly to determine recovery options for threatened species. Research is needed in many areas, including:

- the taxonomy, distribution, abundance and conservation status of biota;
- the identification of threatened species, populations and ecological communities; and
- the identification of threatening processes and critical habitat.

In recent years there has been a sharp decline in the number of trained taxonomists available to perform basic survey and research work. It is

crucial that training is provided for taxonomists and other specialists, particularly those specialising in poorly known groups (eg. many invertebrates, fungi and algae), as taxonomy is fundamental to all other biological sciences. It is equally important that we maintain high standards of curation so that the valuable information stored in herbaria and museums is readily available and as up-to-date as possible. Even if biodiversity techniques are modified to improve efficiency, there is a need for a strong taxonomic infrastructure to service the demands of survey and monitoring teams.

Priority action

135. Develop and implement a biodiversity research strategy

Develop and implement a comprehensive Biodiversity Research Strategy for NSW in collaboration with industry, all spheres of government, tertiary institutions, Aboriginal groups and the community.

The Strategy will build on the work of the Biodiversity Survey Program to set a broad agenda for future directions in biodiversity research in NSW. It will address all aspects of biodiversity research including methodologies, survey, monitoring, information sharing, data management and community involvement, establishing agreed objectives and principles. It will also guide the undertaking of social and economic research related to biodiversity use and conservation.

Performance target – In consultation with the community, a NSW Biodiversity Research Strategy developed and implementation commenced by 2000.

Lead organisations – NPWS, AM, RBG

Support organisations – all NRAs

Supporting actions

136. Maintain and enhance research into the nature and extent of threatening processes.

137. Enhance taxonomic, genetic and ecological research to increase knowledge and understanding of the full range of biodiversity (including micro-organisms) in NSW, drawing on the knowledge and values of both Aboriginal and local groups where appropriate.

138. Maintain and enhance research in conservation biology, particularly research aimed at understanding the biology of species and their interactions with the environment, incorporating the knowledge of Aboriginal and other community groups. This will include enhanced research on ecological processes to assist in ecosystem management, rehabilitation and reconstruction.

139. Support scientific research focusing on species that require intensive genetic management to conserve their biodiversity.

140. Support the development of an agreed classification system for habitats and ecosystems as a basis for bioregional planning.

141. Support the training of conservation biologists, including taxonomists, geneticists, ecologists, and technicians to assist in all research, through post-graduate programs and collaborations between museums, herbaria and universities.

142. Enhance horticultural research on threatened plant species.

143. Expand storage facilities for biological collections.

6. Implementation

Conservation of the biodiversity of NSW will require considerable time and effort and the application of substantial resources from all spheres of government and the community. Given the scale of the factors influencing biodiversity, including both human activities and natural processes, it is clear that any approach to its conservation must be comprehensive. This Strategy has been developed with a clear understanding of this policy context and the broad nature of the actions proposed throughout the Strategy reflect the need to pursue a strategic and integrated approach to biodiversity conservation.

Establishing effective management structures and mechanisms for implementing the Strategy will require an effective management structure to ensure the coordination of efforts and a clear delineation of responsibilities to prevent duplication. The components of the proposed management structure are described below.

Many organisations have responsibilities for implementing Strategy actions. Lead agencies for each action (see Summary of Actions) will be responsible for developing and implementing comprehensive programs to undertake each action and to determine suitable performance measures and expected project outcomes. The Biological Diversity Advisory Council (see below) will play a key role in monitoring the overall implementation of the Strategy, including the achievement of the Strategy's performance targets.

It has previously been noted that more specific objectives, performance targets and actions for the conservation of fish and marine vegetation biodiversity will be developed and incorporated into the NSW Biodiversity Strategy following recent amendment of the *Fisheries Management Act 1994*. This process will be overseen by NSW Fisheries, reporting to the Minister for Mineral Resources and Fisheries.

NSW Biological Diversity Advisory Council

Under the TSC Act, a Biological Diversity Advisory Council (BDAC) has been established. Ten people have been appointed to BDAC, including representatives from the scientific community, the Ecological Society of Australia, the Australian Museum, the National Biodiversity Council, the Nature Conservation Council of NSW, the NSW Aboriginal Land Council, local government and industry. The functions of BDAC are as follows:

(a) to advise the Minister for the Environment and the Director-General of the National Parks and Wildlife Service on the draft NSW Biodiversity Strategy;

(b) to devise and assist in the implementation of a comprehensive consultation process for preparation of the Strategy;

(c) to advise on the status of, and threats to, the biological diversity of the State;

(d) to undertake a review of existing legislation for implementing biological diversity programs and of existing legislation that may directly or indirectly result in the loss of biodiversity and to advise on the necessity for future legislative action; and

(e) to advise the Minister for the Environment and the Director-General of National Parks and Wildlife on matters relating to the conservation of biological diversity, including the monitoring of the implementation of the Strategy.

In an important move, four members will be added to BDAC to cater for the expansion of its Terms of Reference to include fisheries issues.

Cabinet Standing Committee

At the highest level, the NSW Government will utilise the existing Cabinet Committee on Rural and Natural Resources to oversee implementation of the Strategy and to ensure a coordinated whole-of-government approach.

Membership of the Cabinet Standing Committee comprises the Ministers responsible for environment, natural resource management, planning and related issues in NSW.

Scientific Committee

Under the TSC Act, an independent Scientific Committee has also been established. The Scientific Committee has an important role to play in implementation of this Strategy and the conservation of biodiversity. Under the TSC Act the principal functions of the Scientific

Committee include:

- to determine which species are to be listed as threatened;
- to determine which populations are to be listed as endangered and to advise on the identification of their critical habitat;
- to determine which ecological communities are to be listed as endangered and to advise on identification of their critical habitat;
- to identify and list key threatening processes; and
- to review joint management agreements and the performance of parties under such agreements.

The TSC Act also required that the Strategy be considered by the Scientific Committee prior to its adoption by the Government.

Members of the Committee include representatives of the National Parks and Wildlife Service, the CSIRO, the Australian Museum Trust, the Royal Botanic Gardens and Domain Trust, the Entomological Society of Australia, the Ecological Society of Australia, and scientists from a public authority, a tertiary educational institution, and one with expertise in agricultural science and natural resource management.

Biodiversity Strategy Implementation Group (BSIG)

The finalisation of this Strategy, and the development of priority actions, was assisted by an inter-agency implementation group comprised of staff from NPWS, RBG, the Australian Museum, DUAP, DLWC, SFNSW, Agriculture, ZPB and Fisheries. BSIG ensured efficient information flow between agencies. The outcome was a shared Government position on the priority actions for biodiversity conservation.

It is proposed that BSIG will continue to seek coordinated, cohesive results in the Government's implementation of this Strategy. This will include working groups overseeing implementation of relevant priority actions and the continuation of existing interagency committees established to develop key components of the Strategy such as information accessibility and community incentives.

Native Vegetation Advisory Council

The *Native Vegetation Conservation Act 1997* sets up a Native Vegetation Advisory Council to draft a Native Vegetation Conservation Strategy for NSW and enables the development of regional vegetation management plans.

Providing adequate funding and resources for implementation of the Strategy

Given that Australia continues to lose components of its biodiversity, there is now growing recognition that as a nation we have been under-investing in biodiversity conservation and over-investing in activities that threaten biodiversity. Without further investment in biodiversity conservation, serious long-term economic and ecological consequences may result.

The NSW Government considers that just as the benefits of biodiversity conservation should be shared by all the community, the costs of biodiversity conservation should also be equitably shared. However, it is obvious that contributions to biodiversity conservation will not always be monetary in nature. Many community groups, such as volunteer bushland regeneration organisations, already make substantial contributions in time and labour. Recognising the value of all contributions, whether monetary or otherwise, is of great importance.

At the State Government level, funding of the Strategy's implementation will be the responsibility of all relevant agencies. Agencies are to ensure that adequate resources are provided to achieve the full implementation of the Strategy. Agencies should also ensure that broad community participation in biodiversity conservation is facilitated. In setting budget priorities and during the process of corporate planning, agencies will determine the means by which they will undertake to fulfil Strategy obligations relevant to their area of operation.

The NSW Government remains aware, however, that the ability of agencies to pursue implementation of the Strategy may vary over time given changes in broader economic circumstances and State budgetary priorities and that some organisations, such as the Rural Lands Protection Boards, are essentially self-funding. The key challenge for State Government is to efficiently and diligently pursue the protection of biodiversity within a complex inter-relationship of economic, social and ecological pressures.

At the Local Government level, councils will be encouraged to examine a wide range of options for funding implementation of Strategy actions relevant to them. This may include joint initiatives covering two or more councils and region-wide approaches coordinated through Regional Organisations of Councils. The NSW Government will also examine new options for assisting Local Government to improve its capacity to address biodiversity issues at the local level.

There is clearly potential for private sector involvement in biodiversity conservation, for instance in the form of corporate sponsorship of community-based programs or specific Recovery Plans. This potential will be explored in the implementation of the Strategy.

Establishing effective mechanisms for monitoring, reviewing and adjusting the Strategy

As with any Strategy or coordinated program of action, it is important that steps are taken to determine how implementation is proceeding, to measure the pace of change, to examine progress towards meeting key objectives and to identify any policy adjustments that may be required. Given that knowledge of biodiversity is incomplete, this Strategy must be flexible and dynamic if it is to remain up-to-date and of contemporary relevance as a guiding tool for biodiversity conservation.

As the lead agency for the Strategy, the National Parks and Wildlife Service, in conjunction with the Biological Diversity Advisory Council, has the prime responsibility for assessing progress in implementation and for determining the nature and timing of any adjustments that may be necessary. Under the TSC Act, the NPWS also has an obligation to assess its own performance in achieving the objectives and performance targets of the Strategy.

A number of mechanisms, outlined below, will be employed to ensure that these obligations are met, and accountability for implementation of specific actions made clear.

Reports to Cabinet Committee

The National Parks and Wildlife Service will provide annual reports to the Cabinet Committee on Rural and Natural Resources detailing actions undertaken to implement the Strategy. The report will include a discussion of the relevant activities of the NPWS and other State Government agencies and outline actions to be undertaken during the next 12 month period. The report will also consider any apparent difficulties and problems that have arisen in implementing the Strategy.

Strategy Review and Legislative Review

To enable independent examination of the Strategy's progress, the Biological Diversity Advisory Council will, with the assistance of the NPWS, and in consultation with other relevant agencies and the community, coordinate and undertake a review of the Strategy once every three years. The scope of the review will be determined by the Council but should include, as a minimum, the appropriateness and effectiveness of the Strategy, the identification of any areas requiring new or updated actions, the achievement of performance targets and an analysis of the success of community involvement initiatives. An essential requirement of the review will be that it makes provision for broad community involvement, thereby enabling the widest possible range of views to be canvassed.

The Council will also review existing legislation for implementing biodiversity programs, review existing legislation that may directly or indirectly result in the loss of biodiversity and advise on the necessity for future legislative action. The Council is to undertake the legislative review under the TSC Act and will review existing legislation, in consultation with agencies and the community, by March 1999.

Community Information

Providing the community with regular information on the progress of the Strategy and the actions being undertaken is necessary to maintain community interest in, and support for, biodiversity conservation. To achieve this, NPWS will provide information, through mechanisms such as newsletters and other publications, to the community at regular intervals. Information on the Strategy will be distributed to a wide audience including other NSW Government agencies. The focus of community information will be on providing details of actions being undertaken, illustrating new, innovative and best practice approaches to biodiversity conservation and examples of community participation, among other things.

Agency Reporting

NSW Government agencies already provide annual reports that outline the achievements made during the previous year. These reports are a valuable public record of the activities of the various agencies and can be used to assess performance against a wide range of Government objectives. As part of their annual reports, agencies will now also indicate measures undertaken to satisfy the objectives of the Biodiversity Strategy. Agencies will also need to incorporate biodiversity conservation actions into their corporate plans.

At a broader scale, information on biodiversity conservation measures will continue to be incorporated into the NSW Government's biennial State of the Environment Report for NSW. Information on biodiversity is also reported by local councils in their annual State of the Environment reports as a complement to the Report. State of the Environment Reports provide important baseline information for the ongoing monitoring of biodiversity and for assessing progress towards achieving biodiversity conservation objectives.

Ensuring the involvement of the whole community in implementing the Strategy

Achieving the Strategy's objectives requires an outcome-oriented approach to implementation. It also requires adopting an ecological perspective, emphasising a whole-of-government focus. Biodiversity does not recognise administrative boundaries, either State or local, and hence there is a need for effective cooperation between and among State agencies and local councils. Yet, as has been continually stressed throughout the Strategy, successful implementation will require far more than government actions alone. In particular, it is clear that the Strategy will only be fully implemented when the private sector, public interest groups and the general community recognise the benefits of biodiversity and are prepared to become involved in biodiversity conservation measures. Establishing strategic partnerships that harness the energy and expertise of all relevant groups is crucial to the ongoing conservation of biodiversity in NSW.

The general community

There are five main areas where the community must be involved in managing the implementation of this Strategy: information gathering, consultation, decision-making, initiating action; and evaluation. Actions to encourage and facilitate community involvement in biodiversity conservation are a central theme of the Strategy. Awareness and participation in biodiversity initiatives will be pursued through these and other options that will ensure the widest possible degree of community ownership.

Non-government organisations

Non-government organisations, such as the peak environmental, Aboriginal and industry groups, are another of the Strategy's key stakeholders. Their involvement is essential as they are the source of considerable independent expertise in conservation management and are often the focus for numerous formal and informal information networks. As such, non-government organisations represent a key means to improving the state of biodiversity knowledge and, as with the private sector, they will be consulted widely during the implementation, review and updating of the Strategy.

The Private Sector

The private sector, especially the land development industry, has a major role to play in implementing the Strategy. As a major landowner, the private sector is ultimately responsible for determining the type and nature of most development and investment decisions throughout the State. Implementation, review and updating of the Strategy will involve extensive consultations with the private sector to ensure that their interests are accounted for and their contributions recognised.

Local Government

There is now growing recognition that local initiatives are the key to achieving ecologically sustainable development (of which biodiversity conservation is a core objective). Through its traditional roles in planning and development and increasingly through its new roles in environmental management, monitoring and reporting, Local Government will be a key player in efforts to conserve biodiversity. Throughout the implementation process, Local Government will be closely consulted and encouraged to undertake appropriate actions. The NSW Government will also consider new options for assisting Local Government to take a comprehensive approach to local biodiversity conservation.

NSW Government

The NSW Government has primary responsibility for this Strategy. State Government agencies will contribute to implementing the Strategy through both their day-to-day operations and longer-term strategic planning initiatives. Agencies will provide details of their contributions to implementing the Strategy in their annual reports and incorporate future contributions in their corporate work plans. The biennial NSW State of the Environment Report will also continue to address biodiversity issues.

Commonwealth Government

The Commonwealth Government supports a wide variety of programs relevant to biodiversity conservation. These programs link with the National Strategy for the Conservation of Australia's Biological Diversity developed by ANZECC, provide a link to international treaties and conventions, and establish frameworks for individual States and Territories to follow. Implementation of the NSW Biodiversity Strategy will require Government-to-Government consultation and cooperation through existing Ministerial Councils and other mechanisms.

OBJECTIVES AND ACTIONS - SUMMARY TABLE

1. Community consultation, involvement and ownership

Objective 1.1 Promote awareness and support, disseminate knowledge and ensure meaningful community participation

Performance Targets

- Targeted community information programs and packages developed and accessible on a bioregional basis.
- Agency databases linked and compatibility enhanced to provide user-friendly computer information systems, with community access to information facilitated through linked Internet sites.
- Biodiversity information kits prepared and distributed by 2000.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
1	Improve accessibility of biodiversity.	P	NPWS, DLWC	AM, RBG, NRAs, ALCs
2	Produce biodiversity manuals and directories aimed at providing practical information to the community and provide appropriate training in biodiversity conservation and monitoring throughout the government and community.	S		
3	Improve awareness of the functioning of ecosystems, particularly the role of lesser-known organisms incorporating both Aboriginal and non-Aboriginal knowledge.	S		

Objective 1.2 Establish community partnerships

Performance Targets

- Information provided to landholders and the community on benefits and opportunities for biodiversity conservation.
- Complete consultations with the community on appropriate incentive options in 1999.
- In collaboration with other states (through ANZECC) examine opportunities to implement biodiversity conservation incentive programs.
- Implement a range of incentive programs for biodiversity conservation by 2001, targeting the most critical areas.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
4	Provide opportunities and incentives to the community to conserve biodiversity.	P	NPWS, DLWC	AG, local govt.
5	Implement the NSW Biodiversity Strategy as a broad-based package of on-going initiatives, emphasising opportunities and benefits and actively involving the entire community.	S		
6	Work with local communities and existing conservation networks, including established Landcare, TCM groups, local govt., ALCs and other Aboriginal groups to protect, repair and restore biodiversity.	S		

* indicates Priority or Supporting action

No.	Action	P/S* Status	Lead Organisation	Support Organisations
7	Support and encourage the incorporation of biodiversity conservation considerations into catchment management strategies and integrate these with the outcomes of the bioregional conservation assessments.	S		
8	Integrate community-based biodiversity survey and monitoring activities into TCM, bioregional planning and SOE reporting and reduce duplication of effort in data collection by the community and Local and State governments.	S		
9	Support community and school groups involved in bushland rehabilitation and regeneration initiatives, including through increased training opportunities.	S		
10	Continue to explore and develop options for efficiently funding, resourcing and administering programs for biodiversity conservation. This will include opportunities for private sector and community-led biodiversity programs, in addition to initiatives by all spheres of government.	S		

Objective 1.3 Expand biodiversity studies in educational curricula

Performance Targets

- Relevant primary school syllabuses and associated curriculum support material enhanced to incorporate components by 2000.
- Relevant secondary school syllabuses and associated curriculum support material enhanced to incorporate components by 2001.
- Curriculum resources, including teachers kits and teacher training programs, targeting biodiversity issues relevant to the rural community developed by 2000.
- Home-study packages focusing on educational opportunities for the rural community developed by 2000.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
11	Incorporate biodiversity components into education courses.	P	NSW Board of Studies, Dept. of School Education, NPWS, TAFE	SFNSW, DLWC, RBG AM, ZPB, AG
12	Support and encourage further professional development activities to equip teachers with the skills and understanding needed to include the scientific, economic and social aspects of biodiversity conservation, as well as Aboriginal perspectives and interests, in education programs.	S		

* indicates Priority or Supporting action

2. Conservation and protection of biodiversity

Objective 2.1 Implement bioregional assessment and planning throughout NSW

Performance Targets

- Framework for undertaking bioregional conservation assessments across NSW and for using it in natural resource plans and strategies established by early 1999.
- Audit of data and information gaps for western NSW completed by 1999.
- Completion of project on land systems as surrogates for biodiversity.
- New bioregional assessments commenced in four priority bioregions, targeting central-western NSW, and the Sydney Basin by 1999.
- Accelerate the implementation of the outcomes of the Cobar Peneplain and Riverina bioregional assessments and the southern Mallee, northern floodplains and mid-Lachlan sub-regional planning projects.
- Audit the conservation status of NSW plant communities completed and information accessible by 2000.
- State-wide map-based GIS developed and widely accessible by 2000.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
13	Bioregional planning.	P	NPWS, DLWC	RACAC, SFNSW, AG, RBG, AM, RLPBs, local govt, Regional Organisations of Councils, CMCs, Landcare groups, RVCs, River Management C'tees, ALCs
14	Develop and apply methodologies to undertake comprehensive regional assessments on the allocation and use of land and water (freshwater and marine).	S		
15	Negotiate cooperative agreements with adjoining States for the protection and management of contiguous areas of native vegetation and habitat, river systems, migratory and nomadic species and shared threatened species, populations and ecological communities. These agreements should be developed in consultation with Aboriginal and other community groups.	S		
16	Provide mechanisms for the protection of high conservation value wetlands, grasslands and other vegetation and habitat types outside of the reserve system, through implementation of the *Native Vegetation Conservation Act* and related initiatives.	S		

* indicates Priority or Supporting action

Objective 2.2 Establish a comprehensive, adequate and representative reserve system

Performance Targets

- By 2001, complete CRAs (and RFAs where appropriate) for NSW forests.
- Provide on-going opportunities for community involvement in ecologically sustainable forest management.
- Ten-year plan to guide establishment of the CAR reserve system developed by 1999.
- Percentage of land reserved in priority bioregions increased, especially poorly represented and threatened ecosystems.
- Marine parks at Solitary Islands, Lord Howe Island and Jervis Bay established.
- Zoning and operational plans prepared for Solitary Islands and Jervis Bay through a comprehensive community consultation process to be completed by the end of 1999 and for Lord Howe Island by the end of 2000.
- Initial assessment of Julian Rocks, Byron Bay completed by the end of 1999.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
17	Establish a CAR forest reserve system.	P	RACAC	NPWS, SFNSW, DLWC, ALCs
18	Expand the protected area system in NSW.	P	NPWS, RACAC	DLWC, SFNSW, ALCs
19	Continue establishment of a comprehensive system of marine parks.	P	Marine Parks Authority	AM, RBG, DLWC, ALCs

Objective 2.3 Effectively manage protected areas

Performance Targets

- Prepare and publicly exhibit 36 new plans of management for areas protected under the NPWS Act 1974 by 2001.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
20	Develop, implement and review management plans for protected areas.	P	NPWS, DLWC, SFNSW	ALCs, RLPBs
21	Periodically prepare a comprehensive “State of the Parks” report.	S		
22	Undertake a review of National Parks and Wildlife reserves in all categories to ensure consistency in their operation and application, and alignment with IUCN classifications where necessary.	S		
23	Effectively plan, manage and maintain recreational, tourist and educational facilities within and adjacent to protected areas to minimise possible impacts on biodiversity.	S		

* indicates Priority or Supporting action

Objective 2.4 Implement mechanisms for the identification, recovery and rehabilitation of threatened species, populations, and ecological communities and protection of critical habitat

Performance Targets

- 144 recovery plans prepared by 2001.
- Critical habitats declared and identified in environmental planning instruments.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
24	Prepare, implement and review recovery plans.	P	NPWS	all NRAs, landholders, ALCs, Local Councils
25	Review the Schedules of the TSC Act every two years (SC lead).	S	SC	
26	Establish recovery teams to prepare and coordinate the implementation of recovery plans. Where appropriate, these will include independent scientific experts, members of local and Aboriginal communities with relevant knowledge, local government reps, land managers, landowners and other agencies.	S		
27	Inform the community of mechanisms and assistance available for the recovery and rehabilitation of threatened species, populations and ecological communities and seek active community participation in developing, implementing and resourcing recovery plans.	S		
28	In conjunction with the development and enhancement of biodiversity information systems, develop databases and programs to monitor the conservation status of threatened species, populations and ecological communities. Assess the viability of populations and regularly report on progress.	S		

* indicates Priority or Supporting action

Objective 2.5 Support ex-situ conservation

Performance Targets

- Techniques developed for enhancing reproductive output and storage of reproductive tissues, sperm, eggs, embryos and seeds of threatened species and populations.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
29	Implement ex-situ conservation measures	P	RBG, ZPB	AM, NPWS
30	Include ex-situ conservation options in recovery plans for threatened species, populations or ecological communities where appropriate, and incorporate the input of both Aboriginal and local communities.	S		
31	Further develop training programs for specialists and all sectors of the community in captive management of threatened species, wildlife caring and rehabilitation, and wildlife injury and disease.	S		
32	Improve coordination between agencies involved in ex-situ conservation and species reintroduction/restocking, under protocols such as the Guidelines for the Translocation of Threatened Plants in Australia developed by the Australian Network for Plant Conservation.	S		

* indicates Priority or Supporting action

3. Threatening processes and their management

Objective 3.1 Implement mechanism for identifying and managing threatening processes

Performance Targets

• Compliance with the provisions of the TSC Act.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
33	Identify threatening processes and prepare and implement threat abatement plans.	P	SC, NPWS	All NRAs, RLPBs, ALCs, local councils.

Objective 3.2 Minimise the modification of natural ecosystems, habitat loss and fragmentation

Performance Targets

- The first Native Vegetation Conservation Strategy for NSW completed.
- Regional Vegetation Committees established and Regional Vegetation Management Plans developed and implemented.
- Baseline information developed to enable on-going monitoring of the extent and condition of native vegetation.
- Native vegetation decline progressively reduced.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
34	Conserve and sustainably manage native vegetation.	P	DLWC	NPWS, AG, DUAP, RVCs, ALCs, local govt, RLPBs, NSW Farmers Assoc.
35	Develop and promote standards and guidelines on ecologically sustainable grazing and other minimum impact agricultural practices.	S		
36	Ensure that environmental planning instruments and strategies, Catchment Plans, Regional Vegetation Management Plans, council plans of management for community land and property plans identify and protect significant native vegetation wildlife corridors and other environmentally sensitive areas such as waterways and wetlands.	S		
37	Consistent with available resources, continue research, with involvement and advice from relevant community groups, to evaluate the effects of fragmentation and the benefits of wildlife corridors on the viability of species and populations of native biota.	S		
38	Strengthen mechanisms for the protection of urban bushland, particularly the provisions and implementation of SEPP 19, – Urban Bushland, and other mechanisms such as plans of management for community land prepared by local councils.	S		

* indicates Priority or Supporting action

Objective 3.3 Effectively manage weeds, pest animals and introduced species

Performance Targets

- Key knowledge gaps in pest management filled.
- Control plans, including threat abatement plans, for pest animals and weeds developed and implemented.
- Distribution and impacts of weeds and pest animals on biodiversity reduced.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
39	Improve cooperative approaches to weed and pest management.	P	AG, NPWS RLPBs, local government.	DLWC, CRCs Noxious Weeds Advisory C'tee, NSW Pest Animal Council, NVAC, SCMCC, Landcare, community groups
40	Implement new legislation and management mechanisms to promote responsible ownership of companion animals such as dogs and cats.	S		
41	Improve mechanisms for the control of accidental and/or illegal introductions of non-indigenous species, particularly focusing on preventing their release into natural ecosystems.	S		
42	Continue to investigate options, and in light of new knowledge, adapt the management of ballast water to assist in controlling the import of non-indigenous marine organisms.	S		

Objective 3.4 Improve fire management regimes

Performance Targets

- Bush Fire Risk Management Plans developed in consultation with the community, incorporating the principles of ecologically sustainable development.
- Ecological training provided to Fire Control Officers.
- Research on the impacts of fire on biodiversity undertaken and outcomes incorporated into bush fire management programs.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
43	Manage fire in accordance with ESD principles.	P	RFS, NPWS NSWFB	SFNSW, DLWC, RLPBs, Local Govt.
44	Improve the consideration of fire threat in land-use planning and incorporate the results of applied fire research, including the knowledge and experience of Aboriginal and local communities, in land management and land-use planning.	S		
45	Continue a research program to examine the effects of fire on biodiversity.	S		

* indicates Priority or Supporting action

Objective 3.5 Assess and minimise the impacts of pollution on biodiversity

No.	Action	P/S* Status	Lead Organisation	Support Organisations
46	Continue applied research examining the effects of pollution on biodiversity.	S		
47	Improve pollution monitoring, including that undertaken by community and Aboriginal groups, and promote the further development of pollution indicators.	S		
48	Improve the prevention, reduction and control of pollution through options including incentives and strengthened legislation.	S		
49	Promote the further development of techniques for re-using and recycling pollutants and other waste products.	S		

Objective 3.6 Assess and minimise the potential impacts of climate change

No.	Action	P/S* Status	Lead Organisation	Support Organisations
50	Continue to monitor the rate and impact of climate change on biodiversity at global and regional scales, incorporating information from community and Aboriginal groups where appropriate.	S		
51	Undertake research into the potential impacts of climate change on species, populations and ecosystems and secondary effects, such as altered fire regimes and conditions that may favour spread of pathogens or introduced species, and identify practical options for addressing such impacts.	S		
52	Modify conservation strategies and practices to compensate for changing climatic conditions and their effects on biodiversity, noting in particular the importance of native vegetation retention and revegetation as a means of preserving existing carbon sinks.	S		
53	Determine priorities for the management of species and ecological communities which are likely to be threatened by climate change.	S		
54	Investigate the capacity of protected areas to sustain their biodiversity in the event of climate change and, where possible, ensure that altitudinal and latitudinal buffer zones or corridors exist to allow for the movement of organisms in the event of shifts in climatic zones. This will require careful consideration of reserve design principles in conjunction with conservation planning and management implications.	S		

* indicates Priority or Supporting action

4. Natural resource management

Objective 4.1 Develop and implement policies and management practices to achieve ecologically sustainable development and conserve biodiversity

Performance Targets

- Compliance with the provisions of the TSC Act.
- Completion of review within targeted time-frame.
- Local Biodiversity Fund established by 1999.
- Guidelines for the development of biodiversity action plans prepared by 1999.
- Biodiversity action plans developed and implemented by councils by 2001.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
55	Review legislation relevant to biodiversity conservation.	P	BDAC	all NRAs
56	Develop local biodiversity action plans.	P	NPWS, Regional Organisations of Councils, LGSA	all NRAs, ALCs
57	Apply ecologically sustainable development principles in policy-making and in community decision-making processes at all levels. Policies to achieve ESD will be developed and implemented through improved coordination and cooperation between all spheres of government, the private sector, local and Aboriginal communities and non-governmental organisations.	S		
58	In addition to non-regulatory approaches, investigate extension of the application of the beneficiary-pays, user-pays and polluter-pays principles to the degradation of biodiversity on all land tenures.	S		
59	Encourage relevant NSW Government agencies and the private sector to develop and implement policies for environmental management and public reporting that seek to minimise the impacts on biodiversity from their activities and detail efforts to protect or restore elements of biodiversity under their control. This process should incorporate input from local and Aboriginal communities where appropriate.	S		
60	Develop best management practice guidelines to assist land managers adopt sustainable management practices.	S		
61	Implement ecologically sustainable development policies through measures including regulatory arrangements, legislation, standards, economic instruments and formal management agreements.	S		
62	Encourage industry to develop, market and produce environmentally sensitive technologies and utilise processes that reduce the impact on the environment of human activities.	S		
63	Provide for the ongoing evaluation of the ecological, social and economic benefits and costs of conserving biodiversity, focussing on the local and regional level and ensuring the wide dissemination of this information.	S		

* indicates Priority or Supporting action

No.	Action	P/S* Status	Lead Organisation	Support Organisations
64	Develop guidelines for local councils on how to incorporate sustainable resource management activities and biodiversity issues into their planning processes (eg. guidelines related to management of riparian lands and wetlands and for the management of threatened species).	S		
65	In accordance with the *Local Government Act*, councils should identify in their Management Plans all the activities they will undertake to protect environmentally sensitive areas and to promote ecological sustainability.	S		

Objective 4.2 Implement ecologically sustainable agricultural management practices

No.	Action	P/S* Status	Lead Organisation	Support Organisations
66	Collate develop and distribute information on the benefits of biodiversity conservation for agriculture and other types of land use, targeting the local and regional scale.	S		
67	Continue to assist and advise local and Aboriginal communities on ecologically sustainable development, the conservation of biodiversity and its long-term benefits for agricultural productivity. This will include the continued implementation of cooperative programs, such as Farming for the Future.	S		
68	Promote farming practices that either avoid the use of chemicals or reduce the impact of chemicals. Information will also be provided to landholders and agricultural contractors on the environmental effects of agrochemicals and alternatives to their use, including documented examples of best practices that benefit both conservation and production.	S		
69	Implement programs to collect outdated and unwanted agrochemicals, building on plans developed by ANZECC and ARMCANZ, to prevent inadvertent use and environmental impact from inappropriate disposal.	S		
70	Promote best practice farming techniques that address cultivation and stocking rates, control of weed species, grazing regimes, positioning of watering points, irrigation practice and salination.	S		
71	Promote property management planning, through programs such as Farming for the Future, as a means of implementing sustainable agricultural management and, where relevant, to also satisfy TSC Act requirements.	S		
72	Continue to identify and promote opportunities for agroforestry, including the preparation of adequate guidelines, especially when land protection and production objectives can be achieved concurrently. A priority will be the preparation of a Farm Forestry Strategy for NSW to promote the establishment of farm forestry on agricultural land.	S		
73	Through the *Native Vegetation Conservation Act* and other relevant mechanisms, continue to develop and implement procedures for limiting the impacts of clearing and cultivation on biodiversity conservation values.	S		

* indicates Priority or Supporting action

No.	Action	P/S* Status	Lead Organisation	Support Organisations
74	Promote locally indigenous or endemic plant species as a basis for sustainable grazing in the management of pastoral lands.	S		
75	Improve management strategies for TSRs to maintain biodiversity values, particularly the contribution of TSRs as wildlife corridors and as sources of revegetation seed stock. Roadside Vegetation Plans may provide a suitable model for the future development of TSR management.	S		
76	Ensure that biodiversity conservation principles are incorporated into rural restructuring programs, such as West 2000.	S		
77	Continue to develop and promote guidelines for resource users, councils and resource management agencies aimed at the conservation and protection of the soil environment, and ensure compliance with guidelines as a condition on development consent.	S		
78	Develop Total Grazing Pressure agreements in the pastoral regions and link outcomes to incentives to control feral, pest and animal herbivores.	S	DLWC	
79	Continue to work cooperatively with the apiary industry to improve the management of introduced bees to minimise their potential impact on native flora and fauna.	S	NPWS, Beekeeping Industry Consultative C'tee	

Objective 4.3 Implement ecologically sustainable mining and industry management practices

No.	Action	P/S* Status	Lead Organisation	Support Organisations
80	Minimise the potential adverse impacts on biodiversity associated with mining and petroleum extraction conducted on lands of all tenures, through universal application of EMPs and through appropriate mining lease conditions and security deposits sufficient to guarantee satisfactory rehabilitation.	S		
81	Continue to take actions to rehabilitate abandoned mine and extractive sites on land of all tenures.	S		
82	Ensure the comprehensive environmental assessment of mineral, extractive and petroleum exploration activities.	S		
83	Support the investigation and expansion of the use of biological technologies in mining and industry management.	S		

* indicates Priority or Supporting action

Objective 4.4 Implement ecologically sustainable forestry management

No.	Action	P/S* Status	Lead Organisation	Support Organisations
84	Maintain or increase the full range of forest values across the NSW native forest estate (as outlined by 7 sub actions listed on page 36).	S		
85	Develop realistic and meaningful indicators for forest biodiversity, health and condition through continued progress of the Montreal Process.	S		

Objective 4.5 Implement ecologically sustainable tourism management practices

No.	Action	P/S* Status	Lead Organisation	Support Organisations
86	Under the NSW Tourism Masterplan develop, in consultation with Aboriginal and other community groups, programs to promote best environmental practice in tourism infrastructure and operations, the conservation of natural environments and ecosystems used for tourism and address tourism-related environmental issues.	S		
87	Develop, in conjunction with Aboriginal and local communities and the tourism industry, regional strategies for improving the protection of biodiversity values and the presentation of information to tourists about biodiversity and the traditional Aboriginal use of native flora and fauna.	S		
88	Investigate opportunities for the tourism industry to contribute to the protection of biodiversity from which the industry benefits.	S		
89	Through the work of the Nature-based and Ecotourism Task Force develop consistent guidelines, with full public consultation, for commercial tourism operators and other users of public lands.	S		
90	Support the development of environmental codes of practice and professional accreditation systems by the tourism industry, with appropriate consultation with Aboriginal and other community groups.	S		

Objective 4.6 Implement ecologically sustainable urban and coastal management practices

No.	Action	P/S* Status	Lead Organisation	Support Organisations
91	Improve the integration of strategic planning and infra-structure provision to protect and enhance urban biodiversity and to promote the retention of habitat in urban areas.	S		

* indicates Priority or Supporting action

No.	Action	P/S* Status	Lead Organisation	Support Organisations
92	Continue to establish new regional open space parks, in consultation with the whole community to provide protection for bushland in close proximity to existing urban areas and ensure that existing urban bushland areas are sustainably managed and protected.	S		
93	Implement processes to incorporate the principles of ecologically sustainability at all urban planning levels and facilitate maximum public participation throughout the planning process.	S		
94	Encourage, promote and improve the provision of public transit facilities in all future transport plans.	S		
95	Support research into the development and application of alternatives for sewage disposal and reuse.	S		
96	Strengthen the protection and management of transport corridors and adjoining lands to promote the conservation of biodiversity.	S		
97	Implement the NSW Coastal Policy with the cooperation and participation of the whole community, including ALCs and other community groups.	S		

Objective 4.7 Effectively manage water resources to conserve biodiversity and meet environmental, economic, social and community needs

Performance Targets

- River Management Committees established for major regulated river systems in 1998 and for stressed unregulated rivers in 1998/99.
- Appropriate water quality and river flow objectives for NSW rivers identified and agreed on by River Management Committees.
- Groundwater Management Plans and River Flow Management Plans prepared and implemented and outcomes monitored.
- Provisions to restore and protect river corridors, giving effect to water quality and river flow objectives, incorporated into catchment and land-use plans.
- The Council of Australian Government water reforms implemented.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
98	Develop and implement a comprehensive framework for sustainable water management.	P	DLWC, EPA	NPWS, AG, NSW Fisheries SFNSW, ALCs, Local Govt, water supply authorities
99	Review mechanisms for the protection of wild and scenic rivers.	S		
100	Identify and, if appropriate, designate floodplains of high environmental value and ensure that floodplains receive, as a priority, their required environmental flows.	S		

* indicates Priority or Supporting action

No.	Action	P/S* Status	Lead Organisation	Support Organisations
101	Increase research into environmental flow requirements and continue development and application of computer based support systems, linking operation flow decisions to their ecological response on riparian lands, floodplains and wetlands.	S		
102	Governments and with the assistance of the MDBC, ensure that water harvesting for irrigation is ecologically sustainable.	S		
103	Review and enhance the effectiveness of management mechanisms for the protection improvement of water quality, including measures to control and reduce the impacts of salinity, nutrients and pesticides.	S		
104	Further develop and apply biological indicators of water quality.	S		
105	Seek opportunities to reduce the impact of artificial water sources on biodiversity, particularly in rangeland areas.	S		

Objective 4.8 Adopt ecologically sustainable management practices for native wildlife utilisation

Performance Targets

- Policies and programs to achieve ecologically sustainable use of biological resources developed and implemented.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
106	Review the commercial and non-commercial uses of native flora and fauna.	P	NPWS, AG	SFNSW, NSW Fisheries, ALCs, community groups
107	Strengthen, in consultation with the community, programs to control the illegal collecting of, and trade in, native wildlife and review the adequacy of existing penalties.	S		
108	With community input, including input from Aboriginal and other community groups, develop and implement wildlife management programs for utilised species and establish management teams to oversee and report on their implementation.	S		
109	Ensure that NSW industries based on the harvesting and farming of native wildlife operate on an ecologically sustainable basis and adequately contribute to biodiversity research, development and monitoring programs.	S		
110	Provide advice and assistance to industry and local and Aboriginal communities to establish management programs for the ecologically sustainable harvesting of wildlife.	S		
111	Participate in the development of complementary international the interstate management plans for wildlife and their habitats whose ranges are shared with neighbouring countries, States and Territories.	S		

* indicates Priority or Supporting action

Objective 4.9 Ensure NSW receives social and economic benefits from the use of genetic material and products

No.	Action	P/S* Status	Lead Organisation	Support Organisations
112	Develop and implement management arrangements to ensure that the utilisation of genetic resources is undertaken with adequate conservation and commercial safeguards. These arrangements should build upon the work of the Commonwealth/State Working Group on access to biological resources, government agencies and Aboriginal and other community groups.	S		

5. Improving our knowledge

Objective 5.1 Review and apply existing knowledge

No.	Action	P/S* Status	Lead Organisation	Support Organisations
113	Prepare and maintain a census of the flora and fauna of NSW to the finest taxonomic level possible and contribute to the development of national inventories.	S		
114	Review existing data for gaps in knowledge on the distribution and abundance of native biota, focussing on threatened species, populations and ecological communities.	S		
115	Review and consolidate existing knowledge of the processes which threaten biodiversity.	S		
116	Continue the databasing of animal and plant collections and, as part of a review of existing data, establish the accuracy and reliability status of existing information.	S		
117	As an outcome of the above reviews, identify gaps in existing knowledge to guide future surveys, monitoring and research (see also 5.3 & 5.4).	S		
118	Support the work of the SC in identifying and listing threatening processes, threatened species, populations, and ecological communities, as well as in advising on the identification of critical habitat, in consultation with the community as required by the TSC Act (see 2.4).	S		
119	Continue to develop processes to facilitate the application of scientific knowledge in resource and land management.	S		
120	Develop, through cooperative ethnobiological programs, processes to facilitate the application of Aboriginal biological knowledge.	S		
121	Evaluate and use, where appropriate and with the support of Aboriginal and other community groups, the knowledge and practices of Aboriginal and local communities in biodiversity research and conservation programs.	S		

Objective 5.2 Improve the management and dissemination of knowledge

Performance Targets

- In addition to ongoing research efforts, an extra 50 new invertebrate species and 25 new non-vascular plant species will be described each year in NSW.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
122	Enhance taxonomic research.	P	AM, RBG	NPWS, SFNSW, universities

* indicates Priority or Supporting action

No.	Action	P/S* Status	Lead Organisation	Support Organisations
123	Continue to develop and maintain standardised biodiversity databases for storing and analysing biodiversity data, incorporating information from Aboriginal and other community groups wherever possible, and make accessible all collection-based data while safe-guarding information that may lead to exploitation of threatened species.	S		
124	Continue to develop meta-data directories on natural resources information and disseminate these as widely as possible.	S		
125	Support the development of computer assisted description and identification techniques, such as those being developed by the AM and RBG.	S		
126	Encourage formal interaction between the scientific community and other stakeholders in the development and implementation of research projects and stakeholders in the development and implementation of research projects and participation in workshops, symposiums and conferences.	S		
127	Continue development and training in the use of computer support systems for biodiversity research, particularly systems for modelling.	S		
128	Ensure that the results of biodiversity research are communicated and applied in conservation planning and natural resource management.	S		

Objective 5.3 Implement a program of inventory and monitoring of biodiversity

Performance Targets

- Identify and select standardised, best practice approaches for monitoring biodiversity.
- Provisions for biodiversity monitoring incorporated within RFAs.
- Undertake long-term biodiversity monitoring covering a broad range of species and ecosystems.
- Publication of Biodiversity Survey Program Action Plan, detailing a program of prioritised studies and timeframes.
- Agreed standards, methods and protocols for the collection and management of biodiversity data established.
- A wider taxonomic range of organisms included in biodiveristy studies.
- Studies and products from the BSP published and widely promoted and disseminated.
- Greater community involvement in biodiversity studies achieved.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
129	Establishment of mechanism for long term biodiversity monitoring.	P	AM, RBG NPWS	SFNSW, DLWC, EPA RFS, universities, CMCs and Trusts, Land-care groups, RVCs, ALCs.
130	Implement biodiversity survey program.	P	NPWS	all NRAs
131	Continue to undertake systematic regional flora and fauna surveys and mapping at appropriate scales across NSW.	S		

No.	Action	P/S* Status	Lead Organisation	Support Organisations
132	Through the NSW BSP, and in collaboration with the Commonwealth and other States, support a national coordinated program of survey and long-term ecological monitoring to detect declines in biodiversity and, where possible, eliminate the causes of such declines.	S		
133	Monitor the extent and condition of native vegetation, as part of the implementation of the *Native Vegetation Conservation Act*.	S		
134	Encourage and support community-based biodiversity research programs, including the involvement and participation of local and Aboriginal communities and school students.	S		

Objective 5.4 Undertake biodiversity research and develop research infrastructure

Performance Targets

- In consultation with the community, a NSW Biodiversity Research Strategy developed and implementation commenced by 2000.

No.	Action	P/S* Status	Lead Organisation	Support Organisations
135	Develop and implement a biodiversity research strategy.	P	NPWS, AM, RBG	all NRAs
136	Maintain and enhance research into the nature and extent of threatening processes.	S		
137	Enhance taxonomic, genetic and ecological research to increase knowledge and understanding of the full range of biodiversity in NSW, drawing on the knowledge and values of both Aboriginal and local groups where appropriate.	S		
138	Maintain and enhance research in conservation biology, particularly research aimed at understanding the biology of species and their interactions with the environment, incorporating the knowledge of Aboriginal and other community groups. This will include enhanced research on ecological processes to assist in ecosystem management, rehabilitation and reconstruction.	S		
139	Support scientific research focusing on species that require intensive genetic management to conserve their biodiversity.	S		
140	Support the development of an agreed classification system for habitats and ecosystems as a basis for bioregional planning.	S		
141	Support the training of conservation biologists, including taxonomists, geneticists, ecologicists and technicians to assist in all research through post-graduate programs and collaborations between museums, herbaria and universities.	S		
142	Enhance horticultural research on threatened plant species.	S		
143	Expand storage facilities for biological collections.	S		

* indicates Priority or Supporting action

Glossary of Terms and Abbreviations

Agenda 21: United Nations program of action developed at the Rio Earth Summit in 1992, it provides a blueprint for sustainable development into the 21st century.

AG: NSW Agriculture.

Agroforestry: land management practice in which farmers cultivate trees in addition to their other productive activities.

ALCs: Aboriginal Land Councils.

Algae: simple (usually) aquatic plants, often microscopic.

Algal bloom: temporary rapid growth in algae. May be toxic. Often due to nutrients leaching from agricultural lands into water courses.

AM: Australian Museum.

ANZECC: Australia and New Zealand Environment and Conservation Council.

ARMCANZ: Agriculture and Resource Management Council of Australia and New Zealand.

Artesian basin: land underlaid by a strata of impermeable rock which forms groundwater reservoirs.

Ballast water: seawater pumped into a ship's hold to steady it; when the water is released in other oceans the organisms in it may become pests.

BDAC: Biological Diversity Advisory Council (NSW).

Biodiversity: the variety of life forms, the different plants, animals and micro-organisms, the genes they contain and the ecosystems they form.

Bioregion: relatively uniform tract of land of similar origin and climate, with recurring patterns of land type and plant communities.

Biota: living organisms of an ecosystem, usually the flora and fauna.

Biotechnology: the use of living micro-organisms and other biological agents for industrial and technological purposes.

BSIG: Biodiversity Strategy Implementation Group.

BSP: Biodiversity Survey Program.

CAMBA: China Australia Migratory Bird Agreement.

CAR reserve system: Comprehensive, adequate and representative reserve system.

Catchment: the land area drained by a river and its tributaries.

CITES: Convention on International Trade in Endangered Species of Wild Fauna and Flora.

CMCs: Catchment Management Committees.

CRAs: Comprehensive Regional Assessments.

CRCs: Cooperative Research Centres.

Critical habitat: habitat declared to be critical habitat under the Threatened Species Conservation Act 1995, that is habitat critical to the survival of a species, population or ecological community.

DEST: Department of the Environment Sport and Territories (Commonwealth).

Dieback: general term for a significant decline in tree health and numbers, especially native trees, caused by a variety of agents including insect attack, disease and pollution.

DLWC: Department of Land and Water Conservation (NSW).

DUAP: Department of Urban Affairs and Planning (NSW).

Ecological community: an assemblage of species occupying a particular area.

Ecologically sustainable development (ESD): using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.

Ecosystem: communities of organisms and their physical environment interacting as a unit.

EIA: Environmental Impact Assessment.

Endangered (species, populations and ecological communities): species, populations and ecological communities, specified in the *Threatened Species Conservation Act 1995*, in danger of becoming extinct.

Endemic: originating in a given area and confined to that area.

EPA: Environment Protection Authority (NSW).

ESD: Ecologically Sustainable Development.

ESFM: Ecologically Sustainable Forest Management.

Estuarine: belonging to, or associated with, a partially enclosed river mouth or coastal area, characterised by a mix of fresh and saline waters.

Ethnobiology: study of the way plants, animals and micro-organisms are used by humans.

Ex-situ: outside of the natural location.

Extinct: species no longer in existence or not located in the wild during the past 50 years.

Fauna: the total animal population that inhabits an area.

Flora: the vegetation assemblage that inhabits an area.

Fungus: a type of plant lacking chlorophyll, leaves, true stems and roots and which reproduce by spores, eg. a mushroom.

Geographic Information System (GIS): a computer information system which stores, analyses and displays spatial and geographic data.

Habitat: the living space of a species or community, providing a particular set of environmental conditions.

IBRA: Interim Biogeographic Regionalisation of Australia.

IGAE: Inter Governmental Agreement on the Environment.

IMCRA: Interim Marine and Coastal Regionalisation of Australia.

In-situ: within the natural location.

Invertebrate: animal lacking a backbone (eg. insects and worms).

IUCN: World Conservation Union (formerly the International Union for the Conservation of Nature and

Natural Resources).

JAMBA: Japan Australia Migratory Bird Agreement.

LGSA: Local Government and Shires Association.

Local Environmental Plan (LEP): a plan prepared by Local Government under the *Environmental Planning and Assessment Act 1979*. In most (but not all) cases the LEP must be consistent with any relevant Regional Environmental Plans (REPs) or State Environmental Planning Policies (SEPPs).

MDBC: Murray Darling Basin Commission.

Micro-organism: a microscopic animal or vegetable organism.

MPA: Marine Parks Authority.

NFPS: National Forest Policy Statements.

NPWS: National Parks and Wildlife Service (NSW).

NRAs: Natural Resource Agencies (AG, AM, SFNSW, DLWC, NPWS, RGB, EPA, ZPB, NSW Fisheries).

NRIMS: National Resources Information Management Strategy.

NSWFB: NSW Fire Brigades.

NVAC: Native Vegetation Advisory Council.

Pathogen: disease causing organism.

Population: a group of organisms, all of the same species, occupying a particular area.

Protected area: an area of land and/or sea especially dedicated to the protection and maintenance of biodiversity, and of natural and associated cultural resources, and managed through legal or other effective means.

RACAC: Resource and Conservation Assessment Council (NSW).

Rangelands: land with insufficient rainfall for cultivating crops but often used for grazing livestock.

RBG: Royal Botanic Gardens.

Recovery Plan: a document which identifies the actions to be taken to promote the recovery of a threatened species, population or ecological community.

Regional Environmental Plan (REP): a plan prepared under the Environmental *Planning and Assessment Act 1979* dealing with matters of significance for environmental planning for a region.

RFAs: Regional Forest Agreements.

RFS: Rural Fire Service.

RLPBs: Rural Lands Protection Boards.

RVCs: Regional Vegetation Committees.

Salinity: the concentration of salts in soil or water.

SC: Scientific Committee (established under the *Threatened Species Conservation Act 1995*).

SCMCC: State Catchment Management Coordinating Committee.

SEA: Strategic Environmental Assessment.

SFNSW: State Forests of NSW.

Silviculture: the cultivation of tree crops for economic profit.

Sink: a biological or other process that removes a greenhouse gas from the atmosphere: for example, absorption of carbon dioxide by forests.

SOEs: Statement of the Environment Reports.

Species: a group of organisms which are biologically capable of breeding and producing fertile offspring with each other but not with members of other species.

State Environmental Planning Policy (SEPP): a policy prepared under the *Environmental Planning and Assessment Act 1979* dealing with matters of significance for environmental planning for the whole State.

TAFE: NSW Dept of Technical and Further Education.

Taxon (pl. taxa): The named classification unit to which individual organisms or sets of individuals are assigned, such as species, genus and order.

Taxonomy: the classification, identification and description of organisms based on similarities of biology, biochemistry, genetic composition and evolutionary history.

Terrestrial: belonging to or living on the land.

Threat Abatement Plan: a document under the *Threatened Species Conservation Act 1995* which identifies the actions to be taken to abate, ameliorate or eliminate the adverse effects of threatening processes on threatened species, populations or ecological communities.

Threatened (species, populations and ecological communities): is a species etc. specified in the *Threatened Species Conservation Act 1995* as either endangered, vulnerable, or presumed extinct.

Threatening Processes: Processes such as habitat disturbance or destruction or pollution that threaten the survival, abundance or evolutionary development of a species, population or ecological community.

Total Catchment Management (TCM): the coordinated and sustainable use and management of land, water and vegetation on a catchment basis to balance resource utilisation and conservation.

TSC Act: *Threatened Species Conservation Act 1995* (NSW).

TSRs: Travelling Stock Routes.

Vertebrate: animal with a backbone.

VCAs: Voluntary Conservation Agreements.

Vulnerable (species, populations and ecological communities): a species, population or ecological community specified in the *Threatened Species Conservation Act 1995* that is likely to become endangered unless the circumstances and factors threatening its survival or evolutionary development cease to operate.

Wetland: land areas along fresh and salt water courses that are flooded all or part of the time resulting in development of a characteristic suite of plant and animal communities and determining the type and productivity of soils.

Wildlife: native fauna and flora.

WWF: World Wide Fund for Nature.

ZPB: Zoological Parks Board for NSW.

Appendix

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

The National Strategy for the Conservation of Australia's Biological Diversity, (National Biodiversity Strategy) has as its principal goal, the protection of biological diversity and maintenance of ecological processes and systems. The Strategy emphasises that a high priority must be placed on developing and implementing integrated approaches to conservation that both conserve biological diversity and meet other community objectives. In addition, the Strategy accepts the guiding principles of ecologically sustainable development.

The Strategy defines biodiversity and identifies nine guiding principles for the conservation of Australia's biological diversity. These guiding principles are reflected in the NSW Strategy.

A number of actions outlined in the National Biodiversity Strategy are of particular relevance to NSW. These include:

- establishment of a comprehensive, adequate and representative reserve system;
- provision of effective legislation for the protection of native wildlife;
- adoption and implementation of the draft National Endangered Species Strategy and the introduction of endangered species legislation;
- adoption of ecologically sustainable management practices by industry;
- provision of effective policies and programs for the retention of native vegetation and the control of broad-scale clearing and rehabilitation of degraded ecosystems;
- improving our knowledge of biodiversity; and
- development of a complementary NSW Biodiversity Strategy.

ANZECC will have primary responsibility for overseeing implementation of the Strategy at the national level. The National Strategy is the principal means for implementing Australia's domestic obligations under the United Nations Convention on Biological Diversity.

United Nations Convention on Biological Diversity

The objectives of the Convention involve the conservation of biodiversity, sustainable use of its components, and the fair and equitable sharing of the benefits arising from the utilisation of genetic resources.

Contracting parties are obliged to develop and implement national strategies for the conservation and sustainable use of their biological resources. A Global Biodiversity Strategy has been developed to facilitate the implementation of the Convention.

Key commitments in the Convention include:

- the regulation or management of biological resources important for the conservation of biodiversity, whether within or outside protected areas, with the view to ensuring their conservation and sustainable use;
- the control or eradication of those alien species which threaten ecosystems, habitats or species;
- the development of necessary legislation and/or other regulatory provisions for the protection of not only threatened species, but also threatened populations;
- identifying types of activities likely to have significant adverse impacts on the conservation of biodiversity, monitoring the effects of these activities, and regulating and managing them; and
- adopting economically and socially sound measures that act as incentives for the conservation of biodiversity.

National Forest Policy Statement

The National Forest Policy Statement (NFPS) was endorsed by the Federal, State and Territory governments in 1992. The NFPS sets out the broad environmental and economic goals for the management of Australia's forests and outlines measures to be undertaken to ensure the community obtains a balanced return from all forest uses by:

- providing for a comprehensive, adequate and representative (CAR) forest reserve system that will protect old growth forest, wilderness and biodiversity;
- development of an efficient, value adding, internationally competitive and ecologically sustainable wood products industry;
- providing for a range of other forest values including water supply, tourism and recreation in an ecologically sustainable management framework;
- coordination of decision making between the Commonwealth and the States and Territories;
- the expansion of hardwood and softwood plantations; and
- assistance to communities faced with structural adjustments as a result of the implementation of these measures.

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