The New Zealand Biodiversity Strategy

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FOREWORD

The New Zealand Biodiversity Strategy fulfills in part, commitments New Zealand made under the Convention of Biological Diversity. It takes up the challenge to halt the decline of our indigenous biodiversity — our unique plants and animals and the places they live.

Since New Zealand was first settled its unique biodiversity has been in retreat, from the destruction of habitat, harvest by humans, and successive waves of pests, weeds and diseases. Extinctions have been rapid and the threats to our indigenous biodiversity, although changing form, have continued unabated.

Today, some 1000 native animal, plant and fungi species are under threat. The warning of the State of New Zealand's Environment report in 1997 that indigenous biodiversity decline is our "most pervasive environmental issue", is even more valid today.

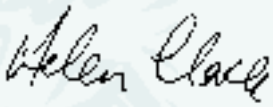
New Zealand first pledged to play its part in halting the decline in global biodiversity at the Rio Earth Conference in 1992. There, we affirmed that biodiversity is vital to sustain life, and offers us a unique basis for our culture and sense of national identity. The New Zealand Biodiversity Strategy now charts the way forward.

The Strategy establishes national goals to "turn the tide" on the decline of our biodiversity, and to maintain and restore a full range of our remaining natural habitats and ecosystems and viable populations of all native species. The Strategy sets out a comprehensive range of actions, that we need to initiate or improve progress on, to achieve these goals.

Biodiversity is everyone's business. It extends into all our backyards and neighbourhoods and is affected by nearly all our activities. Nearly two-thirds of our land area, and over 99% of our vast marine environment, lies outside protected areas. We need to manage our working landscapes well and look after the scarce ecosystems in those areas. Similarly, we need to put our marine fisheries on an ecologically sustainable basis and protect more of the dazzling array of habitats and marine communities in our oceans.

As mutual beneficiaries of New Zealand's biodiversity, we can all play a part in implementing the New Zealand Biodiversity Strategy; by working in partnerships with and alongside management agencies, businesses, community groups and landowners — sharing information and ideas, setting priorities, coordinating activities, supporting funding mechanisms, and learning from our successes and mistakes.

I hope you can be part of our efforts to protect and enhance New Zealand's native species and natural habitats and ecosystems for everyone's sake, and for generations to come.



Rt Hon Helen Clark
Prime Minister of New Zealand

EXECUTIVE SUMMARY

The New Zealand Biodiversity Strategy has been prepared in response to the state of decline of New Zealand's indigenous biodiversity — described in the State of New Zealand's Environment report as our "most pervasive environmental issue". It also reflects New Zealand's commitment, through ratification of the international Convention on Biological Diversity, to help stem the loss of biodiversity worldwide.

The purpose of the Strategy is to establish a strategic framework for action, to conserve and sustainably use and manage New Zealand's biodiversity. The primary focus is on New Zealand's indigenous biodiversity. However, because of the value and economic importance of much of our introduced biodiversity, the conservation of the genetic resources of our important introduced species is also addressed.

Part One — A Strategy for New Zealand's Biodiversity

New Zealand's high level of endemic biodiversity makes a unique contribution to global biodiversity and places on us an obligation to ensure its continued existence. Our indigenous biodiversity — our native species, their genetic diversity, and the habitats and ecosystems that support them — is of huge value to New Zealand and its citizens; to our economy, our quality of life, and our sense of identity as a nation.

However, since humans first settled in New Zealand, our biodiversity has been in decline — through species' extinction, loss and disruption of natural areas and ecosystems, and the effects of an increasing number and variety of introduced plant and animal pests. This trend of decline has continued throughout the 20th century, slowed only in part by more active conservation and natural resource management over the last three decades. Without increased and more targeted management efforts, driven by clear biodiversity goals, the decline in biodiversity will continue, with irreversible consequences.

Increasingly, New Zealand's international reputation and trade opportunities will depend on our performance in maintaining a quality natural environment, of which biodiversity is a key element.

Part Two — A Vision, Goals and Principles for Managing New Zealand's Biodiversity

The Strategy's vision describes a future in which all New Zealanders contribute to sustaining the full range of indigenous biodiversity and share in its benefits, and in which the genetic resources of our important introduced species are secure.

Four goals are established for conserving and sustainably managing New Zealand's biodiversity:

Goal One: Community and individual action, responsibility and benefits

Enhance community and individual understanding about biodiversity, and inform, motivate and support widespread and coordinated community action to conserve and sustainably use biodiversity; and

Enable communities and individuals to equitably share responsibility for, and benefits from, conserving and sustainably using New Zealand's biodiversity, including the benefits from the use of indigenous genetic resources.

Goal Two: Treaty of Waitangi

Actively protect iwi and hapu interests in indigenous biodiversity, and build and strengthen partnerships between government agencies and iwi and hapu in conserving and sustainably using indigenous biodiversity.

Goal Three: Halt the decline in New Zealand's indigenous biodiversity

Maintain and restore a full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critically scarce habitats, and sustain the more modified ecosystems in production and urban environments; and do what else is necessary to

Maintain and restore viable populations of all indigenous species and subspecies across their natural range and maintain their genetic diversity.

Goal Four: Genetic resources of introduced species

Maintain the genetic resources of introduced species that are important for economic, biological and cultural reasons by conserving their genetic diversity.

Thirteen principles are identified to guide the conservation and sustainable management of New Zealand's biodiversity and the implementation of this Strategy.

Part Three — Action Plans for New Zealand's Biodiversity

A comprehensive framework for action directed towards the Strategy goals is outlined in ten "themes": biodiversity on land; freshwater biodiversity; coastal and marine biodiversity; conservation and use of genetic resources; biosecurity and biodiversity; governance; Maori and biodiversity; community participation and awareness; information, knowledge and capacity; and New Zealand's international responsibilities.

For each theme, a desired outcome describes what needs to be achieved to realise the goals for the Strategy. Key biodiversity issues are summarised, highlighting the gap between the current state and management, and the desired outcome. Detailed action plans for each theme, setting out objectives and actions, are designed to target gaps and achieve the desired goals.

Part Four — Strategic Priorities and Implementation

Priority actions identified in Part Three are grouped under the Strategy goals. These actions have been selected as priorities because they should best position us in the short term (the first five years of implementation) to achieve our biodiversity goals in the long term.

A mechanism for coordinating implementation of the Strategy at a central government level is outlined. Successful implementation will require a coordinated effort across central and local government, working in partnership with iwi and hapu, and with the community, the private sector and landowners.

CONTENTS

Foreword

Executive Summary

Part One — A Strategy for New Zealand's Biodiversity 1

Introduction: out on our own 1
Maori view of biodiversity 2
Why New Zealand's biodiversity matters 2
Biodiversity challenges 4
Biodiversity management — past and present 9
Importance of a biodiversity strategy for New Zealand 10

Part Two — A Vision, Goals, and Principles for Managing New Zealand's Biodiversity 15

Introduction 15
A vision for Aotearoa — New Zealand 16
Goals 17
Explanation of goals 19
Principles for managing New Zealand's biodiversity 24

Part Three — Action Plans for New Zealand's Biodiversity 27

The Strategy framework 27
Theme One — Biodiversity on land 33
Theme Two — Freshwater biodiversity 45
Theme Three — Coastal and marine biodiversity 55
Theme Four — Conservation and use of genetic resources 69
Theme Five — Biosecurity and biodiversity 79
Theme Six — Governance 89
Theme Seven — Maori and biodiversity 93
Theme Eight — Community participation and awareness 99
Theme Nine — Information, knowledge and capacity 105
Theme Ten — New Zealand's International responsibilities 115

Part Four — Strategic Priorities and Implementation 123

Priority actions 123
Implementation 129
Management structures and mechanisms 129

Annex One — Roles, Responsibilities and Mechanisms in Biodiversity Management 133
Annex Two — Preparation of the New Zealand Biodiversity Strategy 135

Glossary 137
Suggested Reading 144

PART ONE

A Strategy for New Zealand's Biodiversity

INTRODUCTION: OUT ON OUR OWN

Isolation is a strong theme of New Zealand's biological and cultural histories. Evolution through a long period of isolation created unique flora and fauna. After splitting off from other continents 80 million years ago, the New Zealand landmass became the stage for the evolution of plants and animals so distinctive that it has been described as the closest scientists will get to studying life on another planet[1].

The long isolation and slow evolution meant these plants and animals were especially vulnerable to new changes. New Zealand was one of the last large land areas on earth to be settled by humans. The settlers, and the exotic species they brought with them, had a dramatic impact on our indigenous biodiversity.

Isolation has also benefited New Zealanders. Coupled with our low population density, it has spared us the worst effects of pollution and helped us to maintain a relatively clean, green and healthy environment. The challenge facing us now is to sustain the benefits that are provided by our natural environment, and to halt the decline of our indigenous biodiversity.

This means managing biodiversity in ways that are of benefit to all. It requires us to think "over the fence". We cannot continue to think of protected and productive places separately. Natural systems do not recognise human boundaries. As well as protecting our most important places for indigenous biodiversity, we have to manage this biodiversity as best we can in farming and forestry environments and alongside marine industries, while ensuring a sustainable return from these activities.

Sustaining New Zealand's biodiversity will benefit the whole community, through the clean air and water and biological productivity that come from healthy ecosystems, the pride and profit we get from New Zealand's distinctive biological and green branding, and the enjoyment and sense of identity we derive from our natural world.

Biological diversity, or "biodiversity" for short, describes the variety of all biological life — plants, animals, fungi, and microorganisms — the genes they contain and the ecosystems on land or in water where they live. It is the diversity of life on earth[2].

1 *Diamond, J. 1990. New Zealand as an archipelago: an international perspective.* ***In Ecological Restoration of New Zealand Islands,*** *pp 3—8. Department of Conservation, Wellington.*

2 *See Glossary for a fuller definition of biological diversity.*

MAORI VIEW OF BIODIVERSITY

Maori have a holistic view of the environment and biodiversity that derives from a cosmogony (belief system) that links people and all living and non-living things. Descended from the union of Ranginui (the sky father) and Papatuanuku (the earth mother), and their offspring, the atua kaitiaki (spiritual guardians) — Tane (atua of forests), Tumatauenga (atua of war and ceremony), Rongo (atua of cultivation), Tangaroa (atua of seas), Tawhirimatea (atua of wind and storms) and Haumietiketike (atua of land and forest foods) — humans share a common whakapapa (ancestry) with other animals and plants. People are therefore part of nature and biodiversity.

All components of ecosystems, both living and non-living, possess the spiritual qualities of tapu, mauri, mana, and wairua. Maori, as tangata whenua, are the kaitiaki (guardians) of these ecosystems and have a responsibility to protect and enhance them. This responsibility of people to other living things is expressed in the concept of kaitiakitanga — or guardianship.

As the people are intrinsically linked with the natural world, the mana of the iwi, hapu, or whanau is directly related to the well-being of the natural resources within their rohe, or region.

Understanding and valuing the Maori world-view is an essential step towards a bicultural approach to biodiversity management.

WHY NEW ZEALAND'S BIODIVERSITY MATTERS

New Zealand's contribution to global biodiversity

New Zealand's unique biodiversity is internationally important. We boast the world's only flightless parrot (kakapo); a bird with nostrils at the end of its beak (kiwi); a primitive frog that lays eggs that hatch adult frogs (Leiopelma species); a large insect which fills a role that small rodents play in other countries (giant weta); and many other exceptional species.

High percentages of New Zealand's indigenous species are endemic (they are found nowhere else on earth) — a result of isolated evolution and the diversity of New Zealand's land and seascapes. This level of endemism is remarkable internationally.

Both species of New Zealand bat are endemic, as are all four frogs, all 60 reptiles, more than 90 percent of insects and a similar percentage of marine molluscs, about 80 percent of vascular plants[3], and a quarter of all bird species. In contrast, Great Britain, which separated from continental Europe only 10,000 years ago, has only two endemic species: one plant and one animal. Half a dozen islands in the Hauraki Gulf have a greater level of endemism than the whole of Britain.

The ecosystems in which these species live are also highly distinctive. The kauri forests of the northern North Island, the braided river systems of the eastern South Island, and our geothermal ecosystems are some examples.

The uniqueness of much of New Zealand's indigenous biodiversity means that responsibility for its continued existence is entirely ours; it cannot be conserved in nature elsewhere in the world.

3 Vascular plants include ferns, flowering plants and trees, but do not include mosses and liverworts (of which New Zealand has over 1,000 species).

The value of biodiversity to New Zealand

New Zealand's biological world is the inspiration for our national icons — the kiwi, silver fern and koru. As New Zealanders, we are shaped by these symbols of our natural environment and our relationship to it — whether by cabbage trees or kahikatea forest, weta or whitebait. We would be impoverished kiwis indeed if our national icons went the way of the huia and the moa.

Biodiversity is New Zealand's biological wealth. We base much of our economy on the use of biological resources, and benefit from the services provided by healthy ecosystems. These "ecosystem services" include producing raw materials (principally food from the sea and fibre from the land), purifying water, decomposing wastes, cycling nutrients, creating and maintaining soils, providing pollination and pest control, and regulating local and global climates. Yet we tend to take these services for granted because they are provided free of charge by nature.

Aside from the biological resources we use now, New Zealand's biodiversity represents a pool of untapped opportunities. Like the endemic sponge, discovered off the Kaikoura coast, that produces a cancer-fighting substance, there are almost certainly other species with potentially useful and commercially valuable compounds. Scientists believe that most of these have not yet been discovered.

A 1997 study by economists suggested that the total annual value provided by New Zealand's indigenous biodiversity could be more than twice that of New Zealand's gross domestic product (GDP)[4].

The annual value of indigenous biodiversity on land in 1994 was estimated at $46 billion. This was made up of $9 billion from direct uses (including food and raw materials from agriculture and horticulture and timber from forests), $30 billion from indirect uses[5] of ecosystem services, and $7 billion from passive values[6]. Marine ecosystem services were valued at $184 billion per year (including $315 million from fishing), reflecting the importance of oceans in the functioning of the biosphere and the vast tracts of ocean under New Zealand's care. This makes the estimated total annual value of indigenous biodiversity $230 billion; GDP for the same year was $84 billion.

These estimates represent the value of whole ecosystems, rather than the value of biodiversity to be lost or gained at the margin. To illustrate: the loss of 5-10 percent of the annual direct benefits from indigenous biodiversity is equivalent to about $500 million-$1000 million per year. In comparison, the Government currently spends $166 million on biodiversity management[7].

New Zealand's land-based primary production — farming, forestry and horticulture — is reliant on the protection and management of biological systems. These industries are also based on introduced species (for example, sheep, cattle, radiata pine, apple and kiwifruit). Maintaining the genetic diversity of these species internationally is crucial to their ongoing resilience to environmental change and usefulness for our primary industries.

4 *Patterson M and Cole A 1999. Assessing the Value of New Zealand's Biodiversity. Occasional Paper Number 1, School of Resource and Environmental Planning, Massey University, February 1999.*

5 *"Indirect uses" of biodiversity include climate regulation, erosion control, soil formation, nutrient retention, waste treatment, pollination and biological control.*

6 *Passive values includes "option value" (the value of future use options), "existence value" (the value of preserving biodiversity for its own sake), and "bequest value" (the value placed on biodiversity for future generations). See glossary for further explanations of "economic value".*

7 *This is the amount spent by central government agencies across all "Votes" that have a biodiversity management component.*

In addition to our productive systems being underpinned by healthy ecosystems, our "clean and green" environment is a major selling point in itself and will reap increasing rewards in the 21st century. New Zealand primary producers target customers who enjoy high-quality products that come from a healthy and unpolluted environment. This is also the foundation of our tourism industry. However, our increasingly demanding international clients expect the green image to be backed up by reality.

Apart from the value of biodiversity in sustaining our present quality of life, to many people biodiversity has intrinsic value — the value of the variety of life in itself. As mentioned above, for Maori, indigenous biodiversity is an integral aspect of their world-view, and they have a special role and responsibilities as kaitiaki of our indigenous biodiversity. The responsibility of humans towards other living things and our obligations to future generations provide a strong moral basis for their conservation and underlie the requirements in the Convention on Biological Diversity (see box on page 12).

BIODIVERSITY CHALLENGES

New Zealand's biodiversity decline

New Zealand, one of the last places on earth to be settled by humans, has one of the worst records of indigenous biodiversity loss. While biodiversity varies in natural cycles, nothing since the extinction of the dinosaurs (65 million years ago) compares with the decline in indigenous biodiversity in New Zealand over the last century. Figure 1.1 illustrates the rate of decline of some of our indigenous ecosystems and species.

The first phase of decline was the loss of New Zealand's larger bird species when humans first settled here. By around 1600, about a third of the original forests had been replaced by grasslands, although other habitats, for example wetlands and coastal areas, remained largely unchanged[8]. From around 1850, the gathering pace of European settlement started a new wave of forest destruction. Since then, a further third of our original forests have been converted to farmland, and there has been extensive modification of wetlands, dunelands, river and lake systems, and coastal areas. Other bird species, such as the huia and laughing owl, also became extinct during this time.

As far as we know, in the last 700-800 years, humans and their accompanying pests have made extinct:

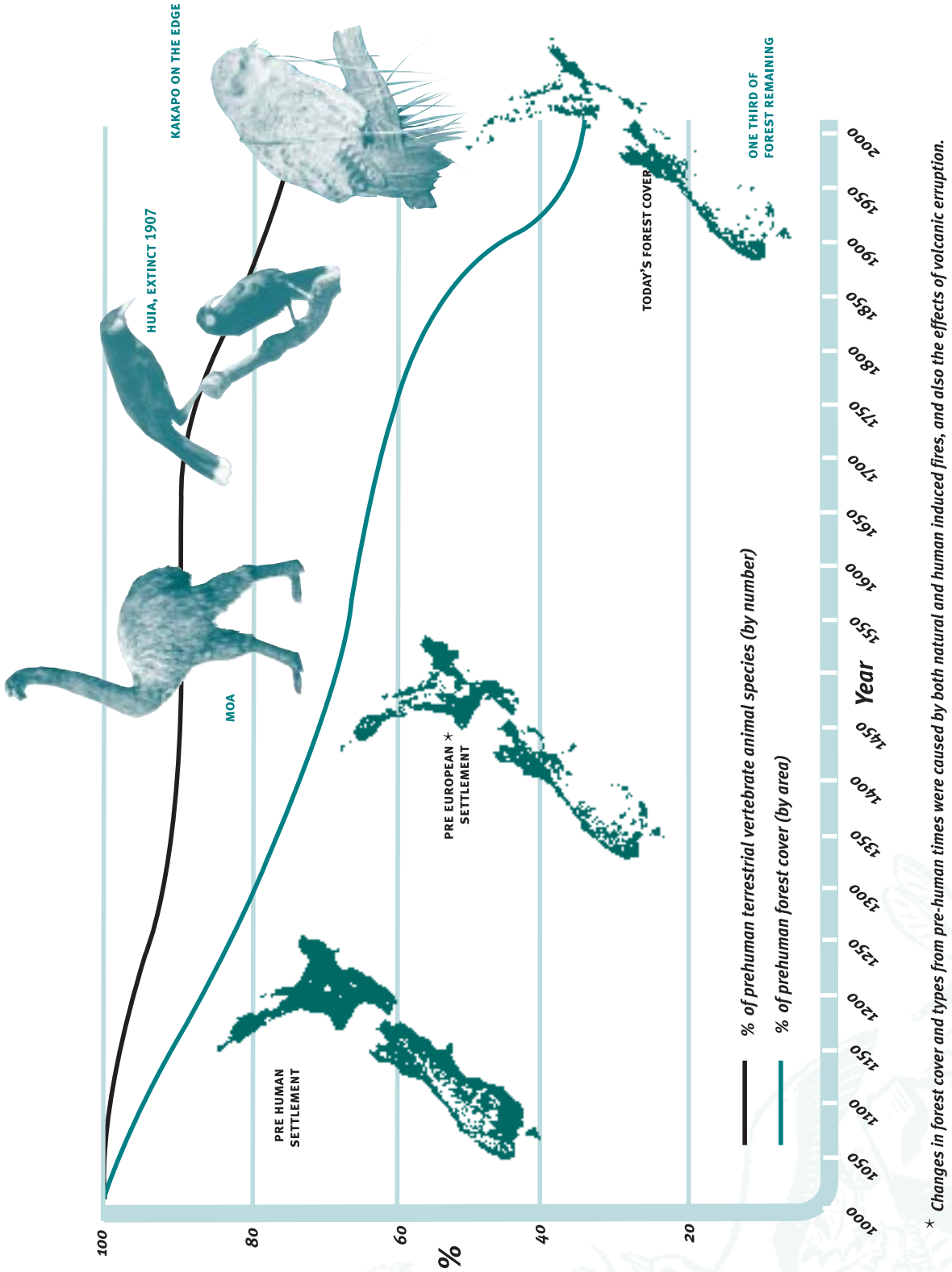
- 32 percent of indigenous land and freshwater birds;
- 18 percent of sea birds;
- three of seven frogs;
- at least 12 invertebrates such as snails and insects;
- one fish, one bat and perhaps three reptiles; and
- possibly 11 plants[9].

Today, about 1000 of our known animal, plant, and fungi species are considered threatened. And it is likely that many presently unknown species are also threatened. Many populations of these threatened species have disappeared from areas where they were once found. This pattern of local loss is the forerunner to species extinction.

8 While Maori contributed to the loss of forests, natural events, such as volcanic eruptions and forest fires arising from natural causes, were also contributing factors.

9 Ministry for the Environment, The State of New Zealand's Environment, 1997.

Figure 1.1: The trend of indigenous biodiversity decline in the last millennium[10]



10 *Estimated trends of indigenous biodiversity loss (as reflected in species extinctions and loss of forest ecosystems) in New Zealand since 1000AD based on data from published sources including* ***The State of New Zealand's Environment,*** *1997.*

Species losses are often the result of an even more pervasive loss — that of natural ecosystems and habitats. Changes in New Zealand's landscapes have had a dramatic impact on New Zealand's biodiversity. Sixty-three percent of New Zealand's land area has been converted into farms, exotic forests, settlements and roads. A once continuous range of unique ecosystems has been turned into a patchwork of isolated fragments. Although a third of the country is managed for conservation purposes, most of this is in upland areas and the mountains. The lowlands, river margins, wetlands, dunelands and coastal areas have relatively few natural habitats for native species.

While ongoing habitat loss and modification continue to be a threat to indigenous biodiversity, an even more serious and pressing threat in terrestrial and freshwater ecosystems is from invasive introduced species which have become animal pests and weeds. Collectively invasive pests pose the greatest single threat to our remaining natural ecosystems and habitats and threatened native species. They damage habitats and important ecosystem processes, and compete with indigenous species for food and prey on them. Invasive pests also pose high costs and a significant ongoing threat to productive ecosystems.

The most damaging animal pests include possums, goats, deer, rats, stoats and feral cats. We also have at least 240 invasive weed species considered harmful to native species. Many of our domesticated species, such as garden plants, have the capacity to become pests or weeds in the wild unless we are vigilant. The possibility of further pests and weeds, such as Asian gypsy moth, or harmful marine organisms being brought into the country, is also an ever-present threat.

Threatened ecosystems

Natural habitats and ecosystems, as well as species, can become rare and threatened. Historically New Zealand has focused on protecting alpine areas and native forests, leaving many other distinctive natural habitats and ecosystems vulnerable to change. Our most threatened natural ecosystems are in lowland areas. Once part of more extensive natural ecosystems, these remnants are now generally isolated patches within or on the edge of farm or forestry lands.

These include:

- *lowland wetlands and peat bogs;*
- *lowland riverine systems and adjacent forests;*
- *dunelands;*
- *coastal forest, scrub and herbfields;*
- *lowland tussock grasslands; and*
- *eastern South Island braided river ecosystems.*

Unlike natural areas on land, only a small number of marine habitats have been fully protected. One of the main reasons for this is our very limited knowledge about New Zealand's marine biodiversity. However, marine research is showing that marine areas are more diverse and distinctive than we realised.

What we don't know

There are still many things we don't know about New Zealand's indigenous biodiversity. There are many small or less visible species that have never been described, and many marine species that have yet to be discovered. It is estimated that we may have as many as 80 000 indigenous species, yet only 30 000 have been described so far. Most of the unknowns belong to our less appreciated taxonomic groups: fungi, and invertebrate animals such as insects, spiders, worms and molluscs (slugs, snails and shellfish).

Despite knowing that species are being lost from some areas, we do not have a good overall picture of how many local extinctions are occurring and how fast, nor of the overall trends and condition in natural habitats and ecosystems. The lack of information makes many decisions about managing biodiversity uncertain. Investment in science and information, drawing on local and traditional knowledge and making best use of what we already know, is vitally important to progress in managing biodiversity.

The slowing of decline

The first responses to New Zealand's biodiversity losses were made by Maori, well before Europeans arrived here. Following the first wave of extinctions, Maori adapted to their new environment and developed conservation practices that governed their use of natural resources. This included the use of tikanga (protocols), tapu (sacred prohibitions) and rahui (temporary restrictions) to control the areas, seasons or species harvested. At the heart of Maori environmental management is the sustainable use of biological resources.

More recently, changes in attitudes to the natural environment and an increase in active conservation management, particularly over the last three decades, appear to have slowed the rate of decline of New Zealand's indigenous biodiversity. Widespread clearance of native vegetation, often under subsidy, drainage of wetlands, extensive reclamation of estuaries, and unrestricted fishing have stopped. Breakthroughs in threatened species management, including new pest control techniques, restoring offshore island sanctuaries, and extending protected areas on land and in the sea, collectively have had an impressive effect. However, they do not appear to be enough to halt the decline.

With the status of our indigenous biodiversity still on a downward trend, the challenge now is to halt this decline and nudge it towards an upward path, as outlined in Parts Two, Three and Four of the Strategy.

Introduced species

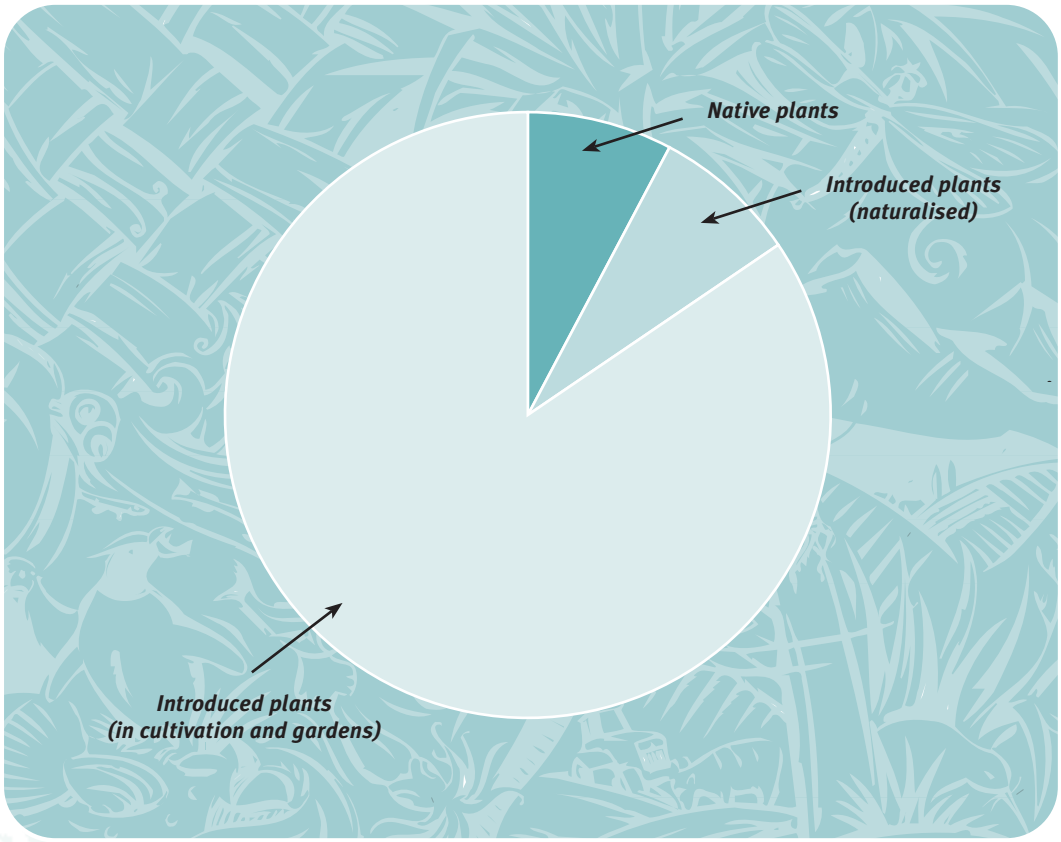
At the same time as indigenous biodiversity was in retreat, New Zealand's total biodiversity (or more precisely, the total number of species) was growing as increasing numbers of exotic species were brought into the country. New Zealand now has the highest number of introduced mammals of any country in the world and the second highest number of introduced birds. In the case of vascular plants, we now have more introduced species in the wild than native ones. Figure 1.2 shows the proportion of New Zealand's native vascular plant species compared to our introduced vascular plants, both in cultivation and those now established in the wild (naturalised). This gives some idea of the potential risk of further introduced plants becoming naturalised and competing with native plants.

Some introduced species perform valuable ecological services in ecosystems that have been changed or where indigenous species have been lost. For example, gorse scrub is often a nursery for indigenous plant seedlings, plants such as banksia and tree lucerne are a food source for native birds, and some introduced birds, such as blackbirds, have become important dispersers of native plant seeds. New Zealanders value many introduced species, for aesthetic, recreational and cultural reasons. Unfortunately, some are also (or have the potential to be) pests or weeds and can be a threat to our natural ecosystems and indigenous species. Management of these introduced species poses special challenges.

New Zealand is almost entirely dependent on introduced species for its primary production — in agriculture, horticulture and forestry. Through selective breeding we modify these species to meet changing market needs. This process can lead to losses in genetic diversity (or genetic erosion) which may limit New Zealand's future ability to develop new breeds and varieties. It can also lessen the resilience of these species to pests and diseases and environmental change.

This Strategy is about managing threats to New Zealand's total biodiversity — both introduced and indigenous. A significant portion of our export wealth — critical to our ability to protect our indigenous biodiversity — is generated by the sale of our introduced biodiversity. And our biosecurity threats are often common to both. Introduced biodiversity is neither all "good" nor all "bad"; threats or benefits of individual introduced species most often depend on the situation in which they arise. The interactions between the introduced and indigenous elements of our biodiversity are complex and dynamic and need to be understood and addressed if we are to achieve our biodiversity goals.

Figure 1.2: Native versus introduced vascular plants



New Zealand has 10% of the world's plants, of these, 7.8% are native, 7.8% are introduced plants that have naturalised (become established in the wild) and 84.4% are introduced plants in cultivation or gardens, but not yet naturalised.

BIODIVERSITY MANAGEMENT — PAST AND PRESENT

Progress achieved

Significant progress has been made in reducing the threats to our indigenous biodiversity in the last few decades. New Zealand's environmental protection and management legislation and administrative structures were substantially reformed in the 1980s and 1990s. There has also been a groundswell of initiatives by private landowners and communities to protect and restore natural areas, assisted by mechanisms such as the Queen Elizabeth II National Trust, Nature Heritage Fund[11], and Nga Whenua Rahui.

Contemporary environmental legislation and management cover three broad fields:

1. **Resource management:**

   the sustainable management of land, freshwater and coastal ecosystems, and harvested biodiversity, including forestry and fisheries management;

2. **Conservation management:**

   the protection and management of natural areas (such as national parks, reserves and conservation areas and marine reserves) and protected species; and

3. **Biosecurity management:**

   the management of risks associated with the importation and accidental introduction of introduced species, new organisms and hazardous substances, and management of threats from established pests.

This management framework provides a solid basis for a greater focus on conserving and sustainably using New Zealand's biodiversity, and is backed by strong public support for a healthy environment, as well as a history of public consultation and involvement in management processes.

There have also been major steps forward in our technical capacity to manage indigenous species and to restore ecosystems. New Zealand is a world leader in the establishment and management of island sanctuaries for threatened species — achieved through the eradication of possums, goats, cats and rats from offshore islands to create safe havens for rare or threatened species. These techniques are now increasingly being applied to the intensive management of "mainland islands" to dramatically improve their value as conservation assets.

Some key issues

The challenge to us as a nation is to continue to build on our strengths and interweave these three strands — our management framework, community and private support, and technical capacity — to deal effectively with New Zealand's most pressing biodiversity issues. These key issues include:

- finding ways to maintain the indigenous biodiversity values of natural habitats and ecosystems outside public protected areas, and to sympathetically manage indigenous biodiversity in production landscapes and seascapes. Both these tasks involve restoring connections between presently isolated fragments of natural ecosystems;

11 *Formerly the Forest Heritage Fund.*

- restoring the condition of already protected ecosystems and the indigenous species found within them, principally by controlling pests and weeds, managing harvesting, and intensively managing the most threatened species; and
- improving our technical knowledge and community understanding of biodiversity (including the Maori world-view and the important role traditional knowledge can play in sustainably managing our biodiversity) and enhancing communities' opportunities and capacity to be involved in biodiversity management. Good information is critical for targeting efforts effectively and enabling New Zealanders to make informed choices about biodiversity and its future.

IMPORTANCE OF A BIODIVERSITY STRATEGY FOR NEW ZEALAND

New Zealand's international position

New Zealand aspires to be seen internationally as being clean and green, and a responsible steward of its environment and biodiversity. Over the next 20 years, we can anticipate a growing international expectation that countries will fulfil their duty of care for their biodiversity and that producers will be able to demonstrate to their customers the part they play in this.

New Zealand has an international responsibility to meet commitments under the Convention on Biological Diversity. Ratified by New Zealand in 1993, the Convention is a response to global biodiversity decline. A ground-breaking international initiative, its significance lies in the scientific and moral imperatives that it establishes for proactive management of biodiversity on a worldwide scale. The Convention on Biological Diversity (see box on page 12) requires signatory nations to prepare national strategies or plans to set national goals to conserve and sustainably use biodiversity.

National commitments

New Zealand made a commitment to prepare a national strategy to set clear goals for New Zealand's indigenous biodiversity in the Environment 2010 Strategy, the Government's strategy on the environment released in 1995. In 1998 the Government adopted "halting the decline of indigenous biodiversity" as one of its ten Strategic Priorities.

The challenge, at a national level, is to integrate biodiversity considerations across all sectors of government and the economy, with a focus on the Government's core responsibilities within an appropriate governance framework.

The challenge regionally and locally

The Convention on Biological Diversity emphasises the need to conserve biodiversity *in situ*, in its natural surroundings. While New Zealand needs to set national priorities and targets, biodiversity exists locally; once priorities have been set, it is local management effort that will determine successful outcomes. The challenge regionally and locally is to translate national priorities and targets into regional and local plans and programmes, promoting the effective participation of communities and resource managers. This will be a joint effort, with central government helping to guide, coordinate, and resource regional and local responses.

The challenge to everyone

Our biodiversity is a living treasure we hold for future generations.

The New Zealand Biodiversity Strategy is an initiative that provides an integrated response to New Zealand's declining biodiversity. It seeks change from:

- the current decline in indigenous biodiversity to a level of stabilisation;
- a paucity of knowledge to better, more widely used information;
- implicit to explicit biodiversity management requirements;
- ad hoc arrangements to clearly aligned and coordinated actions;
- little market recognition of biodiversity to market-driven rewards and sanctions; and
- limited community understanding and involvement to widespread, informed community action.

The Strategy is government-led, but cannot be achieved by government alone. All the myriad of resource management decisions made by land managers, resource users, iwi and hapu, and others, affect biodiversity. It will be changes in the day-to-day practices of all New Zealanders that will determine our record in biodiversity management. And the bottom line in management is that the loss of ecosystems and species is irreversible. Decisions that New Zealanders make today provide the biodiversity legacy or debt to their grandchildren.

Figure 1.3 shows the policy context — at an international, national, regional and local level — for the New Zealand Biodiversity Strategy.

Taking the next steps together

The involvement of a wide spectrum of society in implementing the New Zealand Biodiversity Strategy is vital for its success. Part Two of the Strategy sets out a vision and national goals and principles, Part Three outlines what needs to be done to achieve these and the key players involved, and Part Four describes the first steps for implementation.

The Convention on Biological Diversity[12]

The conservation and sustainable use of biodiversity has been on the international agenda for some time. In 1973, the very first session of the Governing Council for the new United Nations Environment Programme (UNEP) identified the "conservation of nature, wildlife and genetic resources as a priority area".

The international community's growing concern over the unprecedented loss of global biodiversity due to the effects of human activities inspired negotiations for a legally binding instrument aimed at halting this alarming trend. As a result, the UNEP Convention on Biological Diversity was adopted at the Earth Summit in Rio de Janeiro in 1992 and came into force in December 1993. To date, 175 countries have ratified the Convention.

The Convention's objectives are:

- *the conservation of biological diversity;*
- *the sustainable use of its components; and*
- *the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.*

The Convention is the first global agreement to comprehensively address all aspects of biological diversity: ecosystems, species, and genetic resources.

The requirement for signatory countries to develop national biodiversity strategies, plans or programmes for the conservation and sustainable use of biodiversity (Article 6) is a key to implementing the Convention.

National planning for biodiversity enables countries to set their own objectives for managing biodiversity — consistent with the Convention, but reflecting the context of their own domestic environmental policies and capabilities.

12 *The full text of the Convention on Biological Diversity is available on the Secretariat to the Convention's web site: www.biodiv.org .*

PART TWO

A Vision, Goals and Principles for Managing New Zealand's Biodiversity

INTRODUCTION

A vision, goals and principles for biodiversity management for New Zealand (at a national level) are set out in the following section.

The vision describes a desired future for New Zealand's biodiversity and our management of it; this is a long-term view that may take well into the 21st century to become reality.

The goals establish:

- the high-level biodiversity outcomes for both indigenous biodiversity and important introduced species that we are aiming to achieve by 2020 (Goals Three and Four);
- how communities and individuals need to be able to contribute to achieving these outcomes and share responsibility for and benefits from biodiversity (Goal One); and
- commitments under the Treaty of Waitangi in managing biodiversity (Goal Two).

A timeframe of twenty years — a little less than one human generation — is proposed to achieve the Strategy goals. This should allow for the successful planning, implementation and monitoring of all actions and for some improvements in the state of New Zealand's biodiversity to take place[14]. Yet, from an ecological perspective, twenty years is short. Not all biodiversity issues identified in Part Three can be addressed in this time, and new issues will no doubt emerge.

In light of future uncertainty and change, New Zealand's goals for managing biodiversity will most certainly have to be revisited. Refinement of the goals will need to take account of changes in society's values, our knowledge and understanding of biodiversity, technological breakthroughs, and changes in the state of New Zealand's biodiversity into the 21st century.

The principles set out important underlying values, premises and approaches to guide how this Strategy will be implemented.

14 *For example, changes in vegetation cover, composition and condition; marine fish stocks; and the breeding success and population levels of many threatened species.*

A Vision for Aotearoa — New Zealand

New Zealanders value and better understand biodiversity;

We all work together to protect, sustain and restore our biodiversity, and enjoy and share in its benefits, as the foundation of a sustainable economy and society;

Iwi and hapu as kaitiaki are active partners in managing biodiversity;

The full range of New Zealand's indigenous ecosystems and species thrive from the mountains to the ocean depths; and

The genetic resources of our important introduced species are secure, and in turn support our indigenous biodiversity.

Te Tohu Mohukihuki Mo Aotearoa

Kei te matatau me te ngakau nui, te katoa o Aotearoa ki tenei kaupapa "te Koiora rereketanga o te kura taiao."

Kei te mahi ngatahi te katoa ki te whakaora, ki te whakaute, ki te tiaki me te tuari i nga painga, hei tuapapa mo tenei ao hurihuri.

Ko te korowai mana kaitiaki — whakahaere i te kaupapa, kei nga iwi me nga hapu o te Motu.

Te katoa o nga taonga koiora me nga taonga tuku iho, mai i nga tihi maunga ki te kopu o te moana kei te noho momoho.

Ko nga rawa kokuhu taketake, kei te noho whakamau atawhai, ki nga rawa o Aotearoa.

Goal One: Community and individual action, responsibility and benefits

Enhance community and individual understanding about biodiversity, and inform, motivate and support widespread and coordinated community action to conserve and sustainably use biodiversity; and

Enable communities and individuals to equitably share responsibility for, and benefits from, conserving and sustainably using New Zealand's biodiversity, including the benefits from the use of indigenous genetic resources.

Awhero Otinga Tuatahi: Te tohu ki te tini, te tokomaha me te takitahi, i te kawenga me te mahi a ngakau, hei wkakaara ake i te huarahi.

Kia toa te whakarei i nga tohu me te matatau o te tini, te tokomaha, me te takitahi ki nga hua me nga painga o nga "taonga koiora rereketanga o te kura taiao".

Kia ahei te tini te tokomaha me te takitahi, ki te tiari i te kawenga me te ngakau nui kia, pumau ki nga painga i ahu mai i te tiaki me te whakaute i nga "taonga koiora rereketanga o te kura taiao".

Goal Two: Treaty of Waitangi

Actively protect iwi and hapu interests in indigenous biodiversity, and build and strengthen partnerships between government agencies and iwi and hapu in conserving and sustainably using indigenous biodiversity.

Awhero Otinga Tuarua: Te Tiriti o Waitangi

Ko te toa me te pono o te kawanatanga i raro ite maru o te Tiriti o Waitangi ki te whakamana me te whakahono i nga tikanga o nga iwi me nga hapu, i roto i te mahi ngatahi ki te tiaki i nga taonga koiora me nga taonga tuku iho o "te kura taiao".

Goal Three: Halt the decline in New Zealand's indigenous biodiversity

Maintain and restore a full range of remaining natural habitats and ecosystems[15] to a healthy functioning state, enhance critically scarce habitats, and sustain the more modified ecosystems in production and urban environments; and do what else is necessary to

Maintain and restore viable populations of all indigenous species and subspecies across their natural range and maintain their genetic diversity.

Awhero Otinga Tuatoru: Kia kaha te kokiri i te toi "koiora rereketanga o te kura taiao" o Aotearoa, kia kore ai e noho ngoikore:

Kia mau te whakatikatika, i te toiwhenua mahorahora, me nga rawa Ao tuturu, kia noho momoho i roto i tona oranga kia kore ai e nagro i te kitenga kanohi.

Kia kaha te whakaara, te whakamana, te whakawairua me te manaaki i nga rawa tiowhenua me tera kua raweweketia tona ahua e ringa tangata, e noho ngoikore ana i runga whenua, i roto moana.

Goal Four: Genetic resources of introduced species

Maintain the genetic resources of introduced species that are important for economic, biological and cultural reasons by conserving their genetic diversity.

Awhero Otinga Tuawha: Nga taketake iranga o nga taonga koiora i koku hutia ki Aotearoa

Kia mau te whakatikatika te tiaki i nga taketake iranga o nga taonga koiora i kokuhutia ki tenei motu, i haria mai i Hawaiki, i utaina mai ki runga i nga waka, hei whakakikokiko i nga taonga koiora o Aotearoa hei painga mo te katoa.

15 *"Natural habitats and ecosystems" refer to habitats and ecosystems with a dominant or significant indigenous natural character (see Glossary).*

Explanation of goals

Goal One

The Convention on Biological Diversity affirms that conserving biodiversity is the common concern of humankind. Everyone is involved in activities that affect and depend on biodiversity. Conversely, we all have an interest in, and responsibility for helping to conserve and sustainably use biodiversity.

Goal One recognises that people — communities and individuals — are the real powerhouse of positive change, and that community and individual actions to conserve biodiversity depend on adequate understanding, information, motivation and support. In this context, community is used in a broad sense to include iwi and hapu, local communities, primary producers, industry, and central and local government agencies.

A strong message from consultation and submissions in the development of this Strategy was that, given appropriate guidance, information, expertise and resources, local communities and individuals are best placed and most effective at conserving indigenous biodiversity in their own areas. The role of communities in biodiversity management is covered in Theme Eight.

Goal One also seeks for New Zealanders to reap and share in the benefits from the use of indigenous biodiversity and the use of indigenous genetic resources. Issues relating to access to and benefits from indigenous genetic resources are addressed in Theme Four.

Goal Two

The Treaty of Waitangi provides the basis for the relationship between the Crown and Maori in managing biodiversity. Figure 1.3 (page 13) shows the influence of the Treaty in the overall policy context for this Strategy.

Goal Two provides for the active protection of tangata whenua interests in biodiversity, reflecting the principles of kawanatanga, rangatiratanga, kaitiakitanga, and the Crown's duty of active protection of Maori interests as laid down in the Treaty. It also endorses the creation and strengthening of partnerships between government agencies and iwi and hapu in the shared management of indigenous biodiversity. This reflects the Treaty principle of partnership.

Maori interests in biodiversity are more specifically addressed in Theme Seven.

Goal Three

Under the Convention on Biological Diversity, New Zealand has a particular responsibility for conserving our indigenous ecosystems and species. Goal Three sets out the benchmark to halt the decline in our indigenous biodiversity.

In Goal Three, "full range" of natural habitats and ecosystems means the same as a "comprehensive and representative range", that is, a range that reflects the known diversity of habitats and ecological communities remaining in New Zealand. "Healthy functioning state" refers to a state in which an ecosystem can support all indigenous species occurring naturally within it (See Glossary).

Goal Three reflects a focus on natural habitats and ecosystems as a means of conserving species and the diversity within them. This is in keeping with the Convention on Biological Diversity emphasis on conserving biodiversity in its natural surroundings (that is, *in situ* conservation). Maintaining viable populations of indigenous species across their natural ranges should largely be achieved by maintaining a full range of natural habitats and ecosystems. However, within the life of this Strategy, it is likely that the survival of some indigenous species will continue to require an individual species recovery focus beyond just maintaining and restoring the habitats and ecosystems to which these species belong.

This goal also recognises that most of New Zealand's ecosystems are modified to some extent and made up of mixtures of indigenous and introduced species. Ecosystems in production landscapes and in urban areas are also important for maintaining our indigenous biodiversity.

Goal Three is the bottom line nationally if we are to prevent further decline in indigenous ecosytems and species. But it is important to note that this does not preclude goals to maintain or restore indigenous biodiversity to ***higher levels*** in some environments (the marine environment, for example) or for particular areas or species. Communities may choose to seek higher targets for particular ecosystems or species within their region, district, or locality. However, unless we at least stabilise our indigenous biodiversity nationally, higher goals will not be an option.

Figure 2.1 (page 22) shows the intended effects of the Strategy goals in halting the decline of indigenous biodiversity, and the "conservation gains" required, relative to those over the past 25 years.

Figure 2.2 (page 23) illustrates Goal Three for North Island brown kiwi. The triangles show the additional populations of brown kiwi that would need to be actively managed to maintain representative populations across their natural range.

The conservation and sustainable use of indigenous biodiversity in terrestrial, freshwater and coastal and marine environments are addressed in Part Three — Themes One, Two and Three, respectively.

Goal Four

While the primary focus of this Strategy is New Zealand's indigenous biodiversity, Goal Four recognises that many introduced species have become an important part of New Zealand's total biodiversity.

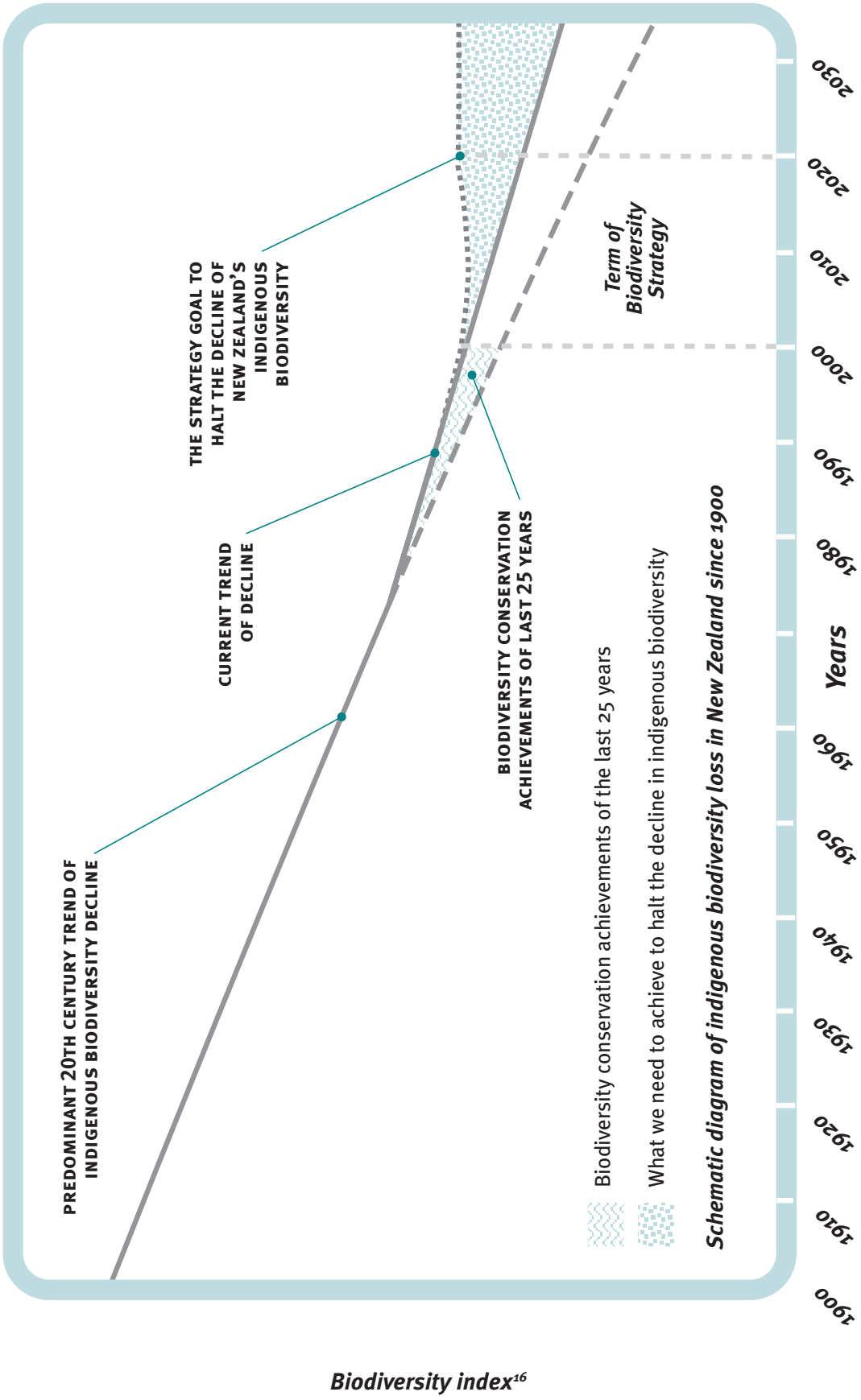
The introduced species referred to in Goal Four include:

- domesticated and cultivated species which are important to New Zealand's primary production industries and economy;
- introduced species that help to conserve indigenous biodiversity, for example by providing habitat or as agents for pest control (that is, biological control agents);
- introduced species in New Zealand that are extinct or endangered in their country of origin; and
- other introduced species established in New Zealand that have become an important part of our non-indigenous biodiversity, for example, statutorily managed sports fish and game.

The intent of Goal Four is to maintain the genetic diversity of introduced species in New Zealand that are economically significant or important for other reasons. It also provides for our international obligations to help conserve introduced species that are rare or endangered, or have become locally extinct, in their country of origin. See Theme Four for actions relating to the genetic resources of introduced species.

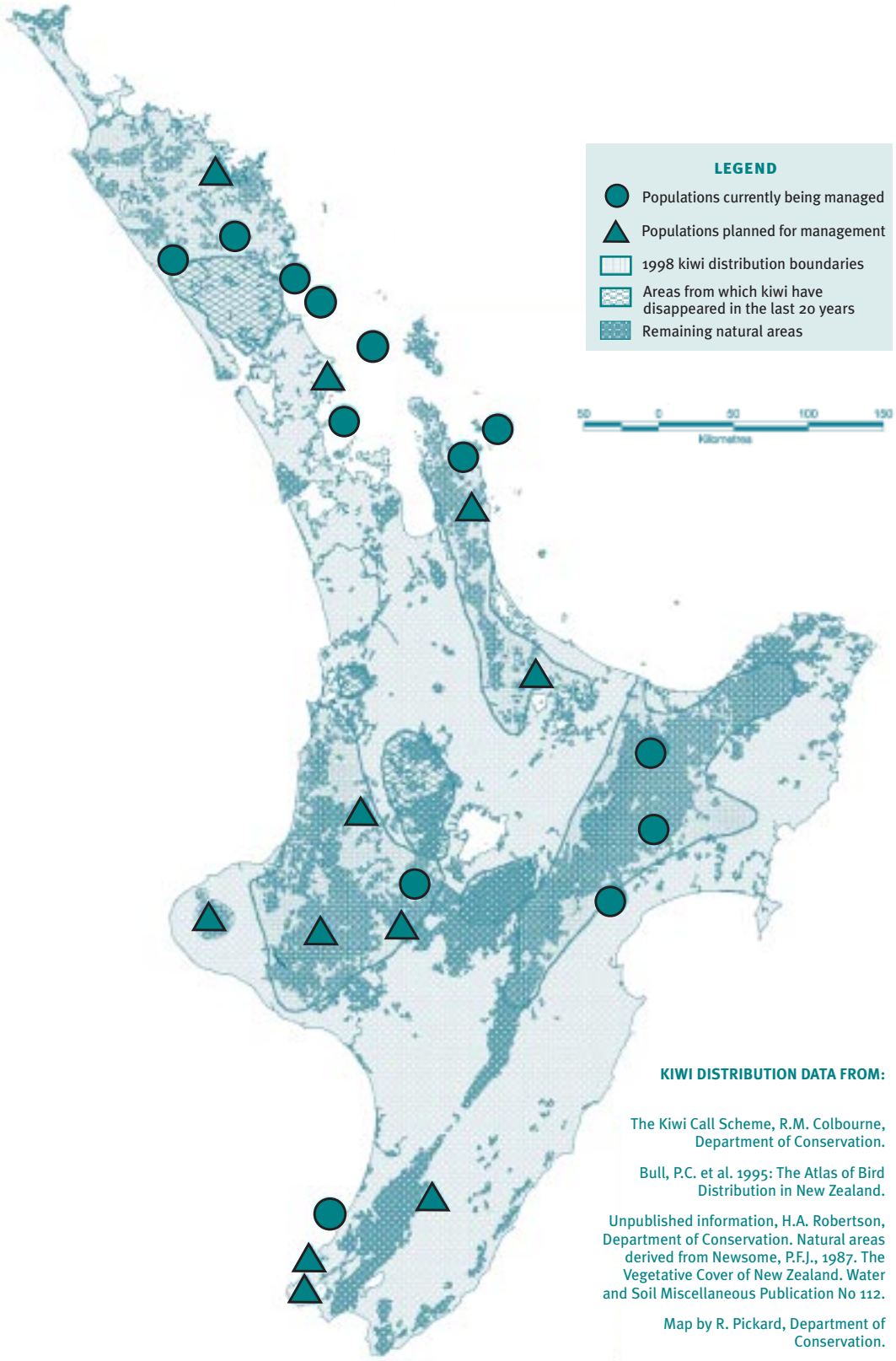
Goal Four should be interpreted in the context of Goal Three and Principle Nine (Indigenous Biodiversity Priorities): where conflicts arise between introduced and indigenous species, priority will be given to conserving indigenous biodiversity.

Figure 2.1: Goal to halt indigenous biodiversity decline in the 21st century



16 *The index of indigenous biodiversity decline is based on what is known about changes in the extent and condition of natural habitats and ecosystems and changes in the distribution of indigenous species, their loss from some habitats (local extinction) as well as complete extinction. Its presentation here is schematic only.*

Figure 2.2: North Island brown kiwi distribution and management



This map shows the present distribution of brown kiwi in the North Island, compared with its distribution in the late 1970s. It also shows places where brown kiwi populations might be managed to achieve more representative populations as envisaged by Goal Three.

Principles for Managing New Zealand's Biodiversity

The following principles (in no particular order) are fundamental to the conservation and sustainable use of New Zealand's biodiversity. They establish important underlying premises, values and approaches as a basis for the Strategy and its implementation. The principles are not ends in themselves, but will provide guidance on how the goals and objectives of the Strategy should be achieved and on resolving conflicts that may arise during this process. The principles will have primary bearing on Parts Three and Four of the Strategy.

Principle One — Governance

The Government is responsible for providing the direction and leadership to ensure the conservation and sustainable use of New Zealand's biodiversity as a matter of national importance.

Principle Two — Treaty of Waitangi

The special relationship between the Crown and Maori as reflected in the Treaty of Waitangi should be recognised and provided for in the conservation and sustainable use of biodiversity, including kaitiakitanga, customary use and matauranga Maori.

Principle Three — Collective and Ethical Responsibilities

All New Zealanders depend on biodiversity and have a responsibility for its conservation and sustainable use beyond their own needs:

- to the needs of future generations; and
- to other species, life forms and ecosystems which have intrinsic value and warrant respect.

Principle Four — Working Together

The conservation and sustainable use of New Zealand's biodiversity require individuals and public agencies to work together in a coordinated manner, to share knowledge, costs and benefits, to be clear about their different roles and responsibilities and to have the capability and resources to contribute.

Principle Five — Respect for Property Rights

Respect for property rights, as well as their scope and associated responsibilities, is essential to ensure a collaborative partnership is developed between resource owners and users and public agencies to sustain and conserve biodiversity.

Principle Six — Recognise Variable Capacity to Respond

In designing mechanisms to support biodiversity conservation, management agencies should recognise the variable capacity of individuals and local communities to implement these mechanisms.

Principle Seven — Internalising Environmental Costs

Where an activity imposes adverse effects on biodiversity, the costs of mitigating or remedying those impacts should be borne by those benefiting from the activity.

Principle Eight — In situ Conservation

Biodiversity is best conserved *in situ* by conserving ecosystems and ecological processes to maintain species in their natural habitats. *Ex situ* measures will be important to support the conservation of some species, however (see Glossary).

Principle Nine — Indigenous Biodiversity Priorities

Priority should be given to conserving indigenous species over introduced species, when making management decisions.

Principle Ten — Sustainable Use

Conserving biodiversity is a priority, but does not preclude its use, where this use is ecologically sustainable and does not result in the long-term decline of biodiversity.

Principle Eleven — Management Actions

Biodiversity management requires a comprehensive approach that recognises all levels of biodiversity (ecosystem, species and genetic). Management actions should identify, and prevent and mitigate the causes of biodiversity loss and in doing so should:

- address all key threats;
- be based on the best and most current information and knowledge available;
- be adaptive, aiming for continual improvement as new knowledge is gained; and
- be focused on the priority needs; and
- be cost-effective.

Principle Twelve — Precautionary Decision Making

Management actions to conserve and sustainably use biodiversity should not be postponed because of a lack of knowledge, especially where significant or irreversible damage to ecosystems can occur or indigenous species are at risk of extinction.

Principle Thirteen — Focus on the Future

Our actions in the past reflect the understanding and conditions of those times; while we can learn from our mistakes, the way forward will not be assisted by apportioning blame for the unsustainable practices of the past.

PART THREE

Action Plans for New Zealand's Biodiversity

THE STRATEGY FRAMEWORK

Part Three of the Strategy sets out a framework for action to achieve the goals in Part Two. Figure 3.1 shows the components of this framework and how they fit together.

Objectives and actions are grouped into ten biodiversity themes or topic areas as follows:

1. ***Biodiversity on Land***

   Terrestrial ecosystems, including natural and modified ecosystems and habitats, and the indigenous species that live there.

2. ***Freshwater Biodiversity***

   Freshwater ecosystems, such as streams, lakes, wetlands, geothermal systems and underground aquifers, and the indigenous species associated with them.

3. ***Coastal and Marine Biodiversity***

   Coastal and marine ecosystems including estuaries, inshore coastal areas, and offshore areas within New Zealand's jurisdiction, and the resident and migratory species within them.

4. ***Conservation and Use of Genetic Resources***

   The conservation and use of genetic resources of indigenous and important introduced species in New Zealand, and the sharing of benefits from their use.

5. ***Biosecurity and Biodiversity***

   The management of risks to indigenous biodiversity and important introduced species from the introduction and spread of harmful organisms, including animal pests, weeds and diseases.

6. Governance

The role of Government in setting national biodiversity goals and coordinating their achievement.

7. Maori and Biodiversity

The interests and role of Maori in biodiversity management.

8. Community Participation and Awareness

The role of New Zealand communities in biodiversity management.

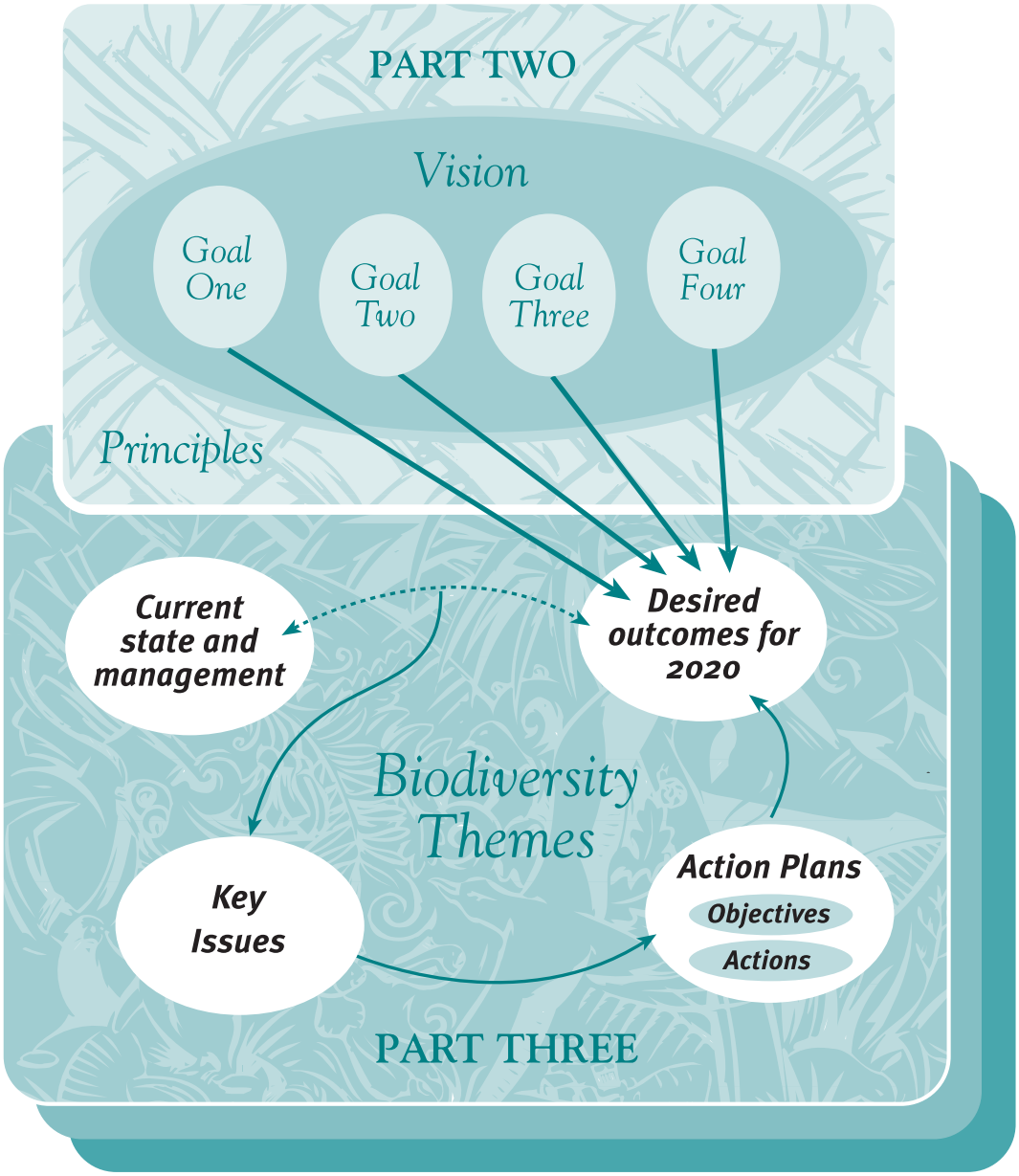
9. Information, Knowledge and Capacity

Requirements for information, knowledge and capacity to effectively manage biodiversity.

10. New Zealand's International Responsibilities

New Zealand's international role and responsibilities in terms of the conservation and sustainable use of global biodiversity.

Figure 3.1: Strategic framework for the New Zealand Biodiversity Strategy



Theme structure

Each theme follows the same structure:

- A **desired outcome** that translates the goals of the Strategy into the biodiversity or management outcomes that need to be achieved by 2020.
- The **current state** of biodiversity on land, and within freshwater and coastal and marine environments.
- The **current management** arrangements and responses.
- A **summary of issues** outlining the key biodiversity issues that need to be addressed in order to bridge the gap between the current and desired state.
- An **action plan** setting out the objectives and actions aimed at gaps and inadequacies in the existing institutional framework and system and efforts in biodiversity management.
- The Government lead and **key players** in the public and private sectors and the community that will be involved in implementing each action.

Action plans

The actions identified within each theme are necessary to achieve the objectives and desired outcomes. They are a mixture of existing programmes that need refocusing or enhancing and new initiatives. Actions in the Strategy are aimed at addressing key gaps and opportunities within our current management framework and effort. Many other initiatives and programmes in biodiversity management have not been identified here, but are an important part of the overall picture. Collectively, these actions should enable the goals of the Strategy to be achieved, although they may be refined and re-prioritised, and further actions may be identified as the Strategy is reviewed over time.

Priority actions are identified within each action plan and are shown in bold. They have been chosen as priorities on the basis that they:

- will contribute most in the first five years to achieving the goals; or
- need to occur first, before other actions can be implemented.

In total 43 actions out of a total of 147 are priority actions. These priorities are further discussed in Part Four.

Roles in biodiversity management

The government lead and key player roles identified with actions are assigned according to current statutory roles and generally include those agencies or groups considered to be most appropriate to be involved in making decisions, providing funding, or implementing particular actions. The government lead role is generally a statutory, policy development or reporting role, rather than an operational one.

It should be noted that while only key players are listed, many other organisations, groups, communities and individuals have a part to play in implementing these actions and achieving the goals of the Strategy.

Annex One outlines the approach taken to assigning roles and responsibilities, and the use of government "intervention" mechanisms used in this Strategy.

Consulting on how actions will be implemented

This Strategy sets our national goals for conserving and sustainably using New Zealand's biodiversity and the key actions needed to achieve this. However, it does not prescribe the detail of how these actions will be undertaken, although at a general level they will be guided by the principles of the Strategy.

Many of the actions in this Strategy will involve resource owners and users as well as management agencies. Because it will be changes in the day-to-day activities of New Zealanders that will make a difference, it is critical that resource owners and users become willing and active participants. An important part of implementing actions will be consultation and engagement with resource owners and users and relevant interest groups where their involvement is necessary, or roles and responsibilities need to be further clarified.

One example is the work the Ministerial Advisory Committee to the Minister for the Environment is doing on sustaining biodiversity on private land. This work is directly related to Actions 1.1c, d, and e, 2.1a and g, and indirectly to a number of other actions in the Strategy. The Ministerial Advisory Committee will lead a dialogue with landowners and the broader community to improve understanding and gain agreement on who will be doing what, and the mix of methods that they will collectively use, to sustain biodiversity on private land. See ***www.biowhat.co.nz*** *for information on this process.*

THEME 1

Biodiversity on Land

Scope

New Zealand's terrestrial ecosystems (including natural and modified habitats within and outside of protected areas, rural production landscapes and urban environments) and the indigenous species inhabiting these areas.

Desired outcome for 2020

A net gain has been made in the extent and condition of natural habitats and ecosystems important for indigenous biodiversity. Scarce and fragmented habitats (such as lowland forests and grasslands, wetlands and dunelands) have increased in area and are in better ecological health due to improved connections and the sustainable management of surrounding areas. Some modified habitats are restored.

A more representative range of natural habitats and ecosystems is secure in public ownership, complemented by an increase in privately owned and managed protected natural areas. Increased and more effective pest management, coupled with species recovery, has restored ecological processes in these areas. No new pest species have become established.

No further human-induced extinctions have occurred. Populations of all indigenous species and subspecies are sustained in natural or semi-natural habitats, and their genetic diversity is maintained. Fewer threatened species require active recovery programmes and ex situ management.

Threats to indigenous biodiversity from the activities of people are avoided or mitigated through sustainable use regimes and the sustainable management of production landscapes and urban areas.

State of biodiversity on land

New Zealand's transition over the past millennium, from an unpeopled and isolated archipelago to a productive agricultural economy, has transformed natural landscapes, habitats, ecosystems, and the composition of our land-based biota. At least three-quarters of New Zealand's original natural areas on land have been significantly disturbed by the activities of people and their accompanying plants and animals; 63 percent of this area has been converted to farms, roads and settlements. In contrast, the extent of habitat loss on land worldwide stands at just over 50 percent.

Most of New Zealand's remaining unmodified habitat is either in remote mountainous areas, on offshore islands, in small lowland forest stands, or in other fragmented patches in lowland and coastal areas. Much of this habitat in the mountains and on islands is protected within extensive public conservation areas. However, other scarce habitats (such as lowland and coastal forest remnants, lowland grasslands, wetlands and dunelands) remain largely unprotected and vulnerable to ongoing decline. Some biological communities (for example, certain blue-grass communities and lowland native grasslands) may be close to extinction.

About 20 000 indigenous terrestrial species have been described in New Zealand so far. These include: 700 protozoans; 3080 plants; 5800 fungi; 10 000 insects; 2600 arachnids (spiders and mites); 200 myriapods (millipedes and centipedes); 500 snails and slugs; 1000 worms (nematodes, earthworms and flatworms); four frogs; 61 reptiles; 88 birds (land and freshwater); and two bats. It is estimated that the true number may be closer to 70 000 species.

Small, spineless or subterranean, our most diverse groups of indigenous species on land (fungi, insects and worms) are the least known and appreciated. Fungi, for example (estimated at around 20 000 species) play a vital role in ecosystems in breaking down and recycling nutrients.

New Zealand has lost a significant proportion of its large native land animals. As far as we know, in fewer than 1000 years human-induced extinctions include:

- 32 percent of endemic land and freshwater birds;
- three of seven frogs;
- one of three bats;
- three of 64 reptiles;
- 11 of the 2300 known vascular plants; and
- at least 12 invertebrates such as snails and insects.[17]

17 *Ministry for the Environment, The State of New Zealand's Environment, 1997.*

An island on the mainland?

David Bellamy called them "islands of survival" and the Department of Conservation (DoC) promotes them as "islands of hope". But if islands are supposed to be surrounded by water, what are they doing on the mainland?

Mainland islands are areas that are being intensely managed to restore former natural habitats and ecosystems. They are called islands because they are often surrounded by very different ecosystems or geographic features which effectively isolate them, and because the techniques being applied to them have been learnt and refined from our experience of restoring real islands, like Kapiti and Little Barrier.

Mainland islands come in all shapes and sizes. Currently there are six mainland island sites managed by DoC: Trounson (in Northland), Otamatuna (in Te Urewera National Park, near the East Coast), Paengaroa (near Taihape), Boundary Stream (in Hawkes Bay), Rotoiti (in Nelson Lakes National Park), and Hurunui (in Lake Sumner Forest Park, in Canterbury). A host of other sites are managed in similar ways, for example, Mapara in the Waikato. The Karori Sanctuary — which is on Council land and privately managed, but with significant central and local government funding — is another type of mainland island.

DoC has chosen the mainland island management approach as a focus for stemming local biodiversity decline. Concentrated efforts at combating pest and weed threats are combined with the recovery of threatened species in an attempt to restore entire ecosystems.

The populations of most surviving native species have been heavily reduced, with many no longer occurring across their natural distributional range. Around 1000 native species (that we know about) are considered threatened. Most of these live on land and terrestrial species constitute around 90 percent of the 400 plants and animals ranked as being most at risk.

The key threats to indigenous species on land are insufficient and fragmented habitat and introduced invasive species (animal pests and weeds), which prey on native species, compete with them, or damage their habitat and important ecosystem processes.

Invasive pests and weeds pose the greatest single threat to biodiversity on land, surpassing even habitat loss. Browsing and grazing animals, such as goats, deer, thar, pigs, cattle, sheep, wallabies, rabbits and, above all, possums, eat our native plants. Introduced predators, such as stoats, ferrets, rats and cats, prey on birds, reptiles, frogs and the larger invertebrates. Many introduced species such as wasps compete with indigenous species, disrupting ecological processes and energy flows. Without sustained pest control, much of New Zealand's protected forests would suffer significant biodiversity losses from browsing animals.

An increasing number of introduced plants are establishing themselves in the wild. New Zealand now has more introduced conifers and flowering plants in the wild than native plant species (see Figure 1.2 on page 8). At least 240 of these introduced plants have the potential to displace native plants, and this number is growing each year. Weed invasions threaten the long-term viability of many of New Zealand's natural habitats, particularly lowland and coastal plant communities already fragmented through land development.

Current management

New Zealand's response to the decline of indigenous biodiversity on land is managed through a comprehensive conservation and resource management framework. It involves national, regional and local government agencies, as well as iwi and hapu, numerous community and environmental groups, landowners and resource users. Key government agencies include the Department of Conservation (DoC), responsible for managing public conservation lands, and regional and city and district councils, jointly responsible for the sustainable management of other land areas. The Ministry of Agriculture and Forestry has a role in regulating sustainable indigenous forest management.

Biodiversity management efforts are targeted at both habitat and species levels, and include:

- identifying and protecting remaining habitats important for indigenous biodiversity;
- restoring scarce or degraded habitats and ecosystems;
- managing threats from pests and the effects of human activities; and
- managing the recovery of threatened native species.

A tendency to separate the management of species from their habitats is recognised as a problem that is starting to be addressed through a stronger ecosystem focus in management programmes.

Habitats protected within public conservation lands comprise about eight million hectares, most of which are in mountainous areas; lowland forests make up only 16 percent of the protected forests within these areas, despite accounting for about 50 percent of New Zealand's original forest area. Under-represented habitats are being identified through the Protected Natural Areas Programme (PNAP) administered by DoC. The aim of this programme is to protect examples of the full range of ecosystems and landscape features of New Zealand, to help maintain the distinctive natural character of the country. The Crown also protects areas that are internationally or nationally outstanding, distinctive or rare, and these areas may be beyond what is purely representative. Local authorities are also undertaking indigenous habitat inventory work as part of their resource management functions.

Although New Zealand has extensive areas that are formally protected, 70 percent of our land is in private ownership. Most of the remnant natural areas on private land are there by the conscious choice of landowners and their forebears. Sustaining biodiversity on private land requires the active assistance of willing landowners. Many landowners want to contribute, but want to be sure that their efforts are part of a coherent larger programme; they are also looking for partnerships based on mutual respect of their rights and responsibilities along with those of management agencies and other interest groups.

Habitats are being protected on private land through government and private-funded covenants and other mechanisms (such as reserve, protected private land and resource consent provisions). Individual landowners are also choosing to fence off and maintain remnant areas of bush, riparian margins and wetlands on their land using their own resources.

"Beetle banks" — farmland refugia for biodiversity

There is growing appreciation among New Zealand's farming communities that enhancing biodiversity contributes to both the health and wealth of highly modified farm ecosystems.

In Canterbury, some recent work by Lincoln University has focused on cropping practices and boundary features, such as shelter-belts, as means of cultivating invertebrate biodiversity. Surveys of a Pinus radiata shelter-belt revealed, among the introduced grasses growing beneath the trees, 20 different spider groups, 13 of which were endemic. Over 300 spiders per square metre were found in this habitat. In contrast, only half the spider groups were found in an adjacent paddock and one-third of the density of spiders. Another habitat with surprising native insect diversity is found in crops and particularly along their boundaries. A survey of carrot paddocks, for example, found 33 species of native rove beetles in just two fields. Practices such as leaving uncultivated field margin areas and planting woody native plants along fence lines or in field corners have also been shown to serve as insect refugia.

The diversity of native insect species has also been shown to be boosted by providing pollen and nectar, which are required by many native predatory and parasitic insects, from introduced plants such as phacelia, buckwheat and common garden alyssum. These insects are beneficial in agricultural and horticultural systems to help control plant-eating insect pests.

Summary of issues

Protecting ecosystems and habitats

Many distinctive natural habitats and ecosystems are under-represented in New Zealand's protected area network[18], including lowland and coastal forest remnants, dunelands, natural shrublands, wetlands, and lowland tussocklands. Many of these habitats are scarce, located on private land and vulnerable to further loss.

- There is a need for the consistent identification of significant remnant natural habitats through enhanced survey and assessment programmes and coordinated databases, to determine relative biodiversity value and therefore national and local protection priorities.
- Resource Management Act (RMA) provisions to promote the protection of significant indigenous vegetation and habitats have not been effectively implemented across New Zealand. This is due to: difficulties in defining the meaning of "significant"; the lack of clarity over values to be protected; uncertainty over the right mix of rules and non-regulatory methods; ineffective consultation with landowners; resourcing problems in local authorities; and unresolved issues relating to private property rights, community benefit and cost sharing.

18 *The terms "protected area network" and "protected area" refer to areas that are protected primarily for nature conservation purposes or to maintain biodiversity values, using a range of legal mechanisms that provide long-term security of either tenure or land use purpose. They may be either publicly or privately owned.*

- Regulation alone is not a preferred option to protect remnant natural areas on private land. Many landowners actively manage remnant habitats now and want to be acknowledged for, and assisted in, what they are doing. Landowners generally don't react positively to being told what to do on their land, therefore regulation is likely to be counterproductive and also risks losing many private "conservators" across the country. Nor is it possible to monitor and enforce a regulation-based regime on the scale that would be necessary. Securing the willing and active participation of landowners is therefore pivotal to sustaining indigenous biodiversity on private land.
- The use of incentives to facilitate voluntary protection of indigenous biodiversity on private land has not been fully explored or tapped, despite the significant progress made through the Nature Heritage Fund, Nga Whenua Rahui, the Queen Elizabeth II (QEII) Trust, and regional initiatives such as the Taranaki Tree Trust.
- Existing funding cannot meet current demands on the Nature Heritage Fund, Nga Whenua Rahui and QEII Trust, nor provide assistance for ongoing pest management to maintain biodiversity values in areas protected through these mechanisms.
- Unsustainable logging of indigenous forests on Crown-managed land may be inconsistent with goals to conserve and sustainably use indigenous biodiversity.

Habitat fragmentation

Fragmentation of natural areas through ongoing land use changes has produced many isolated remnants that are important for biodiversity but vulnerable to continuing degradation, including invasion by pests and weeds and loss of indigenous species.

- There is a need for greater recognition and action to restore fragmented, degraded or scarce natural habitat, halt declining ecological condition, restore essential ecosystem functions, and extend the area of particular habitat types.
- Restoration initiatives on both public and private land are currently constrained by gaps in knowledge about ecological processes and restoration techniques (for example, the use of corridors), a lack of incentives, and the shortage of information, practical guidelines, expertise and resources.
- There is a need for greater recognition of the opportunities to maintain, restore and reconnect fragmented, degraded or scarce habitats for indigenous species through the sympathetic management of production land and urban areas.

Plant and animal pests

Invasive introduced species (pests and weeds) pose serious threats to ecosystem functioning and the survival of indigenous species in many natural areas, on both public and private land. Pest and weed problems are pervasive and widespread, and in many cases, are increasing in both number and distribution; the costs of pest and weed control are high, and insufficient resources currently limit control effort. Many of these invasive pests also pose high costs and an ongoing threat to our primary production ecosystems.

- Current pest management efforts on public conservation lands are insufficient to maintain indigenous biodiversity; limited resources mean pest control is restricted to priority areas and, in most cases, limited to "holding the line" until new techniques for pest control can be developed.

- Threats from plant and animal pests to indigenous biodiversity on private land are not yet comprehensively or consistently addressed. Problems include: a lack of management focus under the Biosecurity Act (see Theme Five); poor coordination between agencies; limited resources among landowners for pest control; and limits of national funds (for example, the Nature Heritage Fund) to cover pest control in private protected areas.
- The increase and spread of naturalised introduced plants that have or may become invasive weeds, represent a latent, and potentially serious, threat to indigenous biodiversity.
- Gaps in our knowledge of pest species, inadequate pest control methods and technologies, and shortage of resources limit the effectiveness of pest management.
- Public and community awareness of the threats posed by pests and support for pest prevention and control methods (such as the use of 1080 poison and biotechnology) are important, but too often they are lacking (see Theme Eight).

Threatened species

About 1000 indigenous species on land are known to be at risk from insufficient or degraded habitat, plant and animal pests, or the adverse effects of human activities. Many populations of threatened species continue to decline as attention and funds are focused on a small number of highly threatened, and often most visually appealing, native species.

- Current species recovery programmes target only a limited number of the most threatened species and less attention on other threatened or poorly known species limits our ability to anticipate and prevent the decline of such species.
- Threatened species management has not always been well integrated with habitat protection and management on public and private land.
- Gaps in the current legislation (RMA, Wildlife Act and Native Plants Protection Act) and the way they interact may impede effective action to protect threatened indigenous species and ecosystems.
- There is growing interest in harvesting indigenous species on land for cultural and commercial purposes, but policy and mechanisms to effectively manage this use on a sustainable basis (except for timber production) are lacking (see Theme Seven).
- The erosion of genetic diversity within indigenous species is occurring as a result of populations of species being reduced and fragmented, and distinct local populations becoming mixed through species transfer and hybridisation (see Theme Four).

Information, awareness and priority setting

There is a continuing need for targeted research and information about indigenous terrestrial biodiversity (for example, its taxonomy, distribution, patterns of genetic flow, ecosystem function and managing threats) to support decision making, and for interactive learning between research providers and biodiversity managers (see Theme Nine).

- The diversity, distinctiveness and vulnerability of New Zealand's terrestrial habitats, ecosystems and species, and the processes that threaten them, are not well appreciated by landowners or New Zealanders in general (see Theme Eight).
- Priority setting for biodiversity conservation management (including threatened species management, habitat protection and restoration, and threat control) is not yet coordinated across the various management agencies that have responsibilities for conserving and sustainably managing biodiversity (see Theme Nine).

Incentives that work

In 1990 the Government set up an independent contestable fund — the Forest Heritage Fund (now the Nature Heritage Fund) — to protect indigenous forests and associated ecosystems on private land. Another similar fund — Nga Whenua Rahui — was established for the same purpose, but with a focus on Maori-owned land.

Now, ten years down the track, 236 740 hectares of privately owned native forests have been formally protected through acquisition, covenants, kawenata and Maori reservations; most have been fenced. Much of this land would have otherwise been logged, cleared or further browsed, with a loss of important natural habitats. Recently both funds were broadened in scope to include ecosystems other than forests, such as wetlands, dune environments and tussocklands. The new name — Nature Heritage Fund — reflects this shift (Nga Whenua Rahui retains its name).

Nga Whenua Rahui is distinct from the Nature Heritage Fund in that it is geared towards Maori landowners retaining tino rangatiratanga (ownership and control) of their land while protecting indigenous forests and other ecosystems.

A recent example of Nga Whenua Rahui helping to secure a prize piece of New Zealand's biodiversity jigsaw is an area near Whangaruru harbour in Northland. The 167 hectares of mixed virgin and regenerating coastal broadleaf forest feature a large freshwater wetland, a rarity on this coast. The area is home to the North Island brown kiwi and pateke (brown teal), both threatened species. As part of its active kaitiaki role, the managing Whanau Trust hopes to create and sustain a viable breeding population of pateke on the wetland. Nga Whenua Rahui has formally protected the area using a kawenata (or covenant) and has assisted with fencing and clearing pateke landing areas within the wetland.

Despite the success of Nga Whenua Rahui and the Nature Heritage Fund in securing areas, these funds do not currently cover ongoing pest control to maintain the ecosystems and habitats leaving these costs to landowners where areas are covenanted.

ACTION PLAN[19]

Objective 1.1 Protecting indigenous habitats and ecosystems

a) Enhance the existing network of protected areas to secure a full range[20] of remaining indigenous habitats and ecosystems.

b) Promote and encourage initiatives to protect, maintain and restore habitats and ecosystems that are important for indigenous biodiversity on land outside of protected areas.

Actions:

a) Complete indigenous biodiversity survey and assessment to identify habitats and ecosystems important for indigenous biodiversity.

Key players: DoC*, LAs*, MfE, research providers, iwi/hapu[21]

b) Add to public conservation lands those habitats and ecosystems important for indigenous biodiversity that are not represented within the existing protected area network or that are at significant risk of irreversible loss or decline, or in situations where public ownership is needed for effective management.

Key players: DoC*, LAs, iwi/hapu

c) Encourage and support initiatives to protect and maintain habitats and ecosystems important for indigenous biodiversity on private land using a mixture of mechanisms, recognising the rights, responsibilities and interests of landowners and society, including information, education, voluntary mechanisms, economic incentives, property rights and regulation.

Key players: MfE*, DoC, LGNZ, LAs, landowners, iwi/hapu

d) Prepare a national policy statement and related material to provide guidance to local authorities on implementing provisions of the Resource Management Act relevant to conserving and sustainably managing indigenous biodiversity[22].

Key players: MfE*, DoC*, MAF, LGNZ, LAs, iwi/hapu, primary production sector, landowners, NGOs, community groups

e) Expand and modify existing national funding mechanisms (the Nature Heritage Fund, Nga Whenua Rahui and Queen Elizabeth II National Trust) to meet current demand by landowners and communities where a priority, to protect habitats and ecosystems important for indigenous biodiversity, and to maintain the condition of protected areas through fencing and pest management.

Key players: DoC*, MfE*, LAs, iwi/hapu, QEII Trust, primary production sector, landowners, NGOs, community groups

**Government lead*

19 *Actions shown in bold are priority actions (see Part Four).*

20 *A "full range" of remaining natural habitats and ecosystems means the same as "comprehensive and representative range", that is, a range that reflects the known diversity of habitats and ecological communities remaining in New Zealand (see Glossary).*

21 *See page 120 for key to key players.*

22 *The Minister for the Environment has appointed a Ministerial Advisory Committee to provide advice on an agreed set of measures for effectively sustaining biodiversity on private land. This work directly picks up on this and other actions in this Strategy. The Committee will lead dialogue with landowners and other interest groups to gain agreement on the mix of measures (including an NPS) that will be used (see **www.biowhat.co.nz** for information on this process).*

f) Identify and remove legislative and other barriers to local authorities using economic incentives (such as rate relief and financial contributions for costs), and investigate new joint national and regional/local funding mechanisms to encourage and support the protection of ecosystems and habitats important for indigenous biodiversity on private land.

Key players: MfE*, DIA, LGNZ, LAs, QEII, landowners, iwi/hapu, NGOs

g) Develop and strengthen information systems to increase access by local authorities, iwi and hapu, sector groups, communities and landowners to indigenous biodiversity survey and ecosystem data and information about indigenous biodiversity management priorities and protection mechanisms.

Key players: MfE*, DoC, LGNZ, LAs, iwi/hapu, primary production sector, NGOs, community groups

h) Promote landowner and community awareness of opportunities to conserve and sustainably use indigenous biodiversity, and to protect and maintain habitats and ecosystems of importance to indigenous biodiversity on private land.

Key players: LAs*, MfE*, DoC*, MAF, TPK, QEII, landowners, iwi/hapu

i) End unsustainable logging of indigenous forest on Crown-managed land as soon as is practicable.

Key players: Treasury*, MAF, DoC

j) Review and phase out indigenous forest logging on Crown-managed land as soon as is practicable.

Key players: Treasury*, MAF, DoC

Objective 1.2 Sympathetic management

Integrate and use measures in the sustainable management of production lands and urban environments that are sympathetic to indigenous biodiversity.

Actions:

a) Incorporate indigenous biodiversity priorities into programmes for sustainable land management, including those under the Sustainable Land Management Strategy and related strategies and provide advice on giving effect to these priorities.

Key players: MfE*, DoC, LAs, iwi/hapu, primary production sector, landowners, NGOs, community groups

b) Encourage and support the protection, maintenance and restoration of indigenous biodiversity in urban environments, recognising the importance of urban initiatives to enhance community awareness of, and involvement in, biodiversity conservation.

Key players: MfE*, DoC*, research providers, LAs, iwi/hapu, NGOs, community groups

Objective 1.3 Pest management in habitats and ecosystems

Prevent, control and manage plant and animal pests, to maintain or improve the condition and health of habitats and ecosystems important for indigenous biodiversity.

Actions:

a) **Develop and implement strategies and plans, including national and regional pest management strategies, to manage those plant and animal pests posing significant threats to indigenous biodiversity.**

Key players: DoC*, MAF*, RCs*, Biosecurity Council, TLAs, landowners, iwi/hapu, community groups

b) Review and address barriers to agencies integrating an indigenous biodiversity focus in national and regional pest management strategies under the Biosecurity Act (see Theme Five).

Key players: Biosecurity Council*, RCs

c) **Increase plant and animal pest control and management efforts to levels congruent with national biodiversity goals in areas on protected public conservation lands important for indigenous biodiversity.**

Key players: DoC*, iwi/hapu, community groups

d) **Increase research into, and development of, new technologies and techniques to combat existing and emergent threats from plant and animal pests to indigenous biodiversity.**

Key players: DoC*, RCs*, MoRST, FRST, research providers, iwi/hapu, primary production sector, landowners

Objective 1.4 Terrestrial habitat restoration

Restore areas of degraded or scarce habitats and ecological processes that are priorities for indigenous biodiversity.

Actions:

a) **Expand habitat and ecosystem restoration programmes and initiatives (including those on offshore islands, "mainland islands", kiwi sanctuary zones, and other sites within production lands and urban areas) to restore scarce or under-represented indigenous habitats and ecosystems to a healthy functioning state.**

Key players: DoC*, LAs*, iwi/hapu, research providers, landowners, NGOs, community groups

b) Develop and implement regionally based restoration strategies identifying priority areas for restoring biodiversity and develop opportunities for collaboration both within and between regions.

Key players: DoC*, RCs*, TLAs, MfE, research providers, landowners, NGOs, community groups, iwi/hapu

c) Encourage community understanding of, and involvement in, programmes and activities to protect, maintain and restore indigenous biodiversity through showcase projects and volunteer programmes, and improve access to information, technology, expertise and resources.

Key players: DoC*, MfE*, LAs*, iwi/hapu, NGOs, community groups, landowners

d) Promote the use of local indigenous species for restoration projects and programmes.

Key players: DoC*, LAs, iwi/hapu, NGOs, community groups, landowners

Objective 1.5 Threatened terrestrial species management

Enhance populations and distributional ranges of indigenous species and subspecies threatened with extinction and prevent additional indigenous species and ecological communities from becoming threatened.

Actions:

a) **Increase planned recovery actions to cover priority threatened indigenous species and subspecies (including kiwi sanctuary zones) so that viable representative populations are maintained in habitats and ecosystems important for indigenous biodiversity.**

Key players: DoC*, research providers, iwi/hapu, industry, NGOs, community groups

b) Review the Wildlife and Native Plant Protection Acts in terms of their effectiveness in protecting threatened indigenous species and ecosystems, taking into account mechanisms under the RMA and other relevant legislation.

Key players: DoC*, MfE

THEME 2

Freshwater Biodiversity

Scope

All freshwater ecosystems (such as streams, lakes, wetlands, geothermal systems and underground aquifers) and the freshwater species within them. These waterbodies and ecosystems are interconnected with both land and estuarine and coastal ecosystems.

Desired outcome for 2020

The extent and condition of remaining natural freshwater ecosystems and habitats are maintained. Some degraded or scarce habitats, such as lowland river systems, important wetlands and riparian areas, are restored or increased in area. Intact natural freshwater areas are protected and their natural character is maintained.

Human activities in catchments are managed in an integrated way, avoiding, remedying or mitigating the adverse effects of land and water use (including pollution and sedimentation) on freshwater ecosystems. All freshwater ecosystems support biological communities largely comprising indigenous species. Plant and animal pests are managed to prevent further spread, and eradicated where necessary, to protect threatened indigenous ecosystems and species. Introduced fish (including sports fish such as trout and bio-control species such as grass carp) and introduced game (such as ducks) are managed so that they do not pose threats to indigenous species of plants or animals.

There have been no further human-induced extinctions of indigenous freshwater species. Threatened species are on their way to recovery within their natural habitat, or in temporary ex situ facilities where necessary. The harvest of indigenous and introduced freshwater species is sustainable and does not pose a threat to freshwater biodiversity.

Land managers and communities continue to be actively involved in protecting and restoring freshwater bodies and habitats of special value to them.

State of freshwater biodiversity

New Zealand has over 70 major river systems and numerous streams, with over four million kilometres of channel covering about 3000 square kilometres. A few of these rivers include significant channels within cave systems, and many of them are interconnected with underground freshwater sources. Most rivers, for part of their length, flow through farmland and many also flow through urban areas. Although a significant proportion of upland streambed is included within protected areas, very few lowland river systems have any form of protection. Many are ecologically degraded through biological invasions, reduced water quality, channelisation, sedimentation and removal of floodplain connections, all of which have adversely affected freshwater biodiversity.

The habitat of some freshwater species (for example, blue duck) is now severely restricted. Only a couple of complete river systems still lie within unmodified catchments and remain free of introduced species.

There are over 770 lakes and innumerable ponds, covering around 3400 square kilometres. People have also created numerous lakes and ponds, and these, and some natural lakes, are managed for a variety of purposes including water supply and power generation. Their biodiversity values vary widely. The 30 or so large deep lakes are of generally high water quality and some support almost intact indigenous ecosystems. However, many of the around 700 shallow lakes are degraded by nutrient enrichment causing eutrophication — a few to the extent that they are incapable of sustaining fish life. Most of the fish communities are dominated by introduced species, and invasive exotic plant species are extensive in most lake systems.

Wetlands represent some of New Zealand's most diverse ecosystems. However, swamps, bogs and marshes now cover only 1000 square kilometres, representing a loss of over 90 percent of the original area of wetland systems. There is great regional variation in the extent of loss, ranging from 63 percent in Southland to 99 percent in the Bay of Plenty. Of the remaining wetlands, many are degraded to varying extents by weed invasions, stock access, modifications to hydrological regimes, and barriers to fish migration. However, some of the remaining wetlands are large and have internationally significant biodiversity values, as do some remaining geothermal areas.

As a result of pressures on freshwater habitats, and the effects of introduced species, pests and weeds and harvesting pressures, many freshwater species (particularly birds and insects) have a significantly restricted distribution. One third of the 29 identified species of indigenous freshwater fish is threatened.

There are still sizeable gaps in our knowledge of freshwater species (particularly in relation to algae and invertebrates) and of habitat requirements (including effects of riparian management). Public awareness, and to a lesser extent scientific effort, have been focused on the more obvious species, especially fish and birds.

Riparian reserves at Lake Taupo don't just benefit the trout

Lake Taupo is New Zealand's largest lake and is an important tourist, recreational and environmental asset. Its waters have generally remained clear and clean, thanks to initiatives of the local community and the Council in planning to protect the water quality in the lake as the district grew up around it. However, as development grows, the water quality of the lake is coming under increasing pressure.

Action was first taken in the 1950s, at a time of rapid development. Some 20 000 hectares of buffer reserves were created around the margin of Lake Taupo and the waterways that feed it. Urban development was carefully planned, with key areas reserved or land uses restricted. By 1981, around 6000 hectares of land had been reserved for conservation purposes, and a further 12 000 hectares had limited land uses.

Although the riparian buffer reserves are not continuous around the river margins and lakeshore, their presence reduces sediment and nutrients entering the lake, and also benefits biodiversity. They protect important spawning grounds for trout, and also habitat for many native fish and freshwater invertebrate species.

Monitoring of a riparian reserve along the Whangamata Stream near Taupo has shown an increase in the variety of native plants and trees, as the original riparian plantings have undergone their own "succession" — with new woody native species invading the flax-dominated stream banks. Fernbirds, fantails, bellbirds and pukeko have returned, and the stream is now an important wildlife area.

Most of these changes have occurred on private land, but Environment Waikato (the regional council), Taupo District Council and DoC, with assistance from iwi, have also helped to manage some of the riparian reserves. Some of the older reserves are now being used as showcases to demonstrate the benefits of riparian protection.

Current management

Freshwater management is characterised by relatively complex and sometimes overlapping responsibilities for freshwater environments and species, under a large number of laws. Natural waters are vested in the Crown and managed and allocated by regional councils, while DoC, Land Information New Zealand (LINZ), regional councils and territorial authorities have various responsibilities for managing the beds of waterbodies and their surrounding land areas. Freshwater species are managed by DoC (most indigenous species), the Ministry of Fisheries (Mfish) (fish species for which there is some commercial harvesting), or fish and game councils (sports fish and game birds).

Freshwater biodiversity issues are largely addressed within a broader water management context. A number of policy mechanisms are used or are being developed to manage freshwater resources. These include: RMA planning tools, such as district and regional plans; initiatives under the Sustainable Land Management Strategy and National Agenda for Sustainable Water Management (NASWM); the Environmental Performance Indicators programme; the 1986 New Zealand Wetlands Management Policy; the 1994 New Zealand Coastal Policy Statement; water conservation orders; conservation management strategies; and iwi management plans.

Some waterbodies, principally lakes and wetlands, are partly protected within public conservation lands or on private land. Wetlands are now eligible for Nature Heritage Fund and Nga Whenua Rahui funding for protection. Very few rivers are protected for all or even most of their length, although eight water conservation orders (four more are pending) protect the waters of outstanding rivers or lakes.

Summary of issues

Managing freshwater habitats and ecosystems

The threats to freshwater biodiversity are diverse and pervasive. Many land use practices adversely affect freshwater biodiversity, through their effects on freshwater habitats and ecosystems, including underground water systems. These practices include drainage, flood control schemes, removal of riparian vegetation, stock access and the addition of sediment, nutrients and contaminants from agricultural, forestry, industrial, residential and urban runoff. Management responsibilities and accountabilities are often not clearly specified in the freshwater environment.

- Reduced flows in some rivers limit freshwater biodiversity, and therefore water allocation decisions — often seen primarily as an economic issue — may have significant biodiversity implications.
- Barriers to fish migration in rivers can prevent fish from completing their life cycles; most indigenous fish species are diadromous (meaning that they migrate to and from the sea) and most catchments in New Zealand have some artificial barriers. For some species (such as eels) the effects of the barriers preventing downstream migration to spawning grounds may be the hardest to overcome.
- Poor water quality in many rivers also frequently limits freshwater biodiversity, and therefore decisions about land use, as well as discharges to water, have significant implications for aquatic biodiversity.
- The grazing and drainage of significant wetlands continue to reduce and degrade wetland habitats and ecosystems. Estuarine habitats — important to the life cycle of diadromous fish such as whitebait and some commercial fisheries such as snapper — are often most at risk from land use activities and coastal development. Indigenous freshwater biodiversity values have not yet been adequately incorporated into sustainable land management strategies and production sector strategies.
- Possible sea level rise may also pose a threat to estuarine habitats and flood plain wetlands.
- Geothermal ecosystems whose surface features are reserved may still be at risk from the effects of energy or fluid extraction through use of connected fields.
- There are very few freshwater ecosystems remaining in their original or pristine state, and without active management these may be at risk of loss of indigenous biodiversity and as benchmarks to compare with more modified ecosystems.
- Management of freshwater biodiversity presents special challenges because of the need to integrate land, water and fisheries management and to coordinate the use of a range of policy and management tools. The fragmented and overlapping responsibilities for management of freshwater ecosystems do not help effective coordination and integration, and accountabilities of agencies that share responsibility are often inadequately specified. The need for coordination also applies to the areas between freshwater and coastal environments.
- The Crown's property and other interests in freshwater biodiversity are generally not well specified and in some instances are being challenged by iwi.

Protection of freshwater habitats

The existing network of protected areas includes some freshwater bodies, but is far from representative of the full range of freshwater ecosystems and habitats.

- Information about protection priorities is deficient, but key areas known to be poorly represented include lowland lakes and rivers, floodplain wetlands, mid-altitude wetlands, and geothermal ecosystems.
- The gap between land and freshwater environments in achieving representative protected areas suggests that a different approach is required in protecting freshwater ecosystems, with a special focus on the sympathetic management of freshwater and surrounding land areas.
- Protecting freshwater biodiversity requires a high level of coordination between management agencies to ensure protection mechanisms are applied in a complementary and integrated way.

Freshwater biosecurity and pest control

Many freshwater ecosystems are subject to a high degree of invasion by introduced pest species, significantly affecting indigenous habitats and ecological processes (see Theme Five and box on page 84).

- Most freshwater ecosystems have been significantly modified by introduced species.
- Many animal and plant pests are highly invasive in freshwater environments, but are not detected until the extent of their spread makes them difficult to control.
- Effective technologies for control or eradication of known pests (for example, koi carp) are not always available.
- Policies, responsibilities and accountabilities for containing the spread of already established introduced freshwater species that have the potential to become serious pests are not fully developed.
- The illegal transfer and release of aquatic species create significant risks to indigenous freshwater biodiversity.

Saving the dwarf inanga

Dwarf inanga is a small endemic galaxid fish, distinctive as our only native freshwater fish species which is fully adapted to living in lake environments. Its natural distribution is restricted to only a few dune lakes in Northland. Populations of dwarf inanga have declined over the last 30 years and the species is ranked as threatened. Currently, the National Institute of Water and Atmospheric Research (NIWA) is carrying out research in several of the lakes to try and isolate what is causing the fish's decline.

One idea was that the inanga were being preyed on by rainbow trout that had been stocked in some of the lakes. However, trials have shown that the presence of the trout does not seem to affect the abundance of the inanga. Recent trials are pointing to the mosquitofish (a native of southwest USA) — introduced around the world to control mosquitoes — as the culprit. Despite being smaller, the mosquitofish has been observed in Northland to kill or immobilise dwarf inanga. Scientists are now wondering if the trout may help the survival of the inanga by preying on the mosquitofish.

Management trials are continuing, but now with a much clearer idea of the relationships between the indigenous and introduced fish in the lakes. With expansion of the mosquitofish range in the North Island, questions are also being asked about its possible role in the decline of other native fish and aquatic invertebrates.

Protection of indigenous freshwater species

Indigenous freshwater species are threatened from a variety of causes, including land use impacts and competition or predation from pest species.

- Protection of threatened freshwater species depends largely on protection or restoration of their habitat, including the physical and biological characteristics of the habitat.
- Our knowledge of the distribution and taxonomy of many indigenous freshwater species is limited. Existing survey and monitoring programmes are generally not sufficient to define freshwater biodiversity or to identify changes in freshwater species composition and abundance or habitat condition.
- The effects of some introduced species on indigenous freshwater biodiversity are not fully understood.
- We do not have sufficient knowledge about all freshwater species that are commercially harvested (for example, eels) to be confident that their harvest is sustainable in some areas.
- Some rare or vulnerable freshwater species (such as giant and short-jawed kokopu fish) are harvested as part of otherwise sustainable whitebait fisheries. This can create difficulties in providing a secure status for such species and for protecting fragile populations from unnecessary harvest.

Cultural and economic values and awareness of freshwater biodiversity

New Zealanders hold a range of cultural and economic values in relation to freshwater environments and fisheries that can both complement and conflict with the conservation of indigenous biodiversity.

- Recreational fishing for species such as trout, salmon or whitebait is highly valued by many New Zealanders (and overseas visitors). This creates a strong interest in the protection and restoration of freshwater habitat, but sometimes also creates a potential conflict between the protection of indigenous and introduced species.
- Maori cultural values with respect to water quality and interests in protecting freshwater ecosystems and habitats to enable the use of freshwater species generally complement objectives to conserve and sustainably use freshwater biodiversity (see Theme Seven).
- There is a generally low level of public understanding of the special characteristics, values and vulnerabilities of freshwater biodiversity (see Theme Eight).

Trout and indigenous biodiversity

Trout were first introduced into New Zealand in 1867. They were liberated widely and are now present in nearly all freshwater systems throughout the country except on Stewart Island. Trout are the backbone of New Zealand's freshwater game fishery. However, they have also had significant adverse impacts on indigenous freshwater species and ecosystems, and their continuing effects are not fully understood.

The effects of trout on indigenous freshwater biodiversity are considered under the Conservation Act as part of the process of preparing sports fish and game plans for approval by the Minister of Conservation, or in the case of national parks and reserves, as part of DoC's management plan reviews. Fish and game councils, DoC, iwi authorities, regional councils, territorial local authorities and members of the public all have an opportunity to participate in these processes.

The New Zealand Fish and Game Council has adopted a policy that trout should not be introduced into catchments where they are not already present. On the basis of current knowledge about the interaction between trout and indigenous freshwater biodiversity, the New Zealand Biodiversity Strategy does not promote a significant reduction in the current distribution of trout. However, in some places (at the margins of their distribution) where trout threaten indigenous species or the natural character of pristine ecosystems, they may need to be reduced or removed.

A significant part of the work of fish and game councils is concerned with protecting and enhancing habitat for trout, which usually also benefits the indigenous species that live in these places.

ACTION PLAN[23]

Objective 2.1 Protection and sustainable management of freshwater ecosystems[24]

a) Ensure that management mechanisms, including mechanisms under the Resource Management Act and protected area statutes, adequately provide for the protection of freshwater biodiversity from adverse effects of activities on land and in water.

b) Protect a full range of remaining natural freshwater ecosystems and habitats to conserve indigenous freshwater biodiversity, using a range of appropriate mechanisms.

Actions:

a) **Provide appropriate national guidance and assistance to decision makers and management agencies on the protection of freshwater biodiversity through a national policy statement on biodiversity, the National Agenda for Sustainable Water Management (NASWM) and the Sustainable Land Management Strategy.**

Key players: MfE*, DoC, MAF, LAs, LGNZ, iwi/hapu, primary production sector, NGOs[25]

b) **Develop and apply a comprehensive classification system for freshwater ecosystems, in line with the framework and criteria developed under the Environmental Performance Indicators Programme, to help identify protection priorities.**

Key players: MfE*, DoC, research providers, RCs, iwi/hapu

c) **Progressively protect priority representative freshwater habitats, using a suite of protective mechanisms.**

Key players: DoC*, MfE, LGNZ, RCs, QEII Trust, Landcare Trust, F&GNZ, NGOs, iwi/hapu

d) Review the range of available protective mechanisms for freshwater biodiversity and determine any required changes to improve their efficiency and effectiveness, including the removal of disincentives to protection.

Key players: DoC*, MfE, LAs, iwi/hapu, primary production sector, land managers, community groups, QEII Trust

e) Support, and where necessary develop, joint national and regional/local incentive mechanisms for protecting scarce and under-represented freshwater bodies and their surrounding areas on private land, and provide support to landowners to maintain the biodiversity values of these areas (see Action 1.1f).

Key players: DoC*, MfE, LAs, iwi/hapu, primary production sector, land managers, community groups, QEII Trust

**Government lead*

23 *Actions shown in bold are priority actions (see Part Four).*

24 *Objectives 2.1a and b are interrelated and actions a) — h) will collectively contribute to their achievement.*

25 *See page 120 for key to key players.*

f) Provide advice and support to land managers and communities (both rural and urban) who wish to protect freshwater waterways, wetlands and habitats in their area to encourage the protection of areas that are a priority for indigenous freshwater biodiversity.

Key players: DoC*, MfE, LAs, iwi/hapu, primary production sector, land managers, community groups, QEII

g) Develop clear national criteria for protecting and managing biodiversity in wetlands and geothermal systems through a review of the 1986 Wetlands Policy and 1986 Geothermal Policy, and incorporate in a national policy statement on biodiversity (see Action 1.1d).

Key players: DoC*, MfE*, RCs, F&GNZ, MoC, iwi/hapu, NGOs

h) Expand monitoring procedures (and establish new ones) for freshwater bodies (including lakes, rivers, underground systems, wetlands and geothermal systems) important for indigenous biodiversity to enable early action to maintain these ecosystems.

Key players: DoC*, MfE, research providers, RCs, iwi/hapu

Objective 2.2 Managing pests in natural freshwater habitats and ecosystems

Prevent, control and manage plant and animal pests that pose a threat to indigenous freshwater biodiversity.

Action:

a) Develop and implement strategies and plans, including national and regional pest management strategies, to manage those plants and animals posing a threat to indigenous freshwater biodiversity and those potential pest species already present in New Zealand but not yet widespread.

Key players: DoC*, RCs*, Biosecurity Council, MAF, iwi/hapu, research providers

Objective 2.3 Freshwater habitat restoration

Restore areas of degraded or scarce natural freshwater habitat and ecosystems that are priorities for indigenous biodiversity.

Actions:

a) Develop and implement regionally based strategies and action plans to prioritise, restore and maintain priority freshwater and riparian ecosystems and to provide opportunities for collaboration between regions and between land and water managers.

Key players: DoC*, MfE*, LAs, iwi/hapu, F&GNZ, NGOs

b) Compile regional inventories of significant artificial barriers to the migration to and from the ocean of indigenous freshwater species and progress priority actions to restore fish passage.

Key players: DoC*, RCs, F&GNZ, iwi/hapu

Objective 2.4 Threatened freshwater species management

Enhance population numbers and ranges of indigenous freshwater species threatened with extinction and prevent additional species and ecological communities from becoming threatened.

Actions:

a) Extend threatened species priority-setting systems to cover indigenous freshwater species.

Key players: DoC*, NGOs, research providers, iwi/hapu

b) Increase and implement planned recovery actions to cover priority threatened freshwater species so that viable representative populations are maintained or restored across their natural range.

Key players: DoC*, research providers, LAs, NGOs, iwi/hapu

Objective 2.5 Management of freshwater species for harvest

Ensure that harvest of indigenous and introduced freshwater species and associated activities do not adversely affect indigenous freshwater biodiversity.

Action:

a) Ensure fisheries management planning assesses risks to threatened indigenous species from their harvest and from introduced species, and take appropriate action to manage these risks, and where necessary, clarify fisheries management responsibilities.

Key players: DoC*, Mfish, F&GNZ, NGOs, iwi/hapu

THEME 3

Coastal and Marine Biodiversity

Scope

Coastal and marine environments including estuaries, inshore coastal and offshore areas within New Zealand's territory and other jurisdiction (including the Exclusive Economic Zone) and the resident and migratory marine species (plants, benthic organisms, fish, marine mammals, birds and other organisms) inhabiting these areas.

Desired outcome for 2020

New Zealand's natural marine habitats and ecosystems are maintained in a healthy functioning state. Degraded marine habitats are recovering. A full range of marine habitats and ecosystems representative of New Zealand's indigenous marine biodiversity is protected.

No human-induced extinctions of marine species within New Zealand's marine environment have occured. Rare or threatened marine species are adequately protected from harvesting and other human threats, enabling them to recover.

Marine biodiversity is appreciated, and any harvesting or marine development is done in an informed, controlled and ecologically sustainable manner[26].

No new undesirable introduced species are established, and threats to indigenous biodiversity from established exotic organisms are being reduced and controlled.

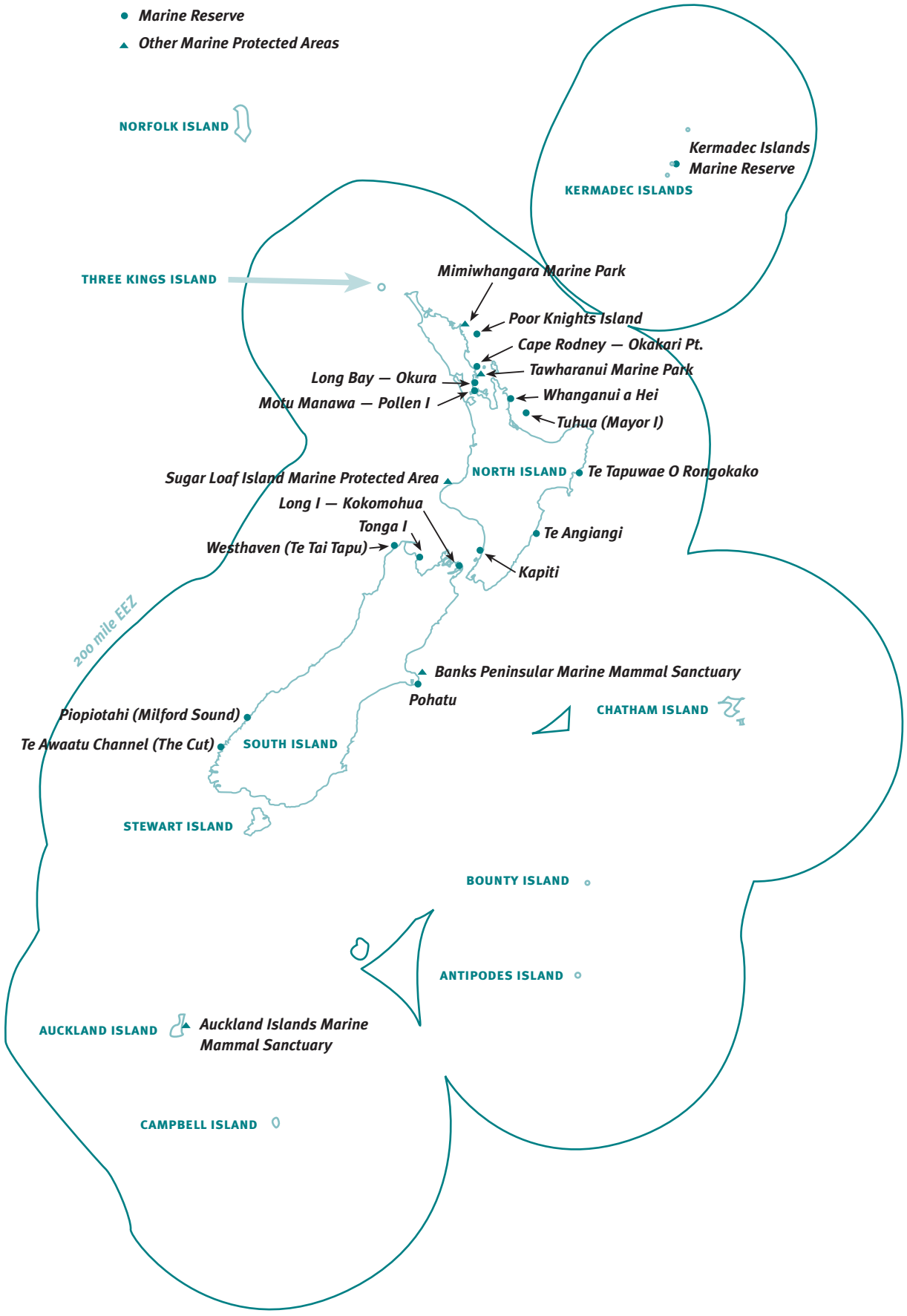
State of coastal and marine biodiversity

New Zealand's Exclusive Economic Zone (EEZ) extends from the edge of the territorial sea (12 nautical miles from shore) to 200 nautical miles (370 km) from shore and covers 430 million hectares — more than 15 times New Zealand's land area. Figure 3.2 shows the extent of New Zealand's marine environment.

New Zealand's coastal and marine ecosystems and species are highly diverse. This is due to a combination of factors — our geological history and isolation, the range and complexity of habitats, and the influence of some major ocean currents. The result is a wide variety, but patchy distribution, of coastal and marine plants and animals.

26 *The Fisheries Act 1996 requires that any adverse effects of fishing on the aquatic environment be avoided, remedied or mitigated, and the biological diversity of the aquatic environment be maintained.*

Figure 3.2: New Zealand's Marine Environment and Protected Marine Areas[27]



27 *Figure 3.2 shows the location of marine reserves and other marine protected areas; it does not include mataitai, taiapure or other fisheries management areas.*

About 8000 marine species have been described in New Zealand waters, including 61 seabirds, 41 marine mammals, 964 fish (of which 108 are endemic), 2000 molluscs (snails, shellfish and squid), 350 sponges, 400 echinoderms (kina, starfish and so on), 900 species of seaweeds and 700 species of micro-algae. These make up almost one-third of New Zealand's total number of described indigenous species.

However, there are many more to be discovered, with seven new species being identified on average each fortnight. Marine scientists estimate that perhaps as much as 80 percent of New Zealand's indigenous biodiversity is found in the sea. While many of our marine fish are found in other countries' seas, many of our benthic (bottom dwelling) marine species are endemic to New Zealand.

New Zealand is visited by a number of migratory species, and provides habitat that is critical to the long-term viability of some of these species, particularly for marine birds that breed in New Zealand.

Evaluating the state of New Zealand's marine and coastal biodiversity is difficult due to our very limited information.

Although our coastal waters and habitats are generally of high quality by international standards, they are under stress in some areas, particularly estuaries near towns and cities and the mouths of large rivers. Some 390 million tonnes of sediment are washed from the mainland into the sea each year, contributing to the decline of some estuarine and inshore habitats. Point source discharges and contaminated runoff also have impacts. Many estuarine ecosystems have been lost or damaged through land reclamation, encroachment from land development, and other human activities.

Estuarine and other coastal ecosystems are also threatened by the invasion of exotic species such as the Asian date mussel and Undaria seaweed. These species are spread by vessels transporting ballast water, hull encrustations, and marine farming equipment from one marine area to another.

Many coastal fish stocks were heavily reduced between 1965 and 1985 following deregulation of the industry. Since the introduction of the fisheries Quota Management System (QMS), most QMS stocks for which biomass and productivity data are known are thought to be above sustainable levels. However, for over half of the stocks managed under the QMS, too little is known to be able to assess whether harvesting levels are sustainable. It is known that for several species (including snapper and orange roughy) some stocks have been depleted below levels judged to produce maximum sustainable yields.

With hunting of marine mammals banned in New Zealand waters since 1978, most whale and dolphin species are recovering or at least holding their own. Fur seal and sea lion numbers appear to be recovering, although their populations are a fraction of their original size. Fisheries by-catch (capture of non-target species) remains a problem for some species, such as Hector's dolphin, New Zealand sea lion, and albatross, although programmes are underway to protect these species.

Shellfish and some other marine invertebrates remain vulnerable to overharvest and to habitat degradation, caused by sediment from rivers, pollution, changes in sea temperatures and fishing activities such as the dragging of heavy nets along the sea floor.

Many of our marine species spend part of their lives in international waters, particularly in the southern ocean, so the state of these areas is of importance to New Zealand's marine biodiversity. New Zealand also has interests in resources in international waters, for example in the marine area around New Zealand's Antarctic territory — the Ross Dependency.

Current management

New Zealand's coastal and marine environment is managed by several different agencies, often for competing economic, social and environmental purposes. Responsibilities for managing coastal and marine biodiversity are shared between central and local government. Mfish manages fisheries under the Fisheries Acts and is responsible for some aspects of marine biosecurity, DoC looks after protected areas and species, and DoC and regional councils together manage coastal resources (excluding fishing and many significant fishing impacts) under the RMA[28].

Local authorities manage land use impacts and discharges, which also impact on marine ecosystems and biodiversity. Discharges from shipping are managed by regulations under the RMA inside the territorial sea and through rules administered by the Maritime Safety Authority outside territorial waters. Mining is subject to the Crown Minerals Act 1991 in both the territorial waters and the larger EEZ. Within territorial waters, regional councils are responsible for managing the environmental effects of mining and other activities under regional coastal plans and the New Zealand Coastal Policy Statement.

Management of the marine environment over the last century has largely focused on sustaining fisheries for use, rather than protecting marine biodiversity for its own sake. This differs from our approach on land where there has been a greater emphasis on protecting species and their habitats (see Theme One). Only a limited number of species are protected under law — our marine mammals (protected under the Marine Mammals Protection Act 1978), most seabirds and a small number of other species (spotted black groper, marine reptiles, black and red corals)(protected under the Wildlife Act 1953). Approximately 4 percent[29] of the territorial sea is protected in marine reserves that are established for scientific purposes under the Marine Reserves Act 1971.

In response to increasing global pressure on marine resources, international management regimes are being developed. The United Nations Convention on the Law of the Sea (UNCLOS) was signed in 1982 and provides a standard international regime for ocean spaces including the territorial sea, the EEZ (which had previously been a global common), and the continental shelf. UNCLOS provides for a sustained yield fisheries regime, as well as the protection of the marine environment. New Zealand has until 2006 to delineate the outer limit of the continental shelf and define our jurisdiction over seabed resources in this area.

Further agreements have added to New Zealand's marine responsibilities. New Zealand has recently signed the United Nations Fish Stocks Agreement, which provides a framework for managing fish stocks that are migratory or extend beyond the EEZ. The Convention on the Conservation of Migratory Species (Bonn Convention) will also provide mechanisms for New Zealand's involvement in managing biodiversity beyond our territorial limits.

New Zealand is also party to treaties covering the protection of the Antarctic and its marine living resources. Legislation implementing these treaties is administered by the Ministry of Foreign Affairs and Trade.

28 Section 30(2) of the RMA excludes the control of harvesting or enhancement of fisheries from regional council functions, where the purpose of the control is to conserve, enhance, protect, allocate or manage any fishery.

29 The 735 000 hectare marine reserve around the Kermadec Islands is much larger than any other marine reserve in New Zealand to date. If excluded this percentage is reduced to about 0.1 percent.

Seamounts — jewels of the ocean

Beneath the vast surface of New Zealand's EEZ, pinnacles and plateaux rise from the ocean depths. Known as seamounts, these undersea hills and mountains are home to diverse marine organisms.

New Zealand, with its complex undersea landforms, has many and varied seamounts scattered throughout the region. Many have only recently been discovered. The marine life inhabiting our seamounts is poorly known and many species have yet to be described. However, we do know that seamounts host many unusual and unique species and have rich biodiversity. Species include benthic (bottom dwelling) animals like bryozoans (small coral-like animals), corals (some growing in "trees" up to 15 metres tall), sea stars, sea cucumbers, sponges, molluscs, anemones and crabs. Seamounts also attract fish and so have become favoured sites for deep-sea fishing for species like orange roughy, oreo and cardinal fish.

There is growing concern among marine scientists in New Zealand about the impact of deep sea fishing using bottom-dragging trawl nets on seamount communities, for example within the Chatham Rise fishery. Research on seamounts south of Tasmania has shown destructive effects in heavily trawled areas. Deep-sea benthic species are particularly vulnerable to disturbance because they are generally slow to grow and reproduce. Some of the coral trees, for example, are estimated to be centuries old.

It is difficult to determine the impact of deep sea trawling on life on seamounts. Pieces of broken coral and assortments of other organisms caught in trawl nets suggest that fishing is having some impact, but we do not know how changes to seamount benthic communities caused by fishing may affect the sustainability of our deep-water fisheries. Growing information about such impacts highlights the need to be cautious about fishing seamounts — in the areas fished, the methods we use and the amount of fish taken.

Summary of issues

Information and awareness of marine biodiversity

Our current knowledge of marine life and how marine ecosystems work is not adequate to show whether we are sustainably managing New Zealand's marine biodiversity. People have perceived the ocean to be uniform and limitless in its capacity to provide food and absorb waste. In general, New Zealanders do not appreciate the great levels of diversity found in marine ecosystems and the threats to this diversity.

- Many marine species remain undescribed and information on the distribution and lifecycle of others remains sparse.
- We have not yet identified and classified New Zealand's marine habitats, the communities of marine life within them, the processes that drive marine ecosystems, or the full extent of threats to marine biodiversity from human activities and broader environmental changes.
- The inter-relationships and dependencies between fishing activities, fisheries stocks and other components of marine biodiversity (that is, an ecosystem-based approach) are inadequately addressed in research and management actions. Some non-target species are being adversely affected by fishing, and others may be at risk.

- Current levels of information are inadequate to determine whether or not harvesting levels are sustainable for over half the fish stocks managed under the QMS. As harvesting pressure on some of these stocks increases, additional information is vital to avoid the risk of these stocks collapsing.
- We do not fully understand the scale of land use impacts, including sedimentation and pollution, on marine biodiversity.
- We currently do not have the information needed to anticipate the nature and intensity of ecological changes that might be induced by climate change.

Coordinated management

New Zealand's coastal and marine environment is used by a variety of interest groups, and responsibilities for its management are shared between a range of central and local government agencies. This requires the management roles and accountabilities of each agency to be clearly defined and demands a high level of cooperation and coordination between agencies.

- Some responsibilities for managing marine biodiversity are not clearly understood, resulting in a lack of accountability for actions and outcomes. There is a need to clarify the respective roles of regional councils, Department of Conservation, Ministry of Fisheries, Ministry for the Environment, the Maritime Safety Authority, Ministry of Foreign Affairs and Trade, Ministry of Transport, Ministry of Commerce, the fishing industry and other interest groups in managing marine biodiversity.
- Beyond the territorial sea there is incomplete coverage of management issues, a lack of coordination of agency responsibilities, and the potential for practices to be inconsistent with those within the 12 mile limit.
- Land use activities (such as nutrient enrichment and pollution from sewage, sedimentation from land runoff, and coastal development) and aquaculture activities can adversely affect habitats important to both fishery stocks and marine ecosystems, and they need to be managed accordingly.
- The management of the coastal and marine environment and of impacts on that environment needs to be integrated within an ecosystem-based framework with explicit biodiversity objectives.

Coastal and marine habitats

Although our coastal waters and habitats are generally of high quality by international standards they are under stress in some areas — in particular estuaries and the mouths of rivers near urban areas.

- Land uses, such as agriculture and forestry, adversely affect the coastal environment through runoff containing eroded soils, nutrients and contaminants; and coastal land development has a major impact on some coastal ecosystems.
- The discharge of wastes from industry and households, including sewage and pollutants in urban stormwater, has an adverse impact on marine and estuarine water quality and also marine biodiversity, although the extent of this is not known.
- Some marine habitats, including seamount communities, and coral, bryozoan, sponge and other benthic communities, are being adversely affected by mechanical activities such as trawling, dredging, dumping and the extraction of oil, gas and minerals.

Coastal and marine species

Some of our coastal and marine species are at risk from human activities, in particular fishing and land-based activities.

- Commercial fishing, although managed through the QMS, has depleted stocks of some target species (for example, snapper, orange roughy and rock lobster) to below levels judged desirable by fisheries scientists and managers. Management should focus on rebuilding depleted stocks and avoiding, remedying or mitigating any negative effects of fishing on ecosystems.
- Commercial fishing impacts include: the capture (by-catch) of non-target species, such as fish, marine mammals (dolphins, sea lions and fur seals), marine invertebrates and seabirds; genetic changes in response to fishing; effects on predator/prey relationships and damage to benthic communities.
- Harvesting pressure in coastal environments from recreational and customary fishing has a significant impact on shellfish and inshore finfish stocks in some areas, and information needs, monitoring and management options for these need to be investigated further.
- The effects of pollution, particularly persistent organic pollutants, and sediments on species and ecosystems are unknown.

Sustainable fisheries

Wild fisheries are reaching their natural limits. The global fish catch — quadrupled in the last 40 years — is no longer rising, seemingly because the oceans cannot sustain a greater catch. The problem is worsened by marine ecosystems being damaged by pollution and habitats being damaged or destroyed.

New Zealand's fisheries have a similar history. In the 1970s, open access to fishery resources and emphasis on increasing commercial harvest led to over-fishing which began to impact on fish stocks and returns to fishers. The extension of New Zealand control over the 200-mile EEZ, coupled with new technology, meant that our fishing industry could expand to fish new species and areas.

The QMS was introduced in 1986 in part to address over-fishing. Under the Fisheries Act, harvest levels for fisheries are based on maximum sustainable yield (or biomass for maximum sustainable yield). Where the biomass falls below this, the harvest should be reduced to build the fishery back up to the level that will produce the maximum sustainable yield. Unfished populations are often fished at a higher level initially until the biomass is "fished down" to a maximum sustainable yield level. The allowable commercial catch is allocated to holders of quotas in proportion to their holding.

Sustainability is still a concern. For over half of the fish stocks managed under the QMS, too little is known to be able to assess whether harvesting is maintaining stocks at or about the level that will produce the maximum sustainable yield. Information is best for important commercially harvested fish stocks, with about 70 percent of the commercial catch (in tonnage) being from fisheries where the stock status is known. Some stocks, including snapper and orange roughy, have been depleted to below the maximum sustainable yield level, although management strategies are in place to rebuild these stocks[30].

Approaches to fishery management continue to evolve as understanding of the marine environment increases and attitudes change. There is now recognition that fisheries are part of an ecosystem and should not be managed in isolation. The 1996 Fisheries Act (which deals only with the effects of fishing) requires that ecosystem inter-relationships be considered. "Changing Course — Towards Fisheries 2010", Mfish's Strategic Direction, reflects growing awareness of the need to maintain wider ecosystem viability and to encourage stakeholder initiatives. Some fisheries are managed on this basis. The scallop fishery in Nelson, for example, is managed to make sure that some areas are not damaged by dredging to protect other species (including brachiopods).

Our improving understanding of ecosystem issues is moving us in the right direction and confirms that an integrated approach to fisheries and environmental management is needed to conserve marine biodiversity.

30 *The Fisheries Act 1996 Amendment Act 1999 allows for some approved by-catch species to be fished to a level below the maximum sustainable yield level, but only where the long-term viability of the fish stock is not impaired.*

Marine biosecurity

New Zealand's coastal and marine environment is vulnerable to the establishment and spread of introduced marine pest species and diseases.

- New marine organisms may arrive, and be transferred around New Zealand waters, in ballast water (used to stabilise ships) or attached to the hulls of visiting ships and fishing and recreational vessels.
- Responsibility for surveillance of the marine environment and emergency response to the entry of new exotic species rests with Mfish. However, responsibilities for managing pests already in New Zealand waters need to be further defined (see Theme Five).
- Mechanisms are needed to control the introduction and spread, within New Zealand waters, of new species, pathogens and toxic organisms that are potentially harmful to marine species and ecosystems.
- Aquaculture poses some risks for marine biosecurity through the transfer of organisms into or around New Zealand waters on spat or equipment, escapes from containment, and the possible introduction of pathogens with imported stock.

Marine protected areas and representativeness

New Zealand's marine reserves cover only a tiny area of New Zealand's marine environment and are not representative of the range of our distinctive coastal and marine habitats and ecosystems (see figure 3.2 on page 56). Marine reserves and other no-take or restricted areas can also provide refuge areas from which degraded areas can be restocked.

- Under the Marine Reserves Act 1971, marine reserves can only be created within territorial waters, but not beyond, resulting in limited protection mechanisms for marine ecosystems outside the 12 mile limit, within the EEZ and areas under New Zealand's jurisdiction.
- The purpose of marine reserves created under the Marine Reserves Act is to preserve a variety of marine habitats for scientific study, but not specifically to meet biodiversity conservation objectives, the achievement of which are incidental to this purpose.
- Outside of marine reserves, measures to protect coastal and marine ecosystems are contained in the RMA (which deals with matters other than fisheries management and excludes the control of fisheries and many fishing impacts)[31] and the Fisheries Act 1996 (which deals with fishing and fishing impacts). However, improved integration and implementation of these measures are required.
- There is a range of measures under the Fisheries Act which can be used to provide protection for fisheries purposes. These include area closures, seasonal area closures, restrictions on certain fishing techniques, partial closures to certain commercial fishing, taiapure and mataitai.
- New Zealand has a role in protecting areas outside the EEZ, particularly the Antarctic.

31 *See footnote 28 on page 58.*

ACTION PLAN[32]

Objective 3.1 Improving our knowledge of coastal and marine ecosystems

Substantially increase our knowledge of coastal and marine ecosystems and the effects of human activities on them.

Actions:

a) Improve our knowledge of marine species, including taxonomy, distribution, habitat requirements, and the threats to species.

Key players: FRST*, MoRST, Mfish, DoC, RCs, NIWA, research providers, museums, iwi/hapu[33]

b) Survey, assess, and map habitats and ecosystems important for indigenous biodiversity and develop an agreed bioregional classification system[34].

Key players: MfE*, DoC*, LINZ, Mfish, NIWA, MSA, RCs, museums, fishing industry, iwi/hapu

c) Identify the uniqueness, representativeness, and importance of the biodiversity of New Zealand's coastal and marine ecosystems.

Key players: DoC*, Mfish*, MfE, NIWA, RCs, fishing industry, iwi/hapu, NGOs

d) Identify, assess, map and rank the threats to New Zealand's coastal and marine biodiversity.

Key players: DoC*, Mfish*, MfE*, MSA, fishing industry, iwi/hapu, NGOs

e) Develop an environmental monitoring system to provide information and a spatial understanding of: the status of marine species; fish stocks; habitats important for indigenous biodiversity; marine environmental health; threats to biodiversity; and the effectiveness of measures to avoid, remedy or mitigate the adverse effects of activities on marine biodiversity. Ensure that this information is readily accessible to all interested groups.

Key players: MfE*, Mfish*, DoC, RCs, fishing industry, iwi/hapu, NGOs

f) Promote individual and community awareness of the effects of activities on marine biodiversity, and the opportunities and responsibilities to protect and maintain habitats and ecosystems of importance to biodiversity.

Key players: Mfish*, DoC*, RCs, resource users, training institutes, iwi/hapu

**Government lead*

32 *Actions shown in bold are priority actions (see Part Four).*

33 *See page 120 for key to key players.*

34 *Bioregional classification is based on a combination of biological, geographical and social or management criteria.*

Objective 3.2 Coordinated marine management

Develop processes for a marine management that enable decision makers to consider whole marine ecosystems.

Actions:

a) **Clarify and agree on comprehensive government policy objectives for marine biodiversity management, considering all stakeholder and public interests. Define agency responsibilities, especially for areas outside of the 12 nautical mile limit, and revise these if necessary[35].**

Key players: DPMC*, MfE, MFAT, Mfish, DoC, LAs, LINZ

b) Advocate for the conservation and sustainable use of marine biodiversity in areas subject to international jurisdiction, including the Ross Dependency and other Antarctic areas.

Key players: MfE*, Mfish, MFAT, MOT, DoC, DPMC

Objective 3.3 Sustainable coastal management

Protect biodiversity in coastal waters from the adverse effects of human activities on land and in the coastal zone.

Actions:

a) As part of the review of the New Zealand Coastal Policy Statement (NZCPS), assess its effectiveness, and that of regional coastal plans, in protecting marine biodiversity, and recommend changes accordingly[36].

Key players: DoC*, MfE, LAs, iwi/hapu, community groups

b) Expand programmes to mitigate the adverse effects of land use on coastal biodiversity, and incorporate marine biodiversity priorities into programmes for sustainable land use, including the Sustainable Land Management Strategy, National Agenda for Sustainable Water Management (NASWM), and related strategies.

Key players: MfE*, MAF, DoC, LAs, iwi/hapu, resource users

c) Maintain or restore the biodiversity of priority sites in the coastal environment.

Key players: DoC*, MfE, LAs, resource users, iwi/hapu, community groups, NGOs

35 *This action addresses a range of marine environment management issues of which biodiversity is only one component.*

36 *There is also a need for the New Zealand Coastal Policy Statement to be consistent with any future national policy statement on biodiversity (see Actions 1.1d and 2.1g).*

Objective 3.4 Sustainable marine resource use practices

Protect biodiversity in coastal and marine waters from the adverse effects of fishing and other coastal and marine resource uses.

Actions:

a) **Ensure implementation of the purpose and principles of the Fisheries Act 1996, including programmes to sustain or restore harvested species and associated and dependent species to ecologically sustainable levels, and integrate marine biodiversity protection priorities into programmes for sustainable fisheries use, such as fisheries plans, using an ecosystem approach.**

Key players: Mfish*, MfE, DoC, fishing industry, iwi/hapu, NGOs

b) **Identify the coastal and marine species and habitats most sensitive to harvesting and other disturbances and put in place measures to avoid, remedy or mitigate adverse effects from commercial, recreational and Maori customary fishing activities.**

Key players: Mfish*, DoC, RCs, fishing industry, iwi/hapu, research providers, NGOs

c) In the absence of, or uncertainty about, information required for the sustainable use of marine resources, apply the precautionary principle[37] when setting sustainability measures for fishing or setting controls for other coastal and marine uses[38].

Key players: Mfish*, RCs, resource users, fishing industry, iwi/hapu, NGOs

d) Improve the environmental impact assessment (EIA) of fishing and other marine and coastal resource use, and integrate these EIA into fisheries decision making processes (including sustainability measures and fisheries plans) and other marine management processes.

Key players: Mfish*, RCs, fishing industry, coastal resource users, iwi/hapu, NGOs

e) Avoid, remedy or mitigate the adverse impacts of human activities (such as marine transport and mining) on marine biodiversity and develop habitat restoration programmes where appropriate.

Key players: DoC*, MSA*, RCs, research providers, coastal resource users, iwi/hapu, NGOs

Objective 3.5 Managing marine biosecurity risks

Develop an integrated system to identify biosecurity risks to marine biodiversity from exotic organisms and establish appropriate management responses to prevent and reduce these risks and to minimise their impacts.

Actions:

a) **Enhance border control to prevent harmful species and diseases establishing and being spread within New Zealand's marine environment (by practices such as discharge of ballast water and the de-fouling of ship hulls).**

Key players: Mfish*, MAF, DoC, MfE, Biosecurity Council, RCs, fishing and marine industry, iwi/hapu

37 *See Principle 12 in Part Two.*

38 *This requirement is included in section 10 of the Fisheries Act 1996.*

b) Determine responsibilities for the management of established marine pests so that appropriate measures (including preparing and implementing pest management strategies under the Biosecurity Act 1996) can be undertaken promptly and efficiently.

Key players: Mfish*, DoC, RCs, MAF

c) Identify the distribution of exotic species and assess the actual and potential impacts of these on marine ecosystems and biodiversity.

Key players: Mfish*, DoC, RCs, NIWA

d) Increase pest control and management efforts to levels congruent with national biodiversity goals and develop new technologies and techniques to combat existing and emergent threats to marine biodiversity from marine pests.

Key players: DoC*, Mfish*, RCs, fishing and aquaculture industry, iwi/hapu, boat users

Objective 3.6 Protecting marine habitats and ecosystems

Protect a full range of natural marine habitats and ecosystems to effectively conserve marine biodiversity, using a range of appropriate mechanisms, including legal protection.

Actions:

a) **Develop and implement a strategy for establishing a network of areas that protect marine biodiversity, including marine reserves, world heritage sites, and other coastal and marine management tools such as mataitai and taiapure areas, marine area closures, seasonal closures and area closures to certain fishing methods.**

Key players: DoC*, Mfish*, TPK, RCs, iwi/hapu, fishing industry, NGOs

b) **Achieve a target of protecting 10 percent of New Zealand's marine environment by 2010 in view of establishing a network of representative protected marine areas.**

Key players: DoC*, Mfish, TPK, RCs, iwi/hapu, fishing industry, NGOs

c) **Review the Marine Reserves Act 1971 to better provide for the protection of marine biodiversity, including extending its jurisdiction to protect marine biodiversity within and beyond the 12 mile limit.**

Key players: DoC*, Mfish, MFAT, iwi/hapu, NGOs

d) Promote and encourage individual and community initiatives to protect, maintain and restore habitats and ecosystems that are important for marine biodiversity.

Key players: DoC*, MfE, RCs, Mfish, iwi/hapu, fishing industry, coastal resource users, NGOs

Objective 3.7 Threatened marine and coastal species management

Protect and enhance populations of marine and coastal species threatened with extinction, and prevent additional species and ecological communities from becoming threatened.

Actions:

(a) Review the threatened species priority setting systems and extend them to assess coastal and marine species.

Key players: DoC*, Mfish, RCs, fishing industry, iwi/hapu, NGOs

(b) Identify and protect threatened species and their key habitats.

Key players: DoC*, Mfish, RCs, fishing industry, iwi/hapu, NGOs

(c) Implement recovery plans and population management plans for those threatened marine species ranked as high priority.

Key players: DoC*, Mfish, LAs, fishing industry, iwi/hapu, NGOs

(d) Accede to the Convention on Migratory Species (the Bonn Convention) to provide an international framework for New Zealand's participation in protecting migratory and widely ranging species such as albatross.

Key players: DoC*, MFAT, NGOs

THEME 4

Conservation and Use of Genetic Resources

Scope[39]

The conservation and sustainable use of the genetic resources of indigenous species and important introduced species (see Goal Four); the sharing of benefits from the use of these genetic resources; and the maintenance of access to genetic resources from other countries.

New Zealand's contribution to conserving the genetic diversity of introduced species that are extinct or threatened in their original habitats.

Desired outcome for 2020

The diversity of genetic resources of important introduced species within New Zealand is maintained, effectively supporting our primary production and biotechnology industries. This is achieved in ways that do not prevent the conservation of indigenous biodiversity.

In situ conservation of indigenous genetic resources is complemented by ex situ means, where necessary.

There is an integrated policy for the management of all genetic material in New Zealand and for bioprospecting activities, in accord with agreed international commitments. There is appropriate domestic and international access to indigenous genetic material, taking into account New Zealand's sovereignty and rights to the benefits from its genetic material, as well as rights and obligations under the Treaty of Waitangi.

Populations of introduced species that are threatened or extinct in their original habitats are maintained in New Zealand where return to their country of origin is not feasible or desirable, using methods that do not pose a threat to indigenous biodiversity.

39 *Some of the issues within the scope of this theme are also addressed in other themes, for example conserving the genetic diversity of indigenous species is addressed through conserving species in their natural habitats and ecosystems (see Themes One, Two and Three).*

Current management

Historically, the Government took an active role in conserving introduced genetic resources such as grassland plants and trees for timber production. However, in recent years there has been increased reliance on market forces and the self-interest of producers to conserve the genetic diversity of species that are important for production. Arable farmers, for example, have recognised the value of ensuring that traditional varieties of plants such as white clover are kept pure and collectively levy themselves to ensure that this occurs. However varieties, strains and breeds for which there is no longer a significant market demand and that are not currently being used by breeders and researchers, are seldom maintained unless this is paid for by the Government or by voluntary groups.

New Zealand holds some significant collections of introduced genetic material, mostly plants. These collections were generally developed with Government funding. Many are maintained by Crown Research Institutes (CRIs) and at least partially funded by the Government. Botanical gardens, zoos, the New Zealand Rare Breeds Conservation Society, and a number of other breed societies and voluntary groups that maintain collections (for example, of old varieties of fruits), also play a significant role in conserving genetic resources.

The development of the plant variety rights system has enabled costs of research and development to be offset against exclusive temporary rights granted, for example, for the sale of new varieties. Similarly, New Zealand's patent system enables protection to be obtained for biotechnological inventions. The Patents Act 1953 is currently under review and a major issue is the extent to which life forms should be able to be patented.

New Zealand's approach to intellectual property issues is subject to a number of international treaties, in particular the WTO-TRIPS[40] agreement and the WIPO Paris Agreement[41].

New Zealand is also a member of the United Nations FAO[42] Commission on Genetic Resources for Food and Agriculture, the International Convention for the Protection of New Varieties of Plants (UPOV) and the International Association of Plant Breeders (ASSINSEL).

Importation of new genetic resources and breeding programmes is carried out by private firms, CRIs and other research institutions. Balancing the economic and environmental risks and benefits of bringing genetic material into New Zealand in the form of new organisms (or of creating such organisms in New Zealand) occurs within the framework of the Hazardous Substances and New Organisms (HSNO) Act 1996 and the Biosecurity Act 1993. Processes and roles for ERMA (the Environmental Risk Management Authority) in relation to the importation of new organisms are largely developed (see Theme Five).

The hunt for wild species whose genes can yield better crops, new medicines and other useful products is called bioprospecting. The genetic resources of our indigenous species may have the potential to be developed into commercial products. An increasing amount of bioprospecting in New Zealand, by both New Zealand and overseas companies, is occurring in the hope of discovering material that will lead to commercially valuable products. Although there are some controls under the Wildlife Act 1953, the approach to managing bioprospecting in New Zealand is currently ad hoc.

40 World Trade Organisation Agreement on Trade-Related Aspects of Intellectual Property Rights.

41 World Intellectual Property Organisation: Agreement for the Protection of Industrial Property.

42 Food and Agriculture Organisation.

Many New Zealand zoos, botanical gardens and wild animal parks are involved in global conservation and recovery programmes for a limited number of rare and endangered introduced plants and animals. In some cases these programmes are vital to the long-term survival of a species, especially where the country of origin has a limited focus on conservation. New Zealand also holds collections, and in some cases wild populations, of strains of introduced species which are now threatened or extinct in their country of origin (for example, the English bumble bee *Bombus subterraneus* and strains of deer, trout and salmon).

Strategic importance of genetic resources

Genetic resources of both introduced and indigenous species are of vital importance to all New Zealanders. A major part of the New Zealand economy (farming, forestry and horticulture) is based on introduced species. Other important sectors of the economy (notably fishing and parts of tourism) and smaller activities such as mussel farming and part of the nursery industry, are based on indigenous species. Genetic resources are also important in New Zealand's biotechnology industry which, while currently small, has the potential for substantial growth.

Almost all our land-based production comes from fewer than 50 animal and plant species. The small number of species, and the low genetic variability within some of these species, increases production but makes land-based production more vulnerable to biological failures caused, for example, by pest attack, disease or climatic change.

In many cases the current productivity of the commonly used plant and animal varieties, strains and breeds resulting from selective breeding has been made possible by access to a wider pool of genetic material.

Access to the gene pool overseas, or the maintenance of the diversity of genetic material of important production species within New Zealand, is crucial to manage risks to our economy and to maintain the potential for new economic activities in the future. New material needs to be able to be accessed to remain competitive in changing markets and in new biologically based industries.

Some introduced species help to conserve indigenous biodiversity: for example, blackbirds are now important dispersers of indigenous plant seeds (and also weed seeds); banksia and eucalyptus species are a food source for nectar-feeding birds such as tuis and bellbirds; gorse provides shelter for regenerating indigenous vegetation that then replaces it; an introduced fungus (Phoma clemetidina) is being used for control of the weed, old man's beard; and introduced insects (Sphecophaga spp.) have been released as biological controls for wasps. Maintaining the genetic diversity of these useful introduced species and carefully managed access to new introduced species will continue to be important.

The genetic diversity of our indigenous species has considerable, but largely unknown, potential to contribute to human well-being. Erosion of indigenous genetic diversity may therefore foreclose options that might have been beneficial. In the same way, saving rare or endangered varieties, strains and breeds of species of introduced plants and animals avoids the loss of genes globally that might have future value.

Important questions to consider in relation to conserving genetic material are:

- *will it be possible to replace this material if we do not maintain it in New Zealand?;*
- *what will it cost to maintain it here and what opportunities would be lost if we do not maintain it here?; and*
- *what would the costs to New Zealand be if we had to obtain it from overseas at some time in the future?*

Summary of issues

Erosion of genetic diversity

The loss of genetic diversity within domesticated, cultivated and harvested species is an increasing global problem. The low genetic variation of even some widely distributed varieties of vital production species makes them vulnerable to unfamiliar diseases and pests and to future environmental change. New Zealand's primary production economy depends overwhelmingly on introduced species. Meeting the changing market demand for biologically based products requires a genetically diverse resource base, so loss of genetic diversity of our economically important species could have significant economic effects.

Maintaining the genetic diversity of indigenous species is also vital for their long-term conservation and potential for sustainable use.

- Secure maintenance of the genetic resources of diverse species and varieties, either in living populations or in collections of seeds, tissues, semen and embryos, can be costly; often only those species and varieties of high economic priority are conserved in this way. Lack of resources means that not all the genetic material in national genebanks is maintained. In some cases it is not known how much material in the genebank is still alive.
- The Plant Variety Rights Act 1987 creates an economic incentive to develop new varieties by protecting the plant breeder's propagation rights for a limited period of time. But it does not cover other biota or other forms of intellectual property, nor are there comparable measures for encouraging the conservation and storage of existing species and varieties, including cultivars that were developed before the plant variety rights legislation came into effect.
- Although market mechanisms and intellectual property regimes, including the patent system, may provide significant incentives for conserving some genetic resources, they do not encourage more comprehensive protection of genetic diversity. Protection of genetic diversity therefore requires effective collaboration between the public and private sectors.
- Transferring indigenous genetic material between New Zealand regions for commercial use (for example, selling or distributing ornamental plants, or transfer of spat of cultured shellfish species) can lead to loss of genetic diversity through hybridisation between closely related species or homogenisation of previously distinct local populations.
- Notwithstanding threatened species recovery programmes, there remains a high risk of loss of genetic material contained in indigenous species that are still declining significantly or that may be subject to some catastrophic event.

Collecting grass genes

The Margot Forde Germplasm Centre in Palmerston North is one of New Zealand's most important collections of introduced biodiversity. Maintained by AgResearch (New Zealand Pastoral Agriculture Research Institute), the Centre is our national genebank of a wide range of grassland plants, mostly grasses and legumes. It provides the basis for grassland breeding and research in New Zealand, and is also our "insurance" against future environmental change.

The collection was started in the 1930s, when we first recognised the value of conserving genetic diversity for plant breeding. The Centre now has over 60 000 seed samples that are carefully maintained at a low temperature and humidity to prolong their life. The seeds represent more than 1500 species and 58 plant families. These include wild relatives of many useful species, cultivars developed both overseas and in New Zealand, as well as collections of native grass species. Throughout the Centre's history, expeditions have been made to areas such as southwest Europe, the Caucasus region, and North and South America, to collect plant material.

The Centre is important internationally and is involved in exchanges with other countries and provision of genetic resources for research overseas. Some of its collections have worldwide significance, for example its 18,000 samples of white clover are a resource for agriculture in temperate regions everywhere.

Funding for the Centre has waxed and waned over the years. However, now it is recognised as a collection of national importance and is funded on a relatively long-term basis. Such funding can be likened to the premium paid on the insurance policy for a sustainable grassland industry for New Zealand.

Balancing important introduced species against indigenous biodiversity

The need to conserve the genetic diversity of important introduced species must be balanced against the need to control introduced pest species (see Themes One, Two and Five).

- Some important introduced species may also threaten indigenous biodiversity (for example, weediness of some crop, pasture and tree species, and damage to indigenous ecosystems by livestock); to avoid conflicts important introduced species may need to be moved to locations where they do not compromise priorities for conserving indigenous biodiversity.

Maintaining access to genetic resources

To maintain the genetic diversity of important introduced species, breeds and varieties in New Zealand, access to genetic material overseas needs to be maintained (see Theme Ten).

- Such access may not always be available due to other countries' policies or laws, and requires negotiation of multilateral or bilateral reciprocal access arrangements.
- In negotiating access agreements to genetic resources, New Zealand must recognise the sovereign rights of countries over their natural resources, and take into account the interests of indigenous and local communities in relation to the identification of, access to and commercial benefits from, these resources.
- Under the Convention on Biological Diversity New Zealand is required to facilitate access to its own genetic resources for environmentally sound purposes by other Convention parties, subject to New Zealand's own sovereignty rights.

- The approach that New Zealand takes for providing access to, and approving use of, its indigenous genetic resources may have important implications for reciprocal access to the indigenous genetic resources of other countries.

Hanging on to harakeke

Harakeke or New Zealand flax is one of our most widely used native plants. Wild varieties were grown and harvested by both Maori and Pakeha to produce a range of products, including clothing, kete (baskets), mats, fishing nets and rope. With changing economies and the rise of petroleum-based products, the demand for flax products declined. However, harakeke remained important to Maori for commercial and cultural purposes, and these uses have grown over the last few decades.

Scientists distinguished just two species of flax (genus Phormium). However, Maori have recognised and named many different types of harakeke based on leaf and fibre characteristics. Different types of harakeke were selected and cultivated for particular purposes, and around 200 names for these have been recorded. Individual weavers maintained plantings of their favourite selections and at a time when use of harakeke seemed to be in decline, a few private collections of traditional harakeke varieties were made. Many of these varieties have now disappeared from their place of origin.

In 1988 the National New Zealand Flax Collection was established, most of which was provided from a large private collection gifted to the Crown. The national collection has over 90 different types of harakeke from all around New Zealand and is managed by Manaaki Whenua (Landcare Research) at two main sites, with partial collections at other sites. Harakeke from the collection is distributed to marae, weavers, schools and other groups involved in restoration projects with the aim of maintaining the diversity of plants for weaving.

Commercial use and bioprospecting of indigenous genetic resources

Using the genetic resources of indigenous species for commercial benefit raises ecological, commercial, cultural and ethical issues, as well as issues of access to genetic resources and how benefits from their use are shared.

- Bioprospecting and propagation activities, if not carefully managed, can erode the genetic diversity of indigenous biodiversity.
- The interests and rights of Maori as Treaty partners in relation to indigenous genetic resources need to be identified and addressed in the development of policy relating to bioprospecting. This includes issues raised in the indigenous flora and fauna claim to the Waitangi Tribunal (Wai 262) and the contribution of matauranga Maori to identifying and commercially developing these resources.
- The extent to which New Zealand's existing intellectual property rights systems can be applied to protect Maori cultural and intellectual property, and issues relating to the patenting of lifeforms, need to be taken into account in the future development of New Zealand's intellectual property rights laws.

- Current piecemeal approaches to managing bioprospecting are no longer adequate in the face of increasing commercial activity. Various ad hoc approaches to the licensing of bioprospecting have been developed under the Wildlife Act 1953, but have little applicability to the marine environment.
- There is a need for a consistent national framework to determine and manage access to, and commercial use of, indigenous genetic resources in line with Article 15 of the Convention on Biological Diversity, and to provide certainty for New Zealand and overseas companies and research institutions.
- There is also a need for a framework to secure New Zealand's interests in indigenous genetic resources and to appropriately distribute the benefits from the commercial use of these resources; this could include channelling a portion of these benefits into the conservation of indigenous biodiversity.

Conserving threatened introduced plants and animals

- New Zealand has become a refuge for some introduced species at risk in other parts of the world, and these are present both in captive management and wild populations. However, where wild populations of these species threaten indigenous biodiversity, the feasibility of repatriating the species to their place of origin or conserving the genetic material in some other way needs to be considered.
- The risk to indigenous biodiversity posed by wild populations of introduced species should be a primary consideration in such decisions.
- The risk of repatriated species introducing new pests and diseases to the country they are being returned to also needs to be considered.

Parma wallaby — pest or part of our heritage?

The parma wallaby (also known as the white-throated or small brown wallaby) is one of five wallaby species established in New Zealand. It is found only on Kawau Island in the Hauraki Gulf, where it was released in about 1870 by Sir George Grey. Although the parma wallaby is rare in its natural habitat in northern New South Wales, Australia, it is common on Kawau.

However, wallabies are a pest on Kawau. They browse native vegetation and may have caused the local extinction of some native plant species that are found on nearby wallaby-free islands. They also cause damage in gardens on the island, including the historic Mansion House garden. DoC and landowners currently control the parma wallaby population to keep it from getting too large.

Yet parma wallaby have not always been treated as pests on Kawau Island. In 1961 the International Union for the Conservation of Nature (IUCN) requested they be protected because of concerns about their possible extinction in Australia. For 15 years parma were protected and many were captured alive from Kawau to supply zoos and to establish breeding colonies in other parts of the world. In 1984, with their security in Australia confirmed, the ban on killing parma on Kawau was lifted.

Today the parma wallaby is not threatened in its native habitat and is also secure in zoos and collections elsewhere. From the perspective of conserving biodiversity, there is therefore no need to conserve parma on Kawau Island, although there may be cultural and historical reasons for doing so.

ACTION PLAN[43]

Objective 4.1 Conservation of New Zealand's genetic resources

Conserve the diversity of New Zealand's genetic resources so as to maintain their current and potential benefits to New Zealanders.

Actions:

a) **Develop a collaborative strategy to manage New Zealand's genetic resources (from both introduced and indigenous species), focusing on:**

   i) **effective cooperation between Government, industry, research institutions and managers of collections of genetic resources;**

   ii) **clearly assigning responsibilities for maintaining New Zealand's genetic resources; and**

   iii) **managing information about collections of genetic resources.**

   Key players: Not yet assigned*, MAF, MoRST, FRST, DoC, research providers, primary production industry associations, NZ Biotechnology Assn, NZ Plant Breeding and Research Assn, NZ Rare Breeds Conservation Society, other breed societies, zoos, ARAZPA, significant private collections[44]

b) **Identify significant areas of risk in the management of the genetic resources of New Zealand's introduced species, including information gaps, and recommend how these risks can be effectively managed.**

   Key players: Not yet assigned*, MAF, research providers, primary production industry associations, NZ Biotechnology Ass, NZ Plant Breeding and Research Assn, NZ Rare Breeds Conservation Society, breed societies, significant private collections, zoos

c) **Identify significant areas of risk in managing genetic resources of New Zealand's indigenous species that are threatened or in decline (with reference to threatened species recovery programmes), and recommend how these risks can be reduced, for example through germplasm banks.**

   Key players: DoC*, research providers, iwi/hapu

**Government lead*

43 Actions shown in bold are priority actions (see Part Four).

44 See page 118 for key to key players.

Objective 4.2 Access to genetic material from other countries

Maintain access by New Zealanders to genetic material from overseas, and participate in international frameworks relating to access to genetic resources and related knowledge and technology.

Actions:

a) Implement the HSNO Act to ensure ongoing access by New Zealand to genetic material from overseas, while safeguarding indigenous biodiversity and human health.

Key players: ERMANZ*, MoC, MAF, MfE, industry associations, iwi/hapu

b) Review arrangements for collecting genetic resources overseas, by New Zealand individuals, companies and research institutions, and conclude agreements as appropriate[45].

Key players: Not yet assigned*, MAF, MoRST, MFAT, research providers, iwi/hapu

c) Continue to participate in renegotiating the International Undertaking on Plant Genetic Resources, and participate in relevant future multilateral or bilateral agreements for access to genetic resources for food and agriculture.

Key players: MAF*, MoC, DoC, MFAT, MoRST, iwi/hapu, industry associations

d) Participate in multilateral and bilateral processes relating to access to genetic resources (not limited to genetic resources for food or agriculture) within the Convention on Biological Diversity framework.

Key players: MoC*, MAF, MFAT, TPK, MoRST, iwi/hapu

e) Continue to develop cooperative research programmes and share information about genetic resources between New Zealand institutions, institutions in other countries, and international bodies.

Key players: To be assigned*, MAF, MoRST, FRST, research providers, iwi/hapu, NZ Rare Breeds Conservation Society, breed societies, zoos, ARAZPA, significant private collections

Objective 4.3 Bioprospecting in New Zealand

Develop an integrated policy and legislative framework for managing bioprospecting in New Zealand, including arrangements for sharing benefits from the use of genetic resources, which are consistent with international commitments.

Actions:

a) Develop policy on access to, and the use of, New Zealand's indigenous genetic resources and the sharing of benefits from their use, taking into account Maori interest in these resources (see Theme Seven) and providing as much certainty as possible for all parties.

Key players: DoC*, MoC, TPK, MoRST, NZ Biotechnology Assn, iwi/hapu, research providers

45 *This action depends on the International Undertaking on Plant Genetic Resources for Food and Agriculture (IUOGRFA) being finalised.*

b) Review existing controls and legislation regulating the bioprospecting of indigenous genetic resources, with a view to developing a more integrated framework for managing bioprospecting and distributing its benefits[46].

Key players: DoC*, MoC, TPK, Mfish, MAF, MfE, LGNZ, iwi/hapu

Objective 4.4 Matauranga Maori and use of genetic resources

Ensure that the use of matauranga Maori (traditional knowledge) in the identification and commercial use and development of intellectual rights to indigenous genetic resources occurs only with the consent of the holders of that knowledge, and that they share in any subsequent benefits (see Theme Seven).

Actions:

a) Address, and seek to resolve, Treaty of Waitangi claims to ownership of biological resources, including indigenous genetic resources.

Key players: TPK*, DoC, MfE, MAF, MoC, MoRST, FRST, iwi/hapu, research providers

b) Develop agreements that safeguard the use of matauranga Maori in the identification, use and development of intellectual rights to indigenous genetic resources, and ensure appropriate sharing of resultant benefits.

Key players: TPK*, MoC, iwi/hapu

c) Provide for Maori interests in indigenous genetic resources, and concerns relating to the patenting of lifeforms, to be taken into account during the current review of the Patents Act 1953.

Key players: MoC*, DoC, TPK, iwi/hapu

Objective 4.5 Conservation of threatened introduced species

Assist with international efforts to conserve threatened introduced plants and animals in New Zealand, provided that this does not conflict with conserving indigenous biodiversity.

Actions:

a) Support the *in situ* conservation of threatened introduced species by returning them, where possible and environmentally desirable, to their place of origin.

Key players: Not yet assigned*, DoC, MAF, ARAZPA

b) Maintain small populations of threatened introduced species in facilities or clearly defined areas where their presence will not pose a threat to indigenous species, where reintroduction to their country of origin is not feasible or is undesirable because of the risk of introducing pests or diseases.

Key players: Not yet assigned*, DoC, ARAZPA, research providers, iwi/hapu

46 This action will need to be aligned with the International Undertaking on Plant Genetic Resources for Food and Agriculture (IUPGRFA).

THEME 5

Biosecurity and Biodiversity

Scope

Managing the risks to indigenous biodiversity and important introduced species from both the intentional and unintentional introduction and spread of organisms capable of causing harm, including animal pests, weeds and diseases, that is, unwanted organisms[47]. Biosecurity management includes: a decision-making and risk analysis framework; biosafety measures to control the introduction and establishment of new organisms[48] (including genetically modified organisms); and border control, surveillance and emergency response for the exclusion and eradication of unwanted organisms and pests.

Management of animal and plant pests on land and in freshwater and the coastal and marine environment is also covered in Themes One, Two and Three.

Desired outcome for 2020

The risks to New Zealand from pests and unwanted organisms (including genetically modified organisms) are managed to protect our indigenous biodiversity and important introduced species. A precautionary approach[49] is taken with respect to new organisms, including genetically modified organisms.

Biosecurity management is effectively coordinated between central and local government, private agencies and interested groups. Systems for managing pests affecting primary production and indigenous biodiversity are coordinated. New Zealand's biosecurity system complements international arrangements to minimise the risks of entry of unwanted organisms to New Zealand.

Management and surveillance systems are backed by effective research and the assessment of biosecurity risks. Ecologically and socially acceptable mechanisms are in place to balance the benefits of new introduced species against potential risks to indigenous species and ecosystems and other valued introduced species.

47 *The term "unwanted organisms" has specific meaning under the Biosecurity Act and could include specific genetically modified organisms.*

48 *"New organisms" include any plant, animal or microorganism coming into New Zealand for the first time or a new species developed through genetic engineering (genetically modified organisms).*

49 *See Principle 12 in Part Two.*

Current management

Biosecurity-related incidents in recent years, such as the tussock moth and fruit fly incursions, the national debate over the release of rabbit calicivirus disease, and the rapid spread of the seaweed Undaria, illustrate the vulnerability of New Zealand's indigenous ecosystems and productive sectors to invasive introduced species.

The framework for biosecurity management is provided by the Biosecurity Act 1993 and HSNO Act 1996. The Biosecurity Act provides for the exclusion of pests and unwanted organisms from New Zealand within a broad cost-benefit framework, as well as the eradication or management of pests once they are here. A number of government departments, as well as local government and non-governmental agencies, have responsibilities under the Biosecurity Act.

The purpose of the HSNO Act is to protect the environment and the health and safety of people and communities by preventing or managing the adverse effects of hazardous substances and new organisms which are proposed to be introduced to the country.

Recent developments in this management framework include:

- the establishment of the Environmental Risk Management Authority of New Zealand (ERMANZ);
- the creation of a Cabinet portfolio for biosecurity;
- the establishment of the Biosecurity Council;
- the merger of the Ministries of Agriculture and Forestry;
- the launch of a new MAF Biosecurity Authority; and
- the commissioning of an independent review of New Zealand's border control services.

These developments aim to provide for greater coordination between agencies in biosecurity matters. The ERMANZ's primary role under the HSNO Act is to decide on applications for the manufacture, import or release of hazardous substances and new organisms into New Zealand. The Biosecurity Council's role is to advise the Minister of Biosecurity on policies and procedures to ensure inter-agency cooperation, and to provide information and education strategies. The Council has prepared a draft biosecurity strategy, and is developing a biosecurity research strategy. New Zealand is also currently involved in the development of an international Biosafety Protocol.

DoC has undertaken scoping assessments of risks posed by potential pests to indigenous species and ecosystems. However, the full integration of indigenous biodiversity considerations into the biosecurity management regime has yet to occur. One of the difficulties here is our limited knowledge about the effects of introduced species on indigenous biodiversity.

Operation Evergreen: eradicating the white-spotted tussock moth

In April 1996 a resident of Auckland's eastern suburbs found a distinctive caterpillar which was identified as a white-spotted tussock moth. A native species of East Asia, it probably arrived in New Zealand as an egg mass on a container, in an imported second-hand car, or in someone's luggage.

Initial concerns were that the tussock moth could be a threat to our plantation forests. However, later feeding trials showed that the moth was also a potentially serious pest to some of our native plants, particularly beech trees, as well as a threat to our horticulture and forestry industries.

Initial surveys showed the moth was confined to an area of about seven square kilometres in Auckland's eastern suburbs. The Government decided to take the once-only opportunity to eradicate the tussock moth before it spread.

An intensive eradication programme was started. In the first year the area was sprayed from the air and the ground using an organic bacterial spray. The second year saw the largest insect trapping programme ever undertaken in New Zealand, with 6500 pheromone-baited traps set. More than 300 properties were also searched. High-density surveillance continued until June 1998 — time for three generations of tussock moth since the last moth had been trapped in April 1997. The moth is now considered eradicated, although MAF is still carrying out small-scale surveillance trapping around the Auckland area.

The apparent success of the tussock moth eradication programme in Auckland is a world first; no other urban pest eradication programme of this scale and complexity has succeeded. Costing around $12 million, its success is attributed to a combination of leadership and vision, backed up by excellent technical and policy support, a dedicated operational team and a high degree of public support.

Summary of issues

Coordination of biosecurity management

Recent initiatives under the Biosecurity and HSNO Acts (such as the establishment of the Biosecurity Council) are in the early stages of implementation. There is still a lack of clarity about some roles and responsibilities of different agencies in biosecurity management.

- Agencies do not yet have fully coordinated objectives, policies and operating procedures.
- There appears to be little incentive for agencies to take the initiative, under the Biosecurity Act, to control pests (particularly new pests) that present risks to indigenous biodiversity.
- Agency responsibilities for managing unwanted organisms detected as being present within New Zealand but not yet widespread are not being acted on because of insufficient priority and inadequate resources, for example the design and implementation of eradication programmes or preparation of pest management strategies.

Integrated border control

Controlling established pests is very expensive and time-consuming, and eradication is rarely possible. Preventing the introduction of new unwanted species before they become established, through integrated border control, is a much smarter strategy and more likely to be effective. However, New Zealand's dependence on international trade and tourism means that border control considerations have to be balanced against the need for transboundary movement of goods and people.

- A lack of resources for identifying exotic organisms that pose a potential threat to indigenous biodiversity, and for detecting and responding to unwanted organisms that do arrive, may be increasing New Zealand's biosecurity risks.
- Surveillance programmes for specific pest species are costly, and therefore the geographical and ecological scope of surveillance programmes is restricted.
- There have been inconsistencies, both within and between agencies, in the way border control decisions are made and advice is given to the Government (for example, in assessing the risks posed by unwanted organisms, and the costs and benefits of taking action to prevent their introduction or establishment)[50].
- Under the Convention on Biological Diversity, New Zealand has agreed to promote notification, exchange of information, and consultation on activities that are likely to adversely affect biodiversity in other countries. Such activities may include the export of species that are known pests in New Zealand. However, there are few mechanisms in place to do this, beyond meeting the animal and plant health status requirements of other countries.

Biosafety for genetically modified organisms (GMOs)

Recent advances in genetic engineering have enabled rapid increases in biological manipulations through biotechnology and the production of genetically modified organisms (GMOs). While the HSNO Act provides a statutory framework for considering GMO developments on a case by case basis, there are concerns about the potential threat of new organisms (including GMOs) to indigenous biodiversity, and a need seen to develop mechanisms to identify and manage these risks. A Royal Commission into genetic modification is to be held and some interim measures may operate during this process.

- Agencies are still in the early stages of developing biosafety protocols for GMOs.
- The roles of agencies in controlling GMOs have not been fully defined; two crucial areas are the post-release monitoring of new organisms (including GMOs) and managing responses to non-intended impacts of these organisms.
- In New Zealand there is a low awareness of biotechnology issues generally and, in particular, issues of biosafety and border control.
- The overall risks and benefits of GMOs to biodiversity need to be assessed.

50 The merger of the former Ministries of Agriculture and Forestry has enabled border control responsibilities to be better integrated.

Aquatic biosecurity issues

Many aquatic pests (animal pests and weeds in freshwater and marine environments) are, or have the potential to be, widespread and pervasive. Pest management strategies are being developed to eradicate a few potentially serious aquatic weeds whose present distribution is limited. Once aquatic pests are established, their control tends to be more difficult and expensive than for pests on land, making prevention even more critical; systems for this are less well developed, however (see Themes Two and Three).

- No agency has clear responsibility for surveillance for, and emergency response to, aquatic weeds and animal pests.
- Some of the greatest risks from potential aquatic weeds appear to be from a number of species already present in New Zealand but not yet widespread or naturalised (for example, the oxygen weed Hydrilla); their management currently falls outside of border control and biosecurity mechanisms.
- Uncertain identity (taxonomic uncertainty) of some introduced aquatic plant species can prevent a timely response being developed.

Knowledge and capacity

Underlying many biosecurity management issues are some significant knowledge gaps and a lack of capacity, especially in relation to assessing the risks of introduced species and new organisms to indigenous biodiversity. This makes the precautionary principle[51] especially important.

- Most agencies do not have adequate information to incorporate risks to indigenous biodiversity into their risk analysis and decision making protocols for biosecurity, nor is there yet an agreed consistent methodology for such risk assessment.
- Risk assessment methodologies for importing new organisms and for the control of unwanted organisms at the border are not fully aligned with each other.
- Under World Trade Organisation rules, justification for import restrictions should be based on sound science, and therefore our ability to impose restrictions on risk goods may be constrained by poor knowledge of the potential impacts of those organisms.
- There is a lack of knowledge for assessing the potential risks to indigenous biodiversity of exotic species that are already in New Zealand, but at present not widely distributed or naturalised.
- New Zealand's situation with respect to the relationship between introduced and indigenous species is unique, so shortfalls in knowledge in this area cannot be readily bridged by access to overseas information.
- There is insufficient expertise and technical capacity in aspects of biosecurity management (especially in relation to effects of pests and unwanted organisms on indigenous biodiversity) amongst relevant agencies.
- The potential risks and benefits of GMOs are not well understood and assessment systems are not easily implemented.

51 *See Principle 12 in Part Two.*

Lying in wait: potential freshwater weeds

Aquatic weeds, the silent invaders of our waterways, pose a particular biosecurity problem for New Zealand. Preventing the entry of potential new aquatic weed species is critical, because once they are established, it is often not feasible to eradicate them and any control is usually costly, ongoing and only partially successful.

New weeds can enter via a number of different pathways: wind-dispersed and bird-spread seed, legal imports of new plant species, mislabelled plants, illegal imports (for example, unapproved mail order plants), and seeds or plants accidentally brought in on clothes or footwear (so called "pocket plants").

Deliberate introductions of freshwater aquatic plant species into New Zealand began as early as 1868, mainly for the ornamental pond and aquarium trade. It was not until the 1950s that legislation was introduced to attempt to control new imports. Despite a progressive growth in controls, in the last 30 years a record number of new aquatic species have been brought into the country.

Currently there are more than 190 species of introduced freshwater plants in New Zealand, of which at least 50 (27 percent) have become naturalised (established in the wild). This almost equals the number of indigenous freshwater plants (59 species). About half (26) of the naturalised plants are considered weeds. Uncertain taxonomy and sketchy records mean that there could be many other weeds already present, but not yet recognised.

Apart from our existing freshwater weeds, there are a large number of freshwater species not yet here, but recognised as potential pests. NIWA has identified 280 taxa (including established weed species) as potential ecological weeds that we need to guard against.

ACTION PLAN[52]

Objective 5.1 Coordinating biosecurity management

Effectively coordinate biosecurity management within and across central and local government and non-governmental agencies, and clarify responsibilities for managing risks from unwanted organisms to indigenous biodiversity and important introduced species.

Actions:

a) **Clarify and assign roles and responsibilities for biosecurity management, for both publicly and privately owned areas, for managing potential pest species already present in New Zealand but not yet widespread.**

Key players: BC*, MfE, DoC, MAF, Mfish, ERMANZ, LGNZ[53]

b) Develop procedures to enhance cooperation between agencies and encourage information sharing on biosecurity issues.

Key players: BC*, MfE, DoC, MAF, Mfish, MoH, ERMANZ, LGNZ

c) Develop and implement a strategy to maintain and develop coordinated expertise and technical capacity within relevant agencies to enable efficient and effective emergency response actions to unwanted organisms.

Key players: BC*, MfE, DoC, MAF, Mfish, MoH, LGNZ

d) Periodically review whether biosecurity management is being effectively coordinated with respect to indigenous biodiversity.

Key players: BC*, DoC, LGNZ

Objective 5.2 Methods of assessing and managing biosecurity risks

Establish effective methods of assessing and managing risks from unwanted organisms to indigenous biodiversity in conjunction with those methods for introduced species.

Actions:

a) **Assess the probability and likely scale of adverse effects on indigenous biodiversity from potential pest species, including species that are:**

i) **not in New Zealand, but may be accidentally introduced through international trade and travel; and**

ii) **already in New Zealand, but which have not become widespread .**

Key players: BC*, MoRST, MfE, DoC, MAF, Mfish, research providers, RCs

**Government lead*

52 *Actions shown in bold are priority actions (see Part Four).*

53 *See page 120 for key to key players.*

b) Develop appropriate risk analysis and management procedures between government agencies to ensure consistent approaches to assessing the ecological, social and economic risks posed by pests, weeds and diseases, including the definition of agreed levels of biosecurity risk.

Key players: MAF*, BC*, MfE, DoC, Mfish, MoH, LGNZ, ERMANZ

c) Develop and implement indicators under the Environmental Performance Indicators Programme and strategies for assessing the effectiveness of biosecurity management in protecting indigenous biodiversity and important introduced species.

Key players: MfE*, RCs*, DoC, MAF

d) Finalise and implement the Biosecurity Research Strategy.

Key players: BC*, MoRST, MAF, DoC, MfE, MoH, research agencies

Objective 5.3 Border control

Maintain and enhance integrated border control measures as the first and most important line of defence for minimising biosecurity risks to New Zealand's indigenous biodiversity and important introduced species.

Actions:

a) Educate travellers and importers about the risks posed to indigenous biodiversity by the illegal and accidental importation of unwanted organisms.

Key players: MAF*, DoC, MoH, Mfish, airport companies, port companies

b) Ensure that the development of import health standards incorporates a risk analysis of threats to indigenous biodiversity.

Key players: BC*, MAF*, DoC, Mfish, MoH

c) Continue to improve an integrated border control system to minimise the risks to biosecurity from the accidental or illegal importation of unwanted introduced species.

Key players: MAF*, DoC, Mfish, MoH

d) Minimise the loss of indigenous biodiversity through illegal trade.

Key players: DoC*, MAF, New Zealand Customs Service

e) Develop mechanisms to make available to importing countries any relevant information New Zealand has on the potential invasiveness of species being exported.

Key players: Not yet assigned*, MAF, DoC, Mfish, MoH, MFAT

Objective 5.4 Managing risks to biodiversity from new organisms

Manage the introduction of new organisms (including genetically modified organisms) in a way that avoids adverse effects on New Zealand's indigenous biodiversity and important introduced species.

Actions:

a) Develop and apply an integrated risk assessment framework that can be consistently applied for assessing the risks posed to biodiversity by the importation of new organisms (including genetically modified organisms).

Key players: ERMANZ*, MfE, DoC, MAF, Mfish, MoH

b) Clarify responsibilities of different parties involved in biosafety management, in particular responsibilities for:

i) post-release monitoring; and

ii) management responses where unintended adverse effects from new organisms occur.

Key players: MfE*, ERMANZ*, MAF, BC

c) Establish a Royal Commission to review key issues surrounding the import, development and release of genetically modified organisms in New Zealand.

Key players: MfE*, DIA, MAF, MoRST, ERMANZ

Objective 5.5 Managing potential pest species

Eradicate or contain introduced species that have the potential to become serious threats to New Zealand's indigenous biodiversity and important introduced species.

Actions:

a) Develop and implement procedures to prevent the escape from captivity of imported species with the potential to become pest species.

Key players: BC*, ERMANZ*, MfE, DoC, MAF, Mfish, industry associations

b) Raise public awareness about introduced species that pose a potential threat to indigenous biodiversity.

Key players: BC*, Mfish, DoC, MAF, RCs, industry associations

THEME 6

Governance

Scope

The role of the Government in establishing national biodiversity goals and priorities, identifying roles and responsibilities in biodiversity management, providing national guidance, and coordinating policies and programmes for the conservation and sustainable use of biodiversity.

Desired outcome for 2020

New Zealand has clearly identified national priorities for conserving and sustainably using indigenous biodiversity and important introduced species. There is strategic alignment with New Zealand's biodiversity goals across government agencies and between central and local government and the private sector.

Central government is playing a key role in leading, funding, coordinating, and monitoring biodiversity policy and management initiatives, while enabling and encouraging local government, the private sector and communities to participate in biodiversity management, at a regional and local level, and to undertake locally appropriate actions. Roles, responsibilities and lead agencies are clearly defined.

The Government is taking a lead in fulfilling obligations under the Treaty of Waitangi and in playing an effective international role in contributing to global solutions to biodiversity issues.

Current management

New Zealand has a legislative and administrative framework for environmental protection and management, which provides a good foundation for the conservation and sustainable use of biodiversity (see Figure 1.3 on page 13). However, gaps in this framework, and its ineffective and inconsistent implementation, continue to give rise to some biodiversity management issues, as outlined in the preceding themes.

Biodiversity management functions are spread among central and local government agencies and other statutory organisations covering natural heritage conservation, sustainable resource management, sustainable management of fisheries and indigenous forestry, biosecurity and biosafety. Because all these management areas impinge on biodiversity, effective coordination and collaboration between agencies is crucial. While coordination and integration are occurring in some areas, this needs to be improved. The management roles of some agencies and their relationships to each other also need clarifying.

Summary of issues

The Government's commitment to conserving and sustainably using indigenous biodiversity, confirmed through the ratification of the Convention on Biological Diversity and the adoption of Environment 2010, implies a responsibility to provide national leadership and direction.

- There is a need to establish a national framework that identifies New Zealand's goals and priorities for conserving and sustainably using biodiversity.
- National biodiversity goals need to be strategically aligned across government and the private sector to ensure they are integrated within the policies and work programmes of all agencies that influence biodiversity outcomes.
- The roles and responsibilities of management agencies, the private sector and the community, for the conservation and sustainable use of biodiversity, need to be clearly defined and understood (this issue has been addressed across all themes).
- Gaps and overlaps in biodiversity management responsibilities, and opportunities for coordination between agencies need to be identified and clarified or addressed, including:
  - responsibilities of agencies for managing biodiversity in marine and freshwater environments (see Themes Two and Three);
  - relationship between central and local government, including appropriate national guidance to local government;
  - roles of regional and district/city councils;
  - biosecurity responsibilities in relation to indigenous biodiversity (see Theme Five);
  - responsibilities of landowners to maintain biodiversity on their land (see Theme One);
  - performance standards and accountabilities for acceptable impacts of resource use on indigenous biodiversity; and
  - control and distribution of information about indigenous biodiversity (see Theme Nine).
- Appropriate mechanisms to enforce policies and actions to conserve and sustainably use New Zealand's biodiversity need to be developed and consistently used by relevant agencies; these might include education, surveillance, compliance monitoring, enforcement programmes and appropriate sanctions for non-compliance.
- Conflicts arising between user groups or within communities about valuing and use of New Zealand's biodiversity may need to be resolved at a national level.
- There may be a need to further define, allocate and manage property rights in relation to biodiversity, including rights of access to, and use of, indigenous genetic resources.
- The Government has obligations under the Treaty of Waitangi with respect to Maori interests in indigenous biodiversity (see Theme Seven).
- New Zealand has international obligations under the Convention on Biological Diversity and other international agreements (see Theme Ten).

ACTION PLAN[54]

Objective 6.1 Governance and biodiversity

Provide strategic direction, funding, national guidance, coordination and monitoring, and encourage private sector, community and individual participation to ensure the conservation and sustainable use of New Zealand's biodiversity.

Actions:

a) **Incorporate the commitments in New Zealand's Biodiversity Strategy into government and departmental planning, including Strategic Result Areas (SRAs), Key Result Areas (KRAs), strategic business plans, and departmental performance and purchase agreements.**

Key players: DPMC*, SSC*, DoC, MfE, MAF, Mfish, TPK, MoRST, FRST, MFAT, MoC, ERMANZ, Treasury[55]

b) **Establish an effective structure (with lead agencies identified) and mechanisms to implement and monitor the implementation of the New Zealand Biodiversity Strategy and to facilitate the resolution of issues and conflicts that may arise during implementation.**

Key players: DoC*, MfE, MAF, Mfish, TPK, MoRST, SSC

c) Monitor and report on the implementation of actions and achievement of goals and objectives in the New Zealand Biodiversity Strategy on an annual basis, and review action priorities within the Strategy, including a comprehensive review of the strategy five years after its adoption.

Key players: DoC*, MfE, MAF, Mfish, TPK, MoRST, SSC

d) Monitor and report on the state of New Zealand's biodiversity as part of the national state of the environment monitoring programme.

Key players: MfE*, DoC, MAF, Mfish, LAs

e) Develop a national policy statement to provide guidance to decision makers on implementing the biodiversity protection provisions of the Resource Management Act (see actions 1.4a and 2.1a).

Key players: MfE*, DoC, LAs

**Government lead*

54 *Actions shown in bold are priority actions (see Part Four).*

55 *See page 120 for key to key players.*

THEME 7

Maori and Biodiversity

Scope

The interests and roles of Maori in conserving and sustainably using New Zealand's biodiversity.

Desired outcome for 2020

The relationship that Maori have with New Zealand's indigenous biodiversity, as tangata whenua, is recognised and valued in the process of conserving and sustainably using biodiversity. Traditional Maori knowledge, or matauranga Maori, about biodiversity is respected and preserved and informs biodiversity management.

Effective working relationships, founded on the Treaty of Waitangi, are continuing to be built between government agencies and iwi and hapu, enabling their involvement at all levels of biodiversity management. The resolution of Treaty claims has expanded the roles Maori play in biodiversity management, enhanced the integration of cultural values, and informed how benefits from the use of indigenous biodiversity can be shared by New Zealanders. There is greater community understanding of Maori customary use of native species and this continues to be ecologically sustainable.

Maori are managing their interests in biodiversity reflecting different iwi and hapu priorities, and sharing in the benefits of its use, to support their economic and social aspirations and fulfil their responsibilities as kaitiaki.

Current management

The traditional relationship developed over centuries of close interaction by Maori with New Zealand's indigenous biodiversity remains an important part of the lives of many Maori. As well as being traditional users of biological resources, Maori have interests in agriculture, forestry, fisheries, aquaculture and ecotourism, all of which revolve around biodiversity. Maori are involved in all aspects of biodiversity management, including conservation and customary and commercial use. They are kaitiaki for the biodiversity of tribal areas and holders of traditional tribal knowledge.

The key environmental laws of the past decade recognise, to varying degrees, Maori interests in New Zealand's indigenous biodiversity, as protected in Article Two of the Treaty of Waitangi. However, Maori continue to assert ownership over indigenous biological resources, including genetic resources, claiming that their ownership of such resources was guaranteed by Article Two.

Maori are also developing their own iwi management plans, addressing natural resource issues within their rohe, including biodiversity. Maori involvement in biodiversity and resource management is also increasingly taking the form of partnership arrangements between Crown agencies and Maori (see following box). For example, partnerships between DoC and individual iwi and hapu include shared management of particular conservation areas and access to biological resources for customary use. Taiapure and mataitai reserves provide opportunities for Maori to participate in the management of customary fisheries and marine biodiversity. Advances in iwi and hapu participation in resource management processes have also been made, although effective partnerships are still uncommon.

The customary use of indigenous biodiversity is a vital part of sustaining relationships with traditional areas and maintaining cultural integrity, knowledge and values. For example, native species are an important source of materials for carving, weaving and rongoa (traditional medicine). Current management regimes enable customary use of biological resources to varying extents across land, freshwater and marine environments and for different species.

Partnership at Motatau

Leading the way in Northland, Ngatihine has taken up management of the Motatau Forest Reserve in a bid to turn the receding tide of kukupa (kereru or native wood pigeon) in the forest.

Located midway between Whangarei and Kaikohe at the head of the Motatau valley, the 350 hectare broadleaf-podocarp forest bears the ecological scars of decades of browsing and predation from possums, goats, pigs, rats, cats and stoats. Like other forests in Northland, the kukupa and kiwi have become scarce, and many tree species, such as taraire, puriri and karaka, are unable to fruit and reproduce.

Under the initiative of Ngatihine, DoC entrusted guardianship and management of Motatau to the iwi in 1994. With help from Landcare Research, DoC, the Education and Training Support Agency (ETSA) and the Lottery Grants Board, and working to a carefully developed management plan, Ngatihine aims to reduce the predator population in the forest and maintain a sizeable buffer zone on the surrounding privately owned land. An intensive pest control operation began in 1997, with ongoing monitoring to test its effectiveness. Training programmes in pest control are also being run at Motatau to enable the ongoing involvement of local people.

If successful, the Motatau programme will provide a model for other conservation campaigns in the area. And the kukupa will once again thrive in the forest, providing that crucial link in the seeding and regeneration of the fruit-bearing native trees.

Summary of issues

Working relationships and partnerships

Working relationships and partnerships in biodiversity management between Maori (iwi and hapu) and management agencies have the potential to be further improved. Factors that currently constrain the development of effective arrangements include:

- the resolution of Treaty of Waitangi claims;
- insufficient capacity and resources within iwi and hapu;

- poor understanding of Maori priorities and cultural values;
- the need to accommodate the interests of the wider New Zealand public in management arrangements, and the respective roles of specialised local and scientific experts in providing advice and management direction;
- a reluctance of some management agencies to consider partnerships with iwi; and
- the variability in experiences in building and maintaining working relationships, and a need for greater sharing of experiences between local and central government, and iwi and hapu.

Matauranga Maori

Traditional Maori knowledge (matauranga Maori) about New Zealand's biodiversity is an important source of knowledge, but is currently under-used and vulnerable to ongoing erosion and loss. Its recognition, use and protection are central to Maori participation in biodiversity management.

- Unresolved intellectual property right issues related to the ownership and use of matauranga Maori (for example, as raised in the Wai 262 claim to the Waitangi Tribunal) constrain its effective protection and application in biodiversity management.
- There are currently no formal mechanisms to sustain matauranga Maori and there is little recognition of its potential contribution in biodiversity management.
- Maori are often willing to share their traditional knowledge but only on the basis that they retain control over that information and the way in which it is used. This may create a potential conflict between promoting the public understanding of matauranga Maori and the desire of Maori to protect this information from improper use.
- Maori biodiversity science and research needs are not yet well recognised within government science funding processes.

Customary use of biodiversity

The customary use of New Zealand's biological resources by Maori remains an important part of sustaining relationships with indigenous biodiversity and maintaining cultural integrity, values and traditional knowledge.

- The development of national policy on customary use of native species by Maori has been constrained by poor public understanding of customary use issues, a lack of recognition of matauranga Maori, and inadequate ecological knowledge of native species.
- Conflicts and tradeoffs between user groups (for example, commercial and recreational) may need to be addressed in resolving some customary use issues.

The term "customary use" embraces traditional Maori use, practices and knowledge, and refers to contemporary uses of biological resources by Maori founded on this body of lore. However, Maori have a spectrum of interests in biological resources — from protection to customary and commercial use or development — and there is a strong link between customary use issues and issues relating to commercial use of genetic resources.

ACTION PLAN[56]

Objective 7.1 Partnerships in biodiversity management

Develop partnerships between Maori and Crown agencies in the conservation and sustainable management of biodiversity, consistent with the principles of the Treaty of Waitangi.

Actions:

a) **Improve current management to encourage iwi and hapu participation in processes for managing biodiversity within their rohe, including management of conservation areas, and resource management processes applying outside of these areas, and recognise iwi and hapu resource management plans that address biodiversity issues within their rohe.**

Key players: DoC*, MfE*, TRK, LAs, iwi/hapu[57]

b) Negotiate and establish protocols and arrangements with iwi and hapu at regional and local levels with respect to the management of specific habitats or particular species within their rohe, as a basis for building and maintaining effective working relationships and partnerships.

Key players: DoC*, TPK, MfE, Mfish, LAs, iwi/hapu

c) Increase measures to support the conservation and sustainable use of biodiversity on Maori owned land[58] in ways that enable the retention of tino rangatiratanga (ownership and control) through such mechanisms as Nga Whenua Rahui.

Key players: DoC*, Nga Whenua Rahui, iwi/hapu

Objective 7.2 Matauranga Maori

Recognise and respect the role of matauranga Maori in biodiversity management and provide for its retention and protection.

Actions:

a) **Work with Maori knowledge specialists to develop a framework for the retention and promotion of matauranga Maori and its use in biodiversity management.**

Key players: TPK*, DoC, MfE, FRST, research providers, whare wananga, iwi/hapu

b) Recognise the knowledge and role of Maori as kaitiaki in the conservation and sustainable use of biodiversity, including the cooperative management of public conservation areas and local authority resource management processes.

Key players: DoC*, MfE*, TPK, LAs, iwi/hapu

**Government lead*

56 *Actions shown in bold are priority actions (see Part Four).*

57 *See page 120 for key to key players.*

58 *"Maori-owned" land refers to both Maori land (as defined in Te Ture Whenua Maori or The Maori Land Act 1993) and general land owned by Maori.*

c) Enable Maori to incorporate traditional values and practices within tikanga-based biodiversity projects (such as the DoC Tikanga Atawhai projects) as part of their role as kaitiaki, and as a means of promoting and reviving matauranga Maori.

   Key players: DoC*, MfE, TPK, LAs, iwi/hapu

d) Educate New Zealanders about the role of matauranga Maori in biodiversity conservation and management.

   Key players: TPK*, DoC, MfE, iwi/hapu

Objective 7.3 Treaty of Waitangi claims settlement processes

Ensure policy development in relation to the conservation and sustainable use of biodiversity is responsive to the outcomes of Crown Treaty settlements and that Treaty settlement proposals are advanced in ways that enable the conservation and sustainable use of biodiversity.

Actions:

a) Monitor Treaty settlements and ensure Treaty settlement provisions and biodiversity management policies are compatible and complementary.

   Key players: DoC*, MfE*, TPK, Mfish, OTS, LAs, iwi/hapu

b) Advise parties negotiating Treaty settlements on the biodiversity implications of settlement options.

   Key players: DoC*, MfE, TPK, OTS, LAs, iwi/hapu

Objective 7.4 Science and research

Recognise and provide for Maori interests and involvement in government-funded scientific research about biodiversity.

Actions:

a) Develop a process for incorporating Maori biodiversity research needs into priority setting for research at national, regional and local levels.

   Key players: MoRST*, FRST*, DoC, MfE, LAs, iwi/hapu, research providers

b) Encourage partnerships between science providers and Maori in undertaking appropriate government-funded research.

   Key players: MoRST*, FRST*, DoC, MfE, LAs, iwi/hapu, research providers

Objective 7.5 Customary use of biodiversity

Recognise and provide for the customary use of indigenous species by Maori, consistent with the conservation and sustainable management of biodiversity.

Actions:

a) **Develop and implement policy to address outstanding issues relating to the sustainable Maori customary use of native species based on the New Zealand Conservation Authority's work in this area, including policy that encourages iwi to provide sufficient habitat for native species to establish conditions that allow customary use of those species.**

Key players: DoC*, NZCA, conservation boards, TPK, iwi/hapu

b) Work with Maori to facilitate access to traditional materials, developing sources and harvesting techniques which minimise the potential adverse effects on indigenous biodiversity, and, where necessary, developing alternative materials.

Key players: DoC*, iwi/hapu

Wai 262 — Indigenous flora and fauna claim

In 1991 a group of claimants (on behalf of Te Rarawa, Ngati Kuri, Ngati Koata, Whanau a Rua, Ngati Porou, Ngati Kahungunu and Ngati Wai) lodged a claim with the Waitangi Tribunal to indigenous flora and fauna; this has become known as the WAI 262 claim after its Tribunal registration number.

The claim concerns rights relating to indigenous plants and animals, specifically:

"Te tino rangatiratanga o te Iwi Maori in respect of indigenous flora and fauna me o ratou taonga katoa (and all their treasures) including .... matuaranga, whakairo, waahi tapu, biodiversity, genetics, Maori symbols and designs and their use and development and associated indigenous, cultural and customary heritage rights in relation to such taonga." (Amended Statement of Claim)

The scope of the claim is broad and includes the ownership and use of indigenous flora and fauna and their genetic resources, related knowledge and intellectual property rights, and their management and conservation. It is the first time the Tribunal has inquired into the area of biodiversity and traditional knowledge. The outcome of the claim may have significant implications for biodiversity management in New Zealand.

While the Tribunal granted the claim urgency in 1995, the research, hearings and reporting may take several years yet (claimant evidence is still being heard and evidence from the Crown is likely to follow). Because of this timing and the uncertainty of the Tribunal's findings and recommendations, it will be important that the Strategy does not constrain the Crown's ability to provide a policy response to the claim. On the other hand, neither should the existence of the claim unreasonably fetter Crown policy development in the biodiversity area.

THEME 8

Community Participation and Awareness

Scope

The understanding and involvement of New Zealand communities in conserving and sustainably using biodiversity.

Desired outcome for 2020

New Zealanders have embraced a vision for conserving and sustainably using biodiversity. They have an enhanced and broader appreciation of New Zealand's biodiversity and better understand the indigenous species, habitats and ecosystems associated with the places where they live — on farms, in and around towns and cities, and in the surrounding natural areas.

Children and adults are learning about biodiversity through schools, polytechnics and universities and community programmes, and are actively involved in its care. People value biodiversity, know how they can contribute to its conservation and sustainable use, and are taking responsibility for action within their businesses, communities and lifestyles.

Individuals within management agencies, researchers and professionals, private resource managers (and users), iwi and hapu and the wider community know and respect each other's roles in biodiversity management and are sharing their knowledge. Each group has sufficient information and capability and is actively incorporating biodiversity priorities in its management programmes, businesses and day-to-day activities. All are involved in, and contributing in some way, towards the achievement of New Zealand's biodiversity goals.

Current management

The concept of shared responsibility and involvement is central to New Zealand's legislative framework and approaches to conservation and natural resource management. Informing, consulting with and involving people and communities in management processes are accepted practices, and promotional and educational tools are increasingly being applied to address biodiversity issues. However, the quality of these processes is crucial to their success, as has been discovered with attempts to protect remnant natural areas through district plans under the RMA.

A range of initiatives are being taken by management agencies, non-government organisations and businesses to promote understanding about biodiversity in all environments (land, freshwater and marine) and to foster community involvement. These include: biodiversity interpretation in protected areas; nationwide conservation volunteer programmes; community habitat restoration projects; landcare, rivercare and beachcare groups; environmental education programmes by local government; and private sponsorship of threatened species recovery programmes.

Environmental education is increasingly being recognised as a key tool to achieve national and regional biodiversity goals. A diverse range of environmental education activities is being undertaken by many different organisations — from formal education providers (schools, polytechnics and universities) to local authorities, professional societies, iwi and hapu, and community, environmental and industry groups. These initiatives are generally in response to specific needs and local circumstances.

The Government's National Strategy for Environmental Education "Learning to care for our environment — Me Ako ki te Tiaki Taiao"[59], seeks to ensure that individuals and communities have the knowledge, skills and attitudes that enable them to make informed decisions affecting the environment.

Community power at Pauatahanui

Pauatahanui Inlet near Wellington is the focus of a community wetland project to enhance wildlife habitat and to preserve the original coastal plant life. The project is being managed by the Pauatahanui Wildlife Management Committee, which operates under the wing of the Royal Forest and Bird Protection Society.

The Pauatahanui Inlet has silted up following deforestation. The 1855 Wellington earthquake also raised the area. Since then, parts of the wetland were lost through drainage and the diversion of the Pauatahanui Stream. In 1984 Forest and Bird was appointed to manage the reserve and bought land to give access to the reserve. This additional land now sites car parks, an information centre, viewing sites, a plant nursery and other facilities.

The Society has been working to restore the wetland and improve habitat for native wetland birds. An extensive replanting programme, with ribbonwood, flax and other native species grown from local seeds, is underway to restore native vegetation to the modified areas. Weed control has been an important part of the project, and every year an animal pest control programme is carried out.

Today the former vegetation is returning to areas from where it had been lost, and the reserve hosts a range of resident and migratory birds. The royal spoonbill, a new species to the area, has appeared. The reserve also contains three rare plant species.

59 *Ministry for the Environment, 1998.*

Summary of issues

People are the fundamental agents of change; individually and collectively, their decisions and actions are crucial to the conservation and sustainable use of biodiversity.

The success of this Strategy depends on behavioural change and the active involvement of people and their organisations and communities in biodiversity management. This relies on people understanding and valuing biodiversity (how it contributes to ecosystem health as well as to their lifestyles) and being motivated to act and respond appropriately to biodiversity issues. Key issues relating to community awareness and involvement include:

- There is a general lack of understanding of the importance of biodiversity in sustaining life, the effects of human activities on biodiversity, how to prevent or reverse the current decline in biodiversity, and how individuals can contribute.
- There is poor awareness about existing biodiversity information and examples of biodiversity conservation. Communities have limited access to these sources and there is a need for a "one-stop shop" for information.
- Effective action by resource managers and users (for example farmers, foresters, horticulturists, fishers and so on) in conserving biodiversity is limited by a number of factors, including: insufficient information or technical capacity; a lack of resources; a lack of appreciation of the relevance of biodiversity to their businesses; and insufficient or perverse incentives.
- There is a need to increase community participation in conserving biodiversity. The approaches taken by management agencies consulting with resource managers and communities and involving them in biodiversity management often vary and in some cases are inadequate.
- Many organisations are currently involved in a diverse range of environmental education initiatives, but programmes and activities are not necessarily well coordinated, integrated or most effective, for example in relation to sharing information, integrating education activities and building partnerships.
- There is a need to recognise and "mainstream" biodiversity concepts in broader environmental education programmes and to make biodiversity information relevant to people's local environments, that is, to enable people to connect biodiversity with their places and how it contributes to their lifestyles. An environmental education curriculum and resource material need to be developed and teachers trained in their application.
- Matauranga Maori and cultural practices and values associated with the conservation and sustainable use of biodiversity need to be recognised in environmental education (see Theme Seven).

ACTION PLAN[60]

Objective 8.1 Community awareness and involvement

Enhance and broaden individual and community understanding about biodiversity (in particular, New Zealand's indigenous biodiversity) and increase community involvement in the conservation and sustainable use of New Zealand's biodiversity.

Actions:

a) **Make information about biodiversity available to people and communities, relevant to their local environments (that is, on the extent and management needs of ecosystems, habitats and native species), to enable them to make decisions and take action to support the conservation and sustainable use of biodiversity.**

Key players: DoC*, MfE*, MAF, Mfish, LAs, iwi/hapu, NGOs, community groups[61]

b) Develop a public awareness programme about New Zealand's lesser known or appreciated indigenous ecosystems, habitats and species important for biodiversity conservation.

Key players: DoC*, MfE, LAs, research providers, universities

c) Encourage greater community involvement and partnerships in management programmes and participatory projects to conserve and sustainably use biodiversity.

Key players: DoC*, MfE, MAF, Mfish, LAs

Objective 8.2 Role of resource managers

Encourage natural resource managers and users and landowners to adopt realistic and pragmatic steps to conserve and sustainably use biodiversity.

Actions:

a) Support, and where necessary develop, joint national and regional/local incentive mechanisms to encourage land, freshwater and marine management practices that lead to the conservation and sustainable management of biodiversity (see also Actions 1.1f and 2.1e).

Key players: MfE*, DoC, MfE, Mfish, LGNZ, LAs

b) Promote and support, in partnership with the Landcare Trust, landcare groups and other community-based groups, the integration of biodiversity considerations into sustainable land and water management initiatives.

Key players: MfE*, DoC, MAF, LGNZ, LAs, Landcare Trust

**Government lead*

60 *Actions shown in bold are priority actions (see Part Four).*

61 *See page 120 for key to key players.*

c) Support activities through the Sustainable Management Fund that enhance landowner and community understanding of ways to avoid or minimise the effects of human activities on biodiversity, and encourage community involvement in practical initiatives that help achieve the sustainable management of biodiversity.

Key players: MfE*, LGNZ, LAs

d) Encourage and support sector-led initiatives to effectively incorporate biodiversity considerations in their strategic planning and operational practices, with a focus on the agriculture, forestry, horticulture, fisheries, aquaculture and tourism sectors.

Key players: MfE*, DoC, MAF, Mfish, MoC, LGNZ

e) Develop and use national and regional "biodiversity awards" to reward notable efforts or achievements by landowners, businesses and community groups to conserve and sustainably use indigenous biodiversity.

Key players: DoC*, LAs*, MfE, LGNZ

Objective 8.3 Environmental education

Expand and enhance education about biodiversity as a key element in developing environmental education programmes and activities.

Actions:

a) Integrate biodiversity considerations into the implementation of the National Strategy for Environmental Education, including the development of environmental education curriculum guidelines for schools, the establishment of an in-service training programme for teachers and guidance for local authorities.

Key players: MfE*, DoC, MoEd

b) Assist Maori in identifying their education needs in relation to the maintenance and promotion of matauranga Maori in biodiversity management, as part of the proposed broader environmental education needs assessment.

Key players: TPK*, MfE

c) Promote and coordinate the role of environmental education in the conservation and sustainable use of biodiversity (as part of the implementation of the New Zealand Environmental Education Strategy) and encourage the active participation of local authorities, iwi and hapu, businesses, and environmental and community groups in developing and implementing environmental education activities.

Key players: MoEd*,MfE*, DoC, LAs

THEME 9

Information, Knowledge and Capacity

Scope

Adequate information, knowledge and capacity underpin the effective implementation of all biodiversity management actions proposed in this Strategy. This theme focuses on our needs — at a national, regional and local level — to improve and share knowledge, information and experience, build our capacity to more effectively manage biodiversity, and learn lessons by monitoring and reporting progress.

Desired outcome for 2020

We have become more effective as a country at learning about biodiversity and our management of it. Decisions that affect New Zealand's biodiversity are based on sufficient and timely information and effective management approaches, underpinned by a growing knowledge base which draws on local and traditional knowledge (matauranga Maori). When information is inadequate, a precautionary approach to decision making is taken.

Significant progress has been made in identifying and describing indigenous species, their distribution, and their genetic properties. Critical shortfalls in information have been addressed in key taxonomic groups and environments, including marine environments. New Zealand has made significant progress towards mapping our ecosystems and understanding how ecosystems function and the human-induced impacts on them. Investment in applied research has enabled technical breakthroughs, especially in relation to pest and weed control technologies that are ecologically appropriate, socially acceptable and of practical use to resource managers. Economic and social applied research guides the development of increasingly effective management methods.

We have become more systematic in our management of biodiversity. A bioregional approach to the assessment of biodiversity and coordination of its management draws effectively on the knowledge, skills and experience of national, regional and local organisations, communities, iwi and hapu, and individuals. Information about biodiversity at all levels is widely accessible, and resource managers are able to select the best mix of management tools from a range of mechanisms to suit local conditions. Those responsible for managing activities that affect biodiversity have sufficient capacity to do so, and share their skills and experience with others.

Monitoring and state of the environment reporting provide relevant and widely available feedback on the status of, and trends in, indigenous biodiversity. An adaptive management approach has been developed and widely adopted that enables ecological and other relevant information to be incorporated in decision making.

Current management

New Zealand maintains a number of different biodiversity-related databases and information sources. Land-based national ecosystem databases include DoC's Protected Natural Areas database, Landcare Research's New Zealand Land Resource Inventory and Terralink's national landcover database. At a regional and local level, most local authorities hold inventories of land and water resources and of significant natural areas, although their quality varies widely. There are also many species collections and databases held by different organisations including DoC, Mfish, CRIs, museums, universities, private companies and professional associations. Some of these collections are recognised as being nationally significant and are funded through the Public Good Science Fund.

The primary conclusion of New Zealand's first State of the Environment report is that New Zealand's environmental information needs considerable upgrading if the state of our environment is to be accurately described and trends detected.

There are significant gaps in our knowledge of indigenous species (their taxonomy, distribution and inter-relationships) and ecosystems. This is especially true in the marine environment, where gaps in our knowledge of marine biodiversity currently prevent a fully sustainable or ecosystem-based approach to management.

Gaps in information about indigenous biodiversity have been highlighted in relation to RMA requirements to manage significant areas of indigenous vegetation and significant habitats of indigenous fauna. Here, a lack of good information and understanding about the information that exists has created implementation problems and increased the risk of loss of natural areas important for New Zealand's indigenous biodiversity. There are also information gaps in relation to how to sensitively manage indigenous ecosystems in a way that allows productive use, while ensuring long-term ecological sustainability and maintenance of indigenous biodiversity.

Research on biodiversity is undertaken by many different agencies, with a range of funding sources; in some cases biodiversity research is thinly spread, poorly coordinated and under-resourced.

There are relatively few commonly adopted methods for how biodiversity information is acquired, managed, transferred and used. This limits information sharing by resource managers and communities. These problems are aggravated by a lack of coherent accountabilities for collecting, managing and sharing information on biodiversity. Programmes already in place, including the Protected Natural Areas Programme, the Environmental Performance Indicators Programme and some adaptive management initiatives, offer potential to address these problems, but they await more general implementation. Systems have not generally provided for the effective participation of local people in checking and adding to information, and few organisations have the in-house expertise to check information themselves.

Historically, management of biodiversity has been perceived as a central government function, and the emphasis has been on creating public protected areas and managing protected species. However, to sustain the full range of New Zealand's terrestrial biodiversity, emphasis will also need to be given to maintaining remnant natural areas on private land and managing production and urban areas sympathetically. There are also needs for improved management of biodiversity in freshwater and marine environments. This creates a demand for new skills and management practices, which have not been generally integrated into the management systems of local government and the private sector. These organisations and sectors often lack the capacity to respond to the needs of biodiversity protection. This shortfall could be addressed through assistance by central government and also central and local government partnerships with the private sector.

Summary of issues

Gaps in knowledge about biodiversity and its management

Gaps in scientific knowledge of New Zealand's biodiversity constrain its effective management. In particular, there are gaps in: knowledge of the taxonomy, distribution and population viability of indigenous species; classifying and understanding the extent, condition and functioning of ecosystems; and knowledge about the interaction between indigenous and introduced species, including introduced pests.

- Processes are needed to identify critical knowledge gaps and to target Crown and private research to fill them, with a focus on the following key areas:
  - diversity and ecological roles of microorganisms;
  - land-based invertebrates and plants;
  - coastal and marine species and ecosystems;
  - impacts of exotic species on indigenous biodiversity;
  - genetic diversity of indigenous species;
  - ecological and evolutionary processes and their links with ecosystem stability and function;
  - interactions between the physical and environmental characteristics of a habitat and its biodiversity; and
  - effects of climate variability and change on biodiversity, including their effects on biosecurity risks to indigenous and important introduced biodiversity.
- Techniques to control the adverse effects of introduced pest species need to be enhanced by investment in applied research, with a particular focus on:
  - enhancing methods to control possums and weeds, especially biological control;
  - developing effective techniques for the control of predators such as stoats, and newly introduced pest species in the marine environments; and
  - developing methods to effectively control the impact of invertebrate pests and diseases on both indigenous biodiversity and our important introduced species.

Taking stock of our ecosystems

At present, many decision makers lack useful and effective tools to classify and map different types of ecosystems in their area. Without access to this bigger picture, decision makers cannot be sure that their management actions are focused on the most important threats to indigenous biodiversity in their area. Nor can they gain from the experiences of decision makers who are facing similar threats in similar conditions elsewhere. To address these issues, there is a need to:

- Recognise existing methods for classifying and mapping ecosystems (such as the Protected Natural Areas Programme, bioregional classifications, landscape-based classifications and recent work on environmental domains) and identify where further work is required.
- Carry out more research to understand the appropriate scales for mapping different ecosystems, based on the issues and threats which resource managers and communities need to manage.
- Develop new systems and methods that help decision makers to map ecosystems and predict future threats to indigenous biodiversity in their area.

Ecosystem management: considering the links

Since their beginning, humans have used ecosystems to provide food, fibre, shelter and other natural resources. People have long recognised and managed ecosystems (at least parts of them), although they have only recently been called that. However, all too frequently, human use of ecosystems has caused species to become extinct or depleted and ecosystems to be degraded.

"Ecosystem management" (also called ecosystem-based management or an ecosystem approach) is a term that describes a management approach that reflects a desire to not repeat the mistakes of the past. Ecosystem management has evolved from previous approaches to natural resource management, and is still rapidly developing. It recognises that people and their actions are part of complex ecosystems and our impacts are felt throughout the ecosystem.

Its central principles are that:

- *natural resources should be used in ways that recognise the ecological processes (including evolutionary ones) operating within ecosystems and seek to maintain and work with these, rather than against them;*
- *natural resources of ecosystems should be used at a rate that does not exceed their ability to renew themselves, so that they are available for future generations to use;*
- *ecosystems should be used in ways that recognise and manage for the range of desired uses, not just the needs of one user; and*
- *resource use should avoid or minimise adverse effects on associated ecosystems.*

Ecosystem management demands a holistic approach and careful consideration of current, past and (anticipated) future patterns of natural resource use and ecological processes. If successfully developed and applied, it should help people to achieve efficient use of natural resources, with ongoing resource availability and benefits and minimum adverse effects on ecosystems and the biodiversity within them.

Monitoring changes in our biodiversity

To understand changes in the extent and condition of New Zealand's biodiversity, we need to use consistent methods to monitor biodiversity that provide useful information about key issues and threats. Most of our existing monitoring data is of limited use — it has gaps on important issues or over time — and it cannot be aggregated or compared with results from other areas.

- Monitoring agencies do not always have appropriate measures and methods (including indicators) to derive consistent information about key biodiversity issues and threats in their area.
- Monitoring regimes are insufficiently linked to resource managers' key biodiversity outcomes, which means that progress towards outcomes cannot be measured effectively.
- Benefits from monitoring biodiversity are not always understood, and statutory requirements to monitor the state of our biodiversity are not always complied with.
- The lack of consistent monitoring measures and methods means that information often cannot be compared or aggregated across different issues or administrative boundaries, and cannot be used by resource managers elsewhere to address similar threats in similar environments.

Sharing and reporting biodiversity information and best practices

Barriers to effective sharing of information mean that biodiversity information (including new techniques developed to manage biodiversity) is not necessarily informing people who are facing similar issues elsewhere.

- Often, we simply do not know what biodiversity information is available elsewhere. Systems to coordinate existing data and information about biodiversity, in a way that is accessible to resource managers and the wider community, are lacking.
- Systems are needed to aggregate local monitoring information and report it using agreed indicators to provide a local, regional and national picture of the extent and condition of, and trends in, our indigenous biodiversity.
- In cases where good management approaches are being developed, experience needs to be effectively shared within and between agencies, sector groups, communities and individuals.

Building capacity

While some organisations with resource management functions have had the resources and made it a priority to address biodiversity issues in their work programmes, many presently lack the capacity to do so. Communities, iwi and hapu, NGO's and businesses also encounter difficulties in getting access to the skills, people and resources, tools, and methods to manage indigenous biodiversity or their effects on it.

- Accountabilities for collecting, managing and sharing information on biodiversity are not clearly assigned to management agencies at national, regional and local levels.
- Information must be backed up by the expertise to interpret it and ensure its effective uptake into management.
- There is a need for a practical, "on the ground", skill base to be developed and maintained in every region. Systems that provide for ongoing improvement of communities' and organisations' knowledge and management capacity are also needed.
- There is a need to develop approaches which help individuals, communities, iwi and hapu, and business groups to develop and sustain commitment to managing biodiversity.
- Capacity takes time to develop — strategic planning is needed to anticipate needs for knowledge, information and techniques.
- Education, skill development and training needs need to be identified and fostered in our education system.

Valuing biodiversity and good management practices

In many cases, the true value of biodiversity is not accounted for in the market because most of the benefits of biodiversity are externalities with low or zero market value. Methods of valuation are needed which allow markets to take better account of the true value of biodiversity and to assess the impacts of human activities on biodiversity. Linked to this is a need to increase the use of incentive mechanisms to encourage and reward the sympathetic management of biodiversity. In particular, guidance is needed to:

- Assist understanding and use of environmental impact assessments and other methods to help decision makers account for the economic and non-economic value of biodiversity and ecosystem services.

- Inform decision makers of the range of regulatory and non-regulatory tools and mechanisms available (including financial, information and property-based measures) for encouraging and rewarding sympathetic management of biodiversity.

Signposts for sustainability — the Environmental Performance Indicators (EPI) Programme

In making choices about the state of our environment we need good information. Without this, we cannot identify our environmental impacts, set realistic targets, assess progress, detect past errors, or objectively weigh economic and environmental values. The purpose of the Environmental Performance Indicators (EPI) Programme, which is being coordinated by the Ministry for the Environment, is to develop and use indicators to measure and report on how well we are looking after our environment.

Nationally coordinated monitoring and reporting programmes exist for such things as weather, atmospheric ozone, threatened species and toxic marine algae. But the vast majority of environmental monitoring is not coordinated or standardised across our nation. The EPI Programme is looking to redress this balance by building on existing information and monitoring to develop national environmental indicators for use throughout the country. This approach will allow costs and expertise to be shared, national trends to be identified, and comparisons to be made between different regions, different environmental issues, and across different environments.

Indicators (performance measures) are being developed under the EPI Programme for marine, terrestrial and freshwater biodiversity. These will help us to measure progress towards goals contained in central and local government policy (including this Strategy) and legislation. They will simplify, quantify and communicate trends in biodiversity for all resource managers, resource users and the public. They will also provide biodiversity managers with an early warning of potential biodiversity problems, and help focus public and the Government's attention on key biodiversity issues now and in the future.

Some examples of proposed indicators for indigenous biodiversity are:

- *change in gross habitat fragmentation of indigenous vegetation cover for each of New Zealand's different environments;*
- *the number of taxa in IUCN (international standard for classifying threatened species) and New Zealand threat categories; and*
- *change in the distribution of selected invasive pest and weed species.*

ACTION PLAN[62]

Objective 9.1 Expand the research frontier

Identify and fill critical gaps in scientific knowledge, including applied research, and prioritise and coordinate future research to address key issues and threats to biodiversity.

Actions:

a) **Develop and implement a coordinated research strategy to identify and fill gaps in our knowledge and understanding of biodiversity relevant to key threats.**

Key players: MfE*, DoC*, MoRST*, FRST, LAs, universities, museums, other research providers, iwi/hapu[63]

b) **Invest in relevant research that contributes to better management of introduced pests and enhanced management of indigenous biodiversity.**

Key players: DoC*, FRST*, MfE, LAs, universities, other research providers

Objective 9.2 Use ecosystem-based methods to map our indigenous biodiversity

Develop and implement effective approaches to map indigenous biodiversity at ecosystem scales and inform management actions and research.

Actions:

a) Develop effective methods of ecosystem classification and mapping biodiversity and for identifying and monitoring key biodiversity issues and threats.

Key players: MfE*, DoC, FRST, Mfish, LAs, research providers, iwi/hapu

b) **Accelerate biodiversity survey, identification and assessment of threats to key ecosystems.** (See also Actions 1.1a, 2.1b and 3.1b).

Key players: MfE*, DoC, FRST, Mfish, LAs, research providers, iwi/hapu, landowners, NGOs

THEME 9

* *Government lead*

62 *Actions shown in bold are priority actions (see Theme Four).*

63 *See page 120 for key to key players.*

Objective 9.3 Keep track of change

Use consistent measures and methods to monitor and provide information on key changes in the extent and condition of indigenous biodiversity.

Actions:

a) Clarify agency accountabilities for monitoring and reporting on indigenous biodiversity.

Key players: DoC, MfE*, MoRST, SSC, Mfish, MAF, LAs, research providers, iwi/hapu

b) Develop, select and use cost-effective methods (including indicators) for monitoring indigenous biodiversity and threats to indigenous biodiversity.

Key players: MfE*, DoC, Mfish, LAs, iwi/hapu

Objective 9.4 Reporting and adaptive management

Ensure that local, regional and national reporting on the state of indigenous biodiversity informs ongoing priority setting for biodiversity management and research as a key part of an adaptive management approach.

Action:

a) Use monitoring results to provide local, regional and national views on the state of New Zealand's indigenous biodiversity, to report on progress towards achieving biodiversity goals, review and re-focus management action, and inform research to fill critical information gaps.

Key players: MfE*, DoC, Mfish, FRST, LINZ, LAs, Statistics NZ, Standards NZ, research providers, iwi/hapu

Objective 9.5 Share Information and best practice

Consolidate and share existing and new information, methods, technologies and management experiences so that others can benefit from relevant knowledge about indigenous biodiversity.

Actions:

a) Develop resources and systems that promote the consolidation and sharing of information about indigenous biodiversity and hands-on biodiversity management.

Key players: MfE*, DoC, MAF, Mfish, MoRST, LAs, research providers, iwi/hapu

Objective 9.6 Build capacity

Enhance the capacity of people and organisations to fulfil their responsibilities to conserve and sustainably manage New Zealand's indigenous biodiversity.

Actions:

a) Document codes of practice and expected performance standards for use of the most cost effective techniques for managing biodiversity and provide for the evaluation and continuous improvement of these techniques and the sharing of information on best practice.

Key players: MfE*, DoC, Mfish, industry and sector groups, research providers, iwi/hapu

b) Incorporate biodiversity values into sector- and industry-based environmental management systems, performance standards, guidelines, environmental policies and codes of practice, with the help of advice and information from government agencies.

Key players: MfE*, industry and sector groups, research providers

c) Ensure that biodiversity management agencies review and monitor their capacity to implement best practice management techniques, enhance their competencies and share these experiences with others.

Key players: MfE*, DoC, Mfish, LAs, research providers

d) Ensure appropriate skills training and education to enhance the capacity of people and relevant management agencies to manage indigenous biodiversity.

Key players: MfE*, DoC, LAs, MoEd, industry and sector groups, universities, research providers, iwi/hapu

Objective 9.7 Valuing biodiversity

Improve the knowledge of market and non-market values of indigenous biodiversity and develop methodologies to evaluate the full cost of activities in terms of their impacts on these biodiversity values.

Actions:

a) Review mechanisms that have been used in other countries to value biodiversity, and where practicable, develop ways to apply these techniques in New Zealand.

Key players: DoC*, MfE*, LAs, industry and sector groups

b) Investigate and raise awareness of the range of incentives (including financial, information and property-based mechanisms) which resource managers can use to encourage and reward sympathetic management of indigenous biodiversity (see also Actions 1.1e, 1.1f and 2.1e).

Key players: MfE*, DoC*, LAs, community groups, iwi/hapu

Depicting ecosystems

Maps, classifications and descriptions are useful tools to help managers and communities to know and manage their local environments and ecosystems. They provide answers to questions such as: what are the defining characteristics and species of an area, and how are these distributed? How do they differ from other areas? Where are their boundaries?

In the last two decades a lot of progress has been made with mapping our natural areas, much of it associated with the Protected Natural Areas Programme (see Glossary). Three key approaches are described below. The map below shows how these approaches apply at various spatial scales — from the national to the local.

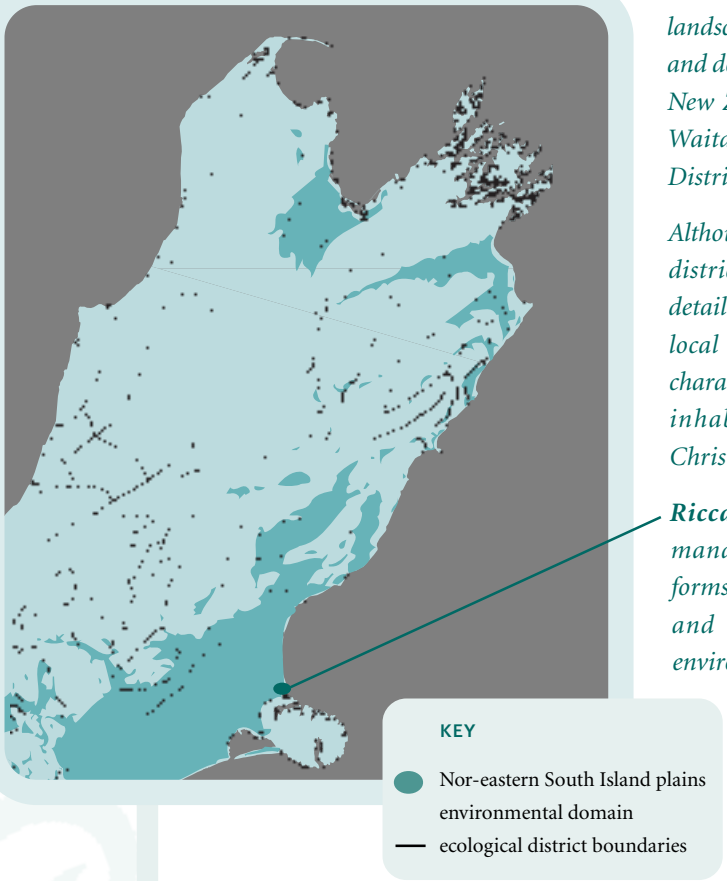
***Environmental domains:** One way of classifying environments is to identify areas with similar environmental conditions. In particular, factors like geology (rock type), temperature, solar radiation, soil water availability and humidity determine plant and animal distributions. Areas with similar environmental conditions are termed "environmental domains".*

***Ecological regions and districts:** In the early 1980s New Zealand was divided into ecologically distinct areas as a basis for a representative protected natural areas system (see Glossary). Two hundred and sixty-eight ecological districts were identified and mapped at 1:500 000 scale, and grouped into 85 ecological regions. Ongoing survey of ecological districts provides a basis for understanding biodiversity protection priorities on the ground.*

***Local ecosystems:** At a more local level, landscape planners and scientists are mapping and describing local ecosystems in some parts of New Zealand (for example, Christchurch and Waitakere cities and the Queenstown Lakes District) to assist local restoration projects.*

Although mapped on a similar basis as ecological districts, these ecosystem maps show greater detail (for example, at scales of 1:25 000) and local variation, and emphasise keystone (or characteristic) species that inhabit (or used to inhabit) these areas. The Riccarton, Christchurch locality is one example.

***Riccarton** is part of a kahikatea, kereru, manatu, lush older plains ecosystem; and forms part of the Low Plains Ecological District and the Nor-eastern South Island plains environment domain.*



THEME 10

New Zealand's International Responsibilities

Scope

New Zealand's international role and responsibilities with respect to the global conservation and sustainable use of biodiversity and the furthering of national biodiversity goals.

Desired outcome for 2020

New Zealand has a visible and effective international role in seeking to ensure improved biodiversity management globally by participating in international forums, sharing information and expertise, and fostering bilateral and multilateral cooperation in biodiversity conservation efforts.

New Zealand has an active role in biodiversity conservation in surrounding marine areas, the Southern Ocean, and Antarctica.

Current management

New Zealand's 1993 ratification of the Convention on Biological Diversity (CBD) confirmed our ongoing commitment to the international effort to conserve and sustainably use global biodiversity. The CBD promotes the need for countries to work together and coordinate efforts to tackle biodiversity issues on a number of fronts, including science and research, information exchange, national planning, and education and training. Special provision is made for the support of developing and small island countries to achieve their biodiversity goals.

The Global Biodiversity Information Facility (GBIF) is a new programme being coordinated by the OECD. It is a global initiative to provide mechanisms to electronically store, link and search the myriad of biodiversity databases which have been established worldwide.

In addition to the CBD, New Zealand participates in other international organisations and processes relevant to environmental protection and species conservation. International treaties have served to raise the profile of New Zealand's biodiversity (for example, New Zealand's World Heritage and important wetland sites), as well as contributing to conservation outcomes in other countries, for example by prohibiting trade in endangered species.

The level of New Zealand's involvement in international environmental organisations (such as the United Nations Environment Programme and Commission on Sustainable Development) depends on our priorities and particular membership obligations. New Zealand also has an active role in biodiversity conservation in our neighbouring marine areas and the Southern Ocean, and in Antarctica (focused on the stewardship of ecosystems within the Ross Dependency[64]).

New Zealand supports biodiversity conservation in other countries, with a focus on the South Pacific region. This occurs bilaterally through New Zealand's Overseas Development Assistance (NZODA) programme and regionally through the South Pacific Regional Environmental Programme (SPREP). Capacity-building in biodiversity and resource management is a priority for development assistance in Pacific Island countries. New Zealand's ongoing financial contributions to the Global Environment Facility (GEF) assist developing countries to meet the costs of implementing the CBD.

Summary of issues

New Zealand has a strategic interest in effective and ongoing participation in international processes in relation to the conservation and sustainable use of biodiversity.

- New Zealand's contribution to international biodiversity conservation and sustainable management initiatives is important; and it is critical that this is focused where it can be most effective.
- New Zealand has a responsibility to support, and a strategic interest in, biodiversity conservation initiatives in developing and small island nations, particularly in the South Pacific and South East Asian region.
- New Zealanders share a global responsibility to ensure their activities do not adversely impact on the biodiversity of other countries or within international waters.
- There needs to be consistency between New Zealand's objectives for conserving and sustainably using biodiversity and our trade policies, in particular the international trade commitments New Zealand has made to the World Trade Organisation.
- New Zealand has specific responsibilities to promote technical and scientific cooperation with other parties to the CBD using the Internet as a tool to achieve this (that is, to develop an Internet Clearing House Mechanism).
- New Zealand has a special interest in Antartica and the Southern Ocean — we have implemented the Protocol on Environmental Protection (Antarctic Treaty) and participate in Southern Ocean fishing management under the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR).
- New Zealand has responsibilties to ensure sustainable fishing under the United Nations Fish Stocks Agreement in areas beyond our EEZ and for migratory species.

64 The region of Antarctica in which New Zealand has claims and particular scientific interests.

Working with our Pacific neighbours

Increasingly New Zealand's overseas development assistance in the South Pacific is being channelled into projects where environmental protection goes hand in hand with community development. New Zealand scientists, conservation managers and volunteers contribute to conserving the indigenous biodiversity of Pacific Island countries (including the Cook Islands, Tonga, Samoa, Vanuatu, the Solomon Islands and Papua New Guinea) by passing on knowledge and skills to local conservation staff and facilitating the development of sustainable income-generating activities.

On the island of Erromango, a southern island in the Vanuatu group, the villagers chose to protect a 3000 hectare area of virgin rainforest, containing the finest remaining stands of local kauri (Agathis macrophylla) in Vanuatu. In 1995 the landowners reached agreement with the Vanuatu Government and the European Union on a five-year lease in exchange for compensation. An improved water supply has opened up possibilities for low-impact ecotourism and a New Zealand-funded management plan aimed at conserving the forest long term has suggested a number of sustainable alternatives to logging, such as ecotourism ventures and sustainable harvesting of forest crops.

The Marovo Lagoon, part of the New Georgia Group in the Solomon Islands, is an immense waterway speckled with hundreds of islands that support a dazzling variety of plants and animals. Through its NZODA programme, New Zealand is assisting the Solomon Islands to conserve Marovo's natural and cultural resources by promoting sustainable income-generating activities.

So far, lodges have been opened for ecotourism-based activities and plans are in place for a kayaking venture. The project also aims to raise local communities' awareness of the benefits of conservation. Marovo's future hangs in the balance. Some villages chose not to accept alternatives to extractive resource use such as logging, while others have embraced a more sustainable approach and are developing resource plans to ensure future generations can share in Marovo's unique biodiversity. A spin-off from this project, however, has been the designation of East Rennell Island as the South Pacific Islands' first World Heritage Site.

ACTION PLAN[65]

Objective 10.1 International forums and treaties

Contribute towards the international effort to conserve and sustainably use global biodiversity through participation in relevant international forums and treaty systems.

Actions:

a) Promote and coordinate credible, constructive and sustained government agency involvement in international organisations, programmes and activities to fulfil New Zealand's obligations and responsibilities under the Convention on Biological Diversity and related treaties.

Key players: MFAT*, DoC, MfE, MAF[66]

b) Review implementation of those international treaties relevant to the conservation and sustainable use of biodiversity to which New Zealand is a party.

Key players: MFAT*, DoC, MfE, MAF

c) Participate in international negotiations, in priority areas for New Zealand as appropriate, on the development of new international environmental instruments relevant to the conservation and sustainable use of biodiversity, such as the negotiation of a Biosafety Protocol to the Convention on Biological Diversity.

Key players: MFAT*, DoC, MfE, MAF, ERMANZ

d) Promote the development and use of mutually supportive trade and environmental policies for the conservation and sustainable use of biodiversity in international trade and other forums.

Key players: MFAT*, DoC, MfE, MAF, MoC

Objective 10.2 Inter-country cooperation

Seek continued and effective cooperation and support for the conservation and sustainable use of biological diversity, directly between governments and through people-to-people cooperation.

Actions:

a) Enhance New Zealand's information exchange and collaboration internationally in biodiversity science, research and technology through the use of the Internet Clearing House Mechanism, travel grants and involvement in relevant international and regional organisations.

Key players: DoC*, MoRST, MfE, MFAT, research providers, universities

**Government lead*

65 *Actions shown in bold are priority actions (see Part Four).*

66 *See page 120 for key to key players.*

b) **Continue to promote policies and programmes for New Zealand's Overseas Development Assistance and the South Pacific Regional Environmental Programme (SPREP) for environmentally sustainable development in partner countries, with priority given to assisting developing and small island countries in the Asia-Pacific region to identify environmental priorities and increase their capacity to conserve and sustainably use biodiversity.**

Key player: MFAT*

c) Cooperate and work with other countries on biodiversity issues of mutual concern and in areas in which New Zealand has particular expertise or needs, such as research on shared taxa, threatened species management and recovery, prevention and elimination of invasive species, biological restoration techniques, and biodiversity assessment.

Key players: will vary*, DoC, MAF, Mfish, FRST, MFAT, research providers

Key to Key Players for Implementation

Local government

LAs	Local Authorities ie, all councils — city, district and regional councils and unitory authorities
RCs	Regional Councils
TLAs	Territorial Local Authorities ie, city and district councils

Government agencies and organisations

BC	Biosecurity Council
CRIs	Crown Research Institutes
DIA	Department of Internal Affairs
DoC	Department of Conservation
DPMC	Department of Prime Minister and Cabinet
ERMANZ	Environmental Risk Management Agency of New Zealand
F&GNZ	Fish and Game New Zealand
FRST	Foundation for Research, Science and Technology
LGNZ	Local Government New Zealand
LINZ	Land Information New Zealand
MAF	Ministry of Agriculture and Forestry
Mfish	Ministry of Fisheries
MfE	Ministry for the Environment
MFAT	Ministry of Foreign Affairs and Trade
MoC	Ministry of Commerce
MoEd	Ministry of Education
MoH	Ministry of Health
MoRST	Ministry of Research, Science and Technology
MSA	Maritime Safety Authority
NIWA	National Institute of Water and Atmospheric Research
NZCA	New Zealand Conservation Authority
NZQA	New Zealand Qualifications Authority
OTS	Office of Treaty Settlements
SSC	State Services Commission
TPK	Te Puni Kokiri or Ministry of Maori Development

Other organisations

ARAZPA	Australasian Regional Association of Zoos, Parks and Aquaria
NGOs	Non Government Organisations
QEII Trust	Queen Elizabeth II National Trust

PART FOUR

Strategic Priorities and Implementation

PRIORITY ACTIONS

This Strategy identifies 147 actions that need to be collectively implemented over the next 20 years to achieve the goals set out in Part Two. These actions will not be sufficient in themselves, however. The focus in the Strategy is on the gaps and inadequacies in our current management of biodiversity that need to be bridged to halt the decline in New Zealand's biodiversity. Therefore the actions identified here are ***additional*** to the management actions and activities that are already contributing to the conservation and sustainable use of biodiversity.

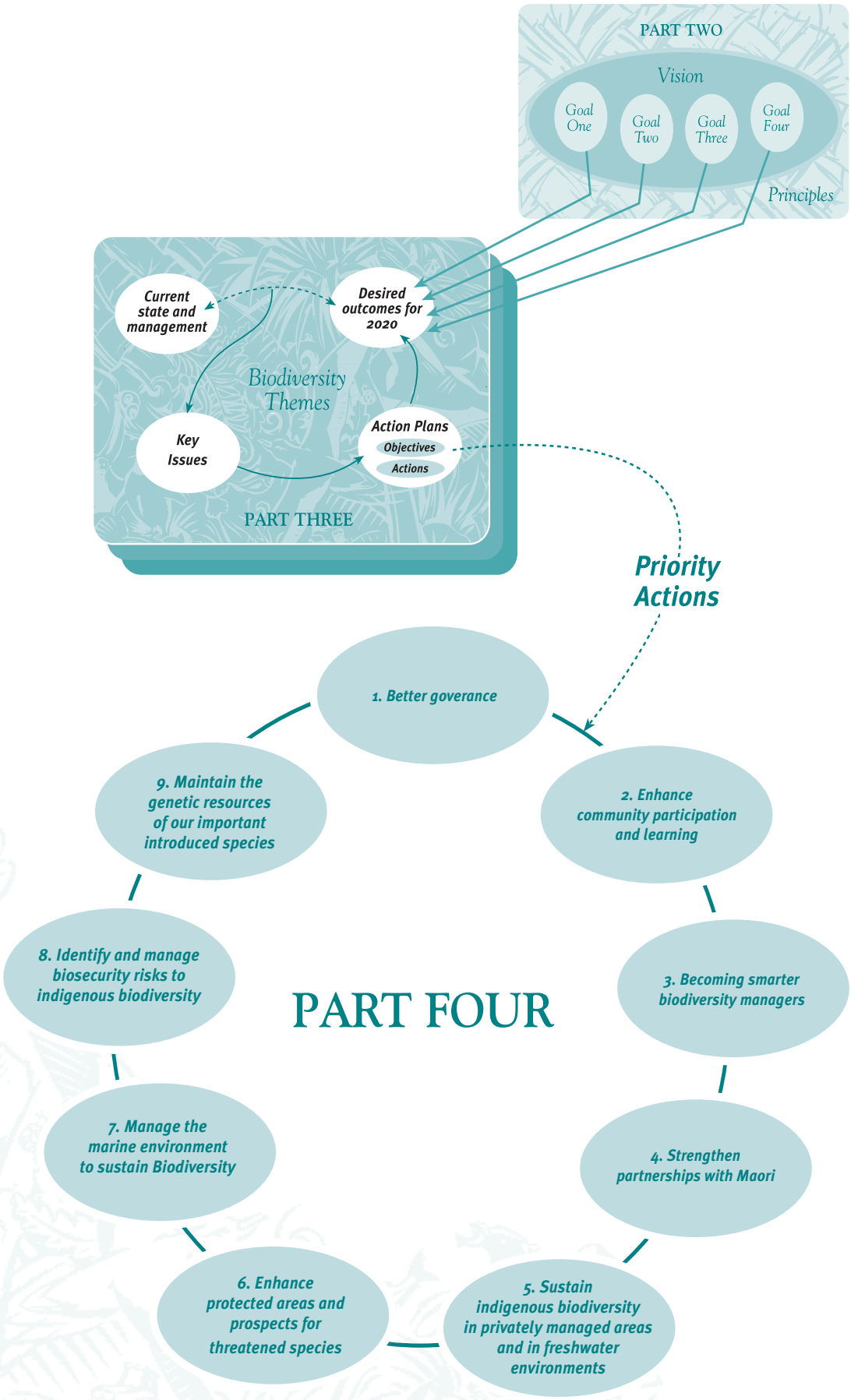
Many of the actions in Part Three are enhancements of existing programmes, rather than new initiatives. However, together they represent a significant increase in the biodiversity management effort that is required. Priority actions are identified in Part Three in recognition that:

- we cannot implement all actions at once;
- some will contribute relatively more towards achieving our biodiversity goals than others; and
- to be effective, some actions need to precede others.

The priority actions, as shown bold in Part Three, are outlined in the following section. These actions were chosen as those likely to best position us in the short term (the next five years) to achieve our biodiversity goals in the longer term. The changes that have occurred to New Zealand's biodiversity have progressively accumulated over a long period. While there is a need for focus and additional effort to enable us to halt the decline of our indigenous biodiversity, the changes will also be cumulative. We will need to progressively change our behaviours to act in a way that sustains our biodiversity.

The 43 priority actions have been grouped in nine priority areas under the biodiversity goal to which they will contribute most directly (see Figure 4.1). These priority actions will not be sufficient by themselves to achieve the goals, but will need to be accompanied by existing programmes and initiatives to conserve and sustainably use biodiversity, as well as the other actions in this Strategy.

Figure 4.1: Strategic framework for the New Zealand Biodiversity Strategy



Goal One: Community and individual action, responsibility and benefits

Enhance community and individual understanding about biodiversity, and inform, motivate and support widespread and coordinated action to conserve and sustainably use biodiversity; and

Enable communities and individuals to equitably share responsibility for, and benefits from, conserving and sustainably using New Zealand's biodiversity, including the benefits from the use of indigenous genetic resources.

1. Better governance

Reversing the decline in indigenous biodiversity is a strategic priority for the Government. Central government has a key role in leading, coordinating and monitoring the implementation of this Strategy.

Having established national goals and objectives for New Zealand's biodiversity, the next task is to ensure that appropriate implementation mechanisms are put into place, and agencies and communities receive the support necessary to play their part. Important first steps will be to incorporate commitments made in the Strategy into government and departmental planning (Action 6.1a), and to establish an inter-agency group at a national level to oversee and facilitate action and appropriate regional-level working arrangements and responsibilities (Action 6.1b). An adaptive management approach in which we build on our successes, share best practice, prioritise effort on a consistent agreed basis, and review progress will be followed.

2. Enhance community participation and learning

The community and private sector have vital roles to play in achieving New Zealand's biodiversity goals. Effective partnerships within and between central and local government, communities and private resource managers need to be forged and strengthened to enable the guidance, sharing of expertise, access to information and support necessary to achieve effective local action.

Improving our information systems to make best use of existing and new information, and making this accessible to people and communities are critical to mobilising and facilitating community action (Action 8.1a). Equally, the private sector — agriculture, forestry, horticulture, fisheries, aquaculture and tourism industries — needs to be further encouraged to take a lead in incorporating biodiversity considerations into their businesses (Action 8.2d). Making biodiversity a part of the environmental education curricula guidelines for schools and developing the resource material to support this are integral to creating a growing understanding about biodiversity and a culture of care within New Zealand (Action 8.3a).

3. Becoming smarter biodiversity managers

Good accessible information, underpinned by a growing knowledge base and the capacity to take action, are vital precursors to achieving most actions in this Strategy. Improved systems to promote information sharing, a consistent approach to monitoring and user-friendly reporting at national, regional and local levels are keys to enabling people to adapt their actions to contribute towards achieving New Zealand's biodiversity goals (Actions 9.3b and 9.4a). These information systems will share information not only about progress on actions and results, but also on the best practice hands-on techniques needed to deal with specific pests and restoration of ecosystems (Action 9.5a).

To capitalise on investment in science and research we first need to identify the gaps in our knowledge and understanding about biodiversity in relation to key threats (Action 9.1a). In order to prioritise our protection and pest management activities we need to accelerate and complete baseline biodiversity surveys and assessment of threats (Action 9.2b). This is especially relevant for freshwater and marine biodiversity (Actions 2.1b, 3.1b and 3.1d). Investment in research in pest control techniques and management approaches that best support indigenous biodiversity on private land is also a priority (Actions 1.3d and 9.1b).

Goal Two: Treaty of Waitangi

Actively protect iwi and hapu interests in indigenous biodiversity, and build and strengthen partnerships between government agencies and iwi and hapu in conserving and sustainably using indigenous biodiversity.

4. Strengthen partnerships with Maori

Good working relationships and partnerships in biodiversity management between Maori and management agencies are evolving slowly; these need to be enhanced and more consistently implemented throughout the country (Action 7.1a). Linked to the move towards a shared management approach is the recognition, use and protection of matauranga Maori (traditional knowledge) about indigenous biodiversity.

The retention and promotion of matauranga by Maori are critical given the risks of its ongoing erosion and loss (Action 7.2a). As part of this, agreements that safeguard the use of matauranga Maori when involved with bioprospecting and the development and use of indigenous genetic resources will also need to be developed. Agreements also need to be reached at a local level that encourage Maori to maintain critical habitat for some of New Zealand's endangered species in sufficient numbers to sustain the populations and allow the customary use of those species (Action 7.5a).

Goal Three: Halt the decline in New Zealand's indigenous biodiversity

Maintain and restore a full range of remaining natural habitats and ecosystems to a healthy functioning state, enhance critically scarce habitats, and sustain the more modified ecosystems in production and urban environments; and do what else is necessary to

Maintain and restore viable populations of all indigenous species and subspecies across their natural range and maintain their genetic diversity.

5. Sustain indigenous biodiversity in privately managed areas and in freshwater environments

New Zealand's public conservation lands do not contain the full range of our indigenous terrestrial ecosystems. How we manage the indigenous ecosystems and species outside of protected areas — on Crown land not managed for conservation purposes, on private land and in freshwater environments — is critical to halting the decline of New Zealand's indigenous biodiversity. Distinctive habitats and ecosystems in these areas continue to be at risk of declining condition and loss of their indigenous components.

This Strategy proposes that agencies work together with land managers to ensure that the critical elements of our indigenous biodiversity are sustained. As a preference, land should remain in private ownership but be subject to changed management approaches that are sympathetic to indigenous biodiversity. To be effective, the Strategy requires the assistance of willing and active landowners. While many landowners are receptive to contributing to New Zealand's biodiversity goals, they need assurance that their efforts will contribute to a coherent larger programme. They are looking for partnerships based on mutual respect of their rights and responsibilities along with those of management agencies and other interest groups.

Consultation will be undertaken to seek agreement on the roles and responsibilities of landowners, management agencies and communities in sustaining indigenous biodiversity on private land (Action 1.1d). There is no single approach that can apply, given the range of environments, communities and individual land managers' circumstances. We need to better support initiatives for protecting indigenous biodiversity on private land including where these impact on our freshwater environments, using an appropriate mixture of mechanisms including economic incentives (Actions 1.1c), and backed up by expanded national funding (Action 1.1e).

Although regulation can only provide part of the answer, clear national guidance through a national policy statement on biodiversity under the RMA and linked to current sustainable land and freshwater management initiatives, will better enable councils to contribute to national priorities for biodiversity conservation (Actions 1.1d and 2.1a).

Good information at national, regional and local scales, and improved access to this by resource and land managers and the community are also needed (Actions 9.1a, 9.2b and 8.1a). There is a need to protect priority freshwater habitats (Action 2.1c) and to develop a system for classifying freshwater ecosystems as a first step to assist protection priorities (Action 2.1b).

Clarification of roles and responsibilities for pest management and better coordination at a national and regional level are needed to maintain the ecological condition of natural areas important for biodiversity (Actions1.3a and 5.1a).

6. Enhance protected areas and prospects for threatened species

New Zealand's public conservation lands and other protected areas currently secure a mix of extensive upland areas, island sanctuaries and lowland remnants. These areas fall short of representing the full range of indigenous habitats and ecosystems however, and many protected ecosystems are at threat from animal and plant pests. Threatened species often require targeted recovery action to prevent their further decline and loss.

The preference will be to work with landowners to adopt sympathetic management practices. However, where this is not possible or where the ongoing management requirements are significant, additions will be made to public conservation lands. In particular, additional purchases will be made where there are scarce or under-represented habitats and ecosystems, or habitats where there are endangered species and a high risk of irreversible loss, and where public ownership is needed for effective management of the land (Action 1.1b).

Increased and better focused pest management is needed to stabilise and restore the condition of ecosystems most important for indigenous biodiversity on public conservation lands (Action 1.3c). Progress towards more effective and cheaper pest control techniques through investment in relevant research is critical for longer-term gains in pest management (Actions 1.3d and 9.1b).

Expansion of restoration initiatives, on offshore and mainland islands, will enable ecological decline to be reversed in key protected areas (Action 1.4a). This will be complimented by increased planned recovery actions for priority threatened native species (Action 1.5a). Areas of risk to the genetic resources of indigenous species need to be better identified, and proposals to manage those risks developed (Action 4.1c).

7. Manage the marine environment to sustain biodiversity

New Zealand's coastal and marine environment contains a significant portion of our biodiversity, much of which is poorly understood. Fishing practices, the effects of activities on land, and biosecurity threats constitute the areas of greatest risk to marine biodiversity.

We need to improve our knowledge about the marine environment (Action 3.1b) and identify threats to marine biodiversity, particularly for those habitats most sensitive to damage (Action 3.1d). Responsibilities for managing marine biodiversity need to be clarified (Action 3.2a), our network of marine protected areas expanded (Action 3.6a, 3.6b and 3.6c), and border control improved to reduce the risk of entry of harmful species and diseases (Action 3.5a).

Fisheries are significant economically, culturally and recreationally, and the transition to a sustainable regime that explicitly provides for the maintenance of biodiversity will be a challenge. This will be progressively achieved by the implementation of Part II of the Fisheries Act 1996 including through the use of sustainability plans, using an ecosystem-based approach and incorporating measures that seek to minimise any adverse effects on marine biodiversity from all fishing and other activities (Actions 3.3b, 3.4a and 3.4b).

8. Identify and manage biosecurity risks to indigenous biodiversity

The recent developments to integrate our border control and biosecurity response systems need to be built on to ensure risks to indigenous biodiversity from unwanted and new organisms are fully assessed and managed (Action 5.3c). With the increasing volume of trade and changing locations for the goods coming to New Zealand, assessment of the risks to indigenous biodiversity from potential pest species needs to be improved (Action 5.2a).

Roles and responsibilities for pest management need to be clarified, particularly in relation to introduced species that are present but not widespread in New Zealand and have the potential to be pests (Action 5.1a).

In following the approach of trying to manage our biosecurity risks offshore and being a responsible and supportive international citizen, New Zealand will continue, through its Overseas Development Assistance Programme, to provide assistance to small island countries in the Asia-Pacific region to increase their capacity for biosecurity management (Action 10.2b).

Goal Four: Genetic resources of introduced species

Maintain the genetic resources of introduced species that are important for economic, biological and cultural reasons by conserving their genetic diversity.

9. Maintain the genetic resources of our important introduced species

New Zealand's economy depends in large part on the genetic resources of a limited number of introduced species. While maintenance of the genetic diversity of these species will generally be left to the market and producers, given the need to ensure our producers have access to overseas genetic material, the Government must take a strategic interest in the genetic resources of our economically important introduced species. This will need to be developed collaboratively with industry, starting with the identification of significant areas of risk to the genetic resources of introduced species (Actions 4.1a and 4.1b).

IMPLEMENTATION

The successful implementation of this Strategy will require a coordinated effort across central and local government, working in collaboration with the private sector, the community and landowners, and in partnership with iwi and hapu.

To successfully implement the Strategy:

- central government agencies need to incorporate relevant priority actions into their work programmes and to coordinate these across Government;
- community involvement in the conservation and sustainable use of New Zealands' biodiversity needs to be increased and better supported and coordinated; and
- an adaptive management approach needs to be taken, aiming at the continual improvement of existing management practices through responsiveness to feedback from information gathering, research results, policy development, management action, and monitoring of biodiversity outcomes.

The implementation of the Strategy will be monitored to assess progress towards meeting goals and objectives. The Strategy will be reviewed after five years to consider its effectiveness and identify any changes that need to be made. Figure 4.2 illustrates the monitoring and review of the Strategy.

MANAGEMENT STRUCTURES AND MECHANISMS

Primary responsibility for implementing actions in this Strategy is held by a range of government agencies. Lead agencies for each action will be responsible for developing and implementing programmes to undertake each action and to determine suitable performance measures and expected project outcomes.

A management structure or mechanism will be established to coordinate the implementation of actions, reassess biodiversity priorities, resolve conflicts as they arise, and monitor and report on progress.

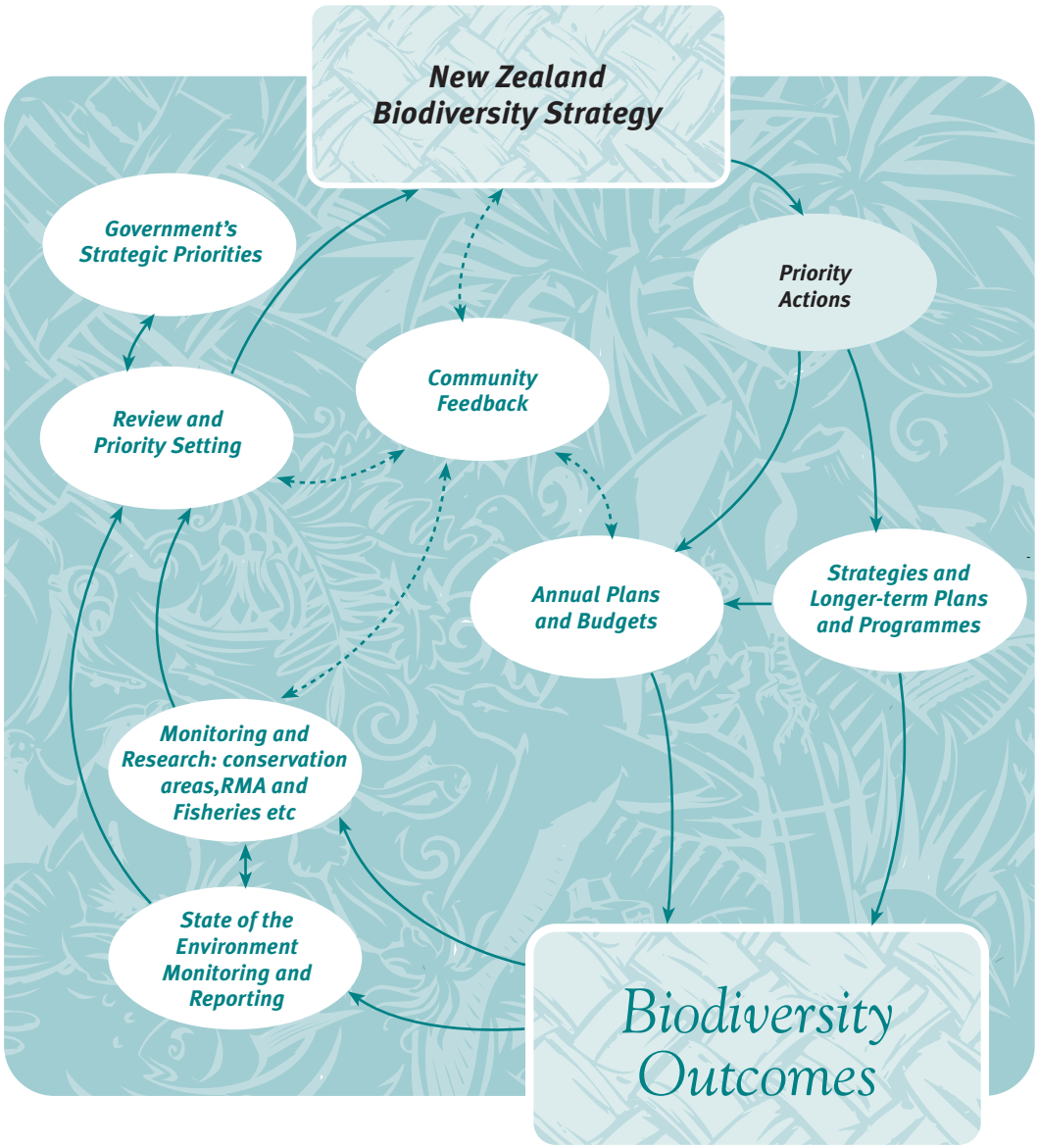
Overall responsibility for implementing the Strategy will be taken by the Minister of Conservation and Local Government, leading a team of Ministers. This team will include the Minister for the Environment and of Biosecurity, and the Minister of Fisheries. They will be supported by a central government coordinating group made up of chief executives from the relevant agencies. These Ministers and their agencies have the key responsibilities for biodiversity management within central government as represented in their purchase agreements.

A second group of Ministers and related agencies have a close interest in the management of biodiversity, although this may not be directly represented in the outputs purchased by the Government. These include the Treasurer, the Ministers of Maori Affairs, Agriculture and Foreign Affairs and Trade, and the Minister of Forestry and Research, Science and Technology. This group will be asked to provide advice on relevant issues.

The central government coordinating group will have a number of functions, including:

- ensuring effective investments in biodiversity management by using the goals, objectives and actions in the Strategy to provide coordinated purchase advice to Ministers on priorities for spending;
- improving biodiversity information by ensuring these investments include appropriate provision for information gathering, reporting and monitoring and by sharing this information with the community;
- determining ways to provide for involvement of the wider community and ensuring central government and community initiatives are appropriately linked and coordinated; and
- undertaking a substantive review of the Strategy after five years, assessing goals, roles, governance arrangements, objectives and priority actions.

Figure 4.2: Monitoring and Review of the New Zealand Biodiversity Strategy



Facing the challenge

This Strategy describes the trend of decline in New Zealand's indigenous biodiversity since human settlement. In recent years, however, another, more promising trend has emerged — the growing inclination and capacity of New Zealanders to stem this decline and restore important ecosystems.

Poised at the beginning of the new millennium, we still have the opportunity to stabilise our indigenous biodiversity and, in the future, to further restore it. This unprecedented task will require the growing skills of our conservation and resource managers, scientists and local experts, and a national commitment to act. The opportunity exists now, but perhaps not for much longer. And opportunities will certainly not exist forever. The goals of this Strategy will become harder to achieve if the decline continues and we lose more of what we currently have. New Zealand as a nation, and as a collection of local communities, now faces choices about how much biodiversity we wish to conserve and how much we wish to contribute to this effort.

All sectors of New Zealand society — in both rural and urban communities — have a role to play. It is not a matter of just leaving the job to central and local government. Stemming biodiversity decline requires full community effort. Central and local government have a role to play; but so too do iwi and hapu, farmers, fishers, foresters, and others who manage and have an influence on natural resources. Community groups, educators, businesses, researchers and people living in towns and cities, as well as in rural areas, also have critical roles.

Our indigenous biodiversity is a public good to be shared by the nation; its conservation is therefore also in the interests of all New Zealanders. To meet the goals of this Strategy we need to commit additional resources. Some of this will need to come from tax-funded central government sources. However, there will also be a need for increased effort across the community — through changes in our uses of land and marine environments, voluntary efforts, and funding through local government and the private sector. We also need to develop clear targets to measure progress against our chosen goals and to reassess these goals in the light of what we learn along the way.

The challenge of sustaining our unique biodiversity is before us all.

Annex One:

ROLES, RESPONSIBILITIES AND MECHANISMS IN BIODIVERSITY MANAGEMENT

The Strategy takes the current roles of government agencies, the private sector, landowners and other stakeholders and seeks to provide the conditions and mechanisms to help them to achieve the desired outcomes. In general this approach, rather than any radical change in roles and responsibilities, was supported through consultation and submissions. The submissions also supported the emphasis on strengthening biodiversity outcomes on private land.

The Strategy only includes actions where there is a need for community or public agency involvement. This includes actions by individuals, for which at present there may be no economic incentive to undertake that action. Where existing initiatives and incentives are sufficient to address threats to biodiversity, they have not been included.

The Strategy is designed to assist government, local authorities, the private sector, community groups and individuals by providing a framework for determining the biodiversity outcomes that are sought and the optimal mechanisms to achieve those outcomes. The choice of the type of mechanism, and who undertakes the actions to achieve the outcome, will depend on the issues and particular situation. While the Government has overall responsibility for developing and implementing the Strategy, actions will be shared between government (at all levels), the community and the private sector.

The current position of the Government is that intervention[1] should only be used where there is a strong case for it and where net benefits[2] are likely to flow from it. Ideally, well functioning markets should be able to provide desirable outcomes; however market failure may prevent this.

Government interventions may not always deliver the outcome sought. Poorly designed regulations or mechanisms may also result in unforeseen costs due to the creation of perverse incentives (incentives that cause unintended or undesirable actions) or due to crowding out provision by the private sector. Regulation that is not well targeted may also result in high implementation costs or unintended outcomes. Voluntary and cooperative approaches may achieve better results in some circumstances because solutions can be better fitted to practical realities, and the speed of response and updating can be faster[3].

1 *Government provision of services, regulation or incentives to encourage certain actions are described as "interventions" in the market.*

2 *The benefits of Government interventions should exceed the costs, including direct and indirect costs. Direct costs relate to transactions, enforcement, monitoring, administrative and other management activities. Indirect costs include the cost of the Government crowding out voluntary initiatives and distorting the allocation of resources within the economy.*

3 *The OECD Report on Regulatory Reform, 1997.*

A range of intervention mechanisms is included in the action plans in this Strategy (see box below). These were chosen on the basis that the intervention:

- is necessary to correct an identified market failure; or
- provides a positive net benefit, that is, the benefits exceed costs.

Interventions should also:

- be effective, including cost effective;
- be transparent and well targeted;
- not crowd out private provision;
- be acceptable to stakeholders;
- be undertaken by whoever is best placed to maximise the net benefit;
- have low risk to the Crown and to biodiversity;
- not be compromised by a lack of underlying information; and
- be compatible with the Treaty of Waitangi and the property rights system that may emerge from the Treaty claims settlement process.

The Strategy includes measures to encourage individuals to take actions that conserve and enhance biodiversity, either as a primary or secondary objective of management. Where the Government is providing resources in support of private initiatives, outcomes will need to be monitored and accountabilities established.

The performance of the Strategy will be monitored to ensure that the objectives and actions achieve the desired outcomes and Strategy goals, and that appropriate changes are made in response to the monitoring results. This adaptive approach will apply to management structures and mechanisms, as well as the allocation of resources.

Types of intervention

1. *Interventions affecting existing property rights:*
   - *Changes to the nature of property rights*
   - *Regulations and systems to clarify rights and responsibilities*
2. *Interventions involving public ownership:*
   - *Acquiring or disposing of property rights to manage biodiversity*
3. *Interventions involving incentives:*
   - *Education and moral persuasion*
   - *Information*
   - *Financial, technical or other assistance*
   - *Coordination where biodiversity (or threats to it) crosses property or administrative boundaries*

Annex Two:

PREPARATION OF THE NEW ZEALAND BIODIVERSITY STRATEGY

A short history

New Zealand attended the Rio Earth Summit in 1992 and signed, along with 150 other nation states, the Convention on Biological Diversity. Ratification in 1993 confirmed our commitment to a range of provisions aimed at conserving and sustainably using and sharing New Zealand's biodiversity. Among these provisions was the requirement to "prepare national strategies, plans or programmes" to give effect to the Convention in a New Zealand context.

New Zealand has long recognised and responded to problems of biodiversity decline. However, these responses have tended to be on a regional or local scale or focused on individual places and species. The conclusion of The State of New Zealand's Environment report (1997) — that biodiversity decline is New Zealand's most pervasive environmental issue (both extensive and multi-faceted) — confirmed the need for a comprehensive national approach to better address threats to our biodiversity.

The Government approved the preparation of a national biodiversity strategy in 1995 through the Environment 2010 Strategy and the process was initiated in 1996.

The process

The development of the New Zealand Biodiversity Strategy was led by the Department of Conservation, with the Ministry for the Environment. Thirteen other central government agencies were also involved:

- Ministry of Agriculture and Forestry;
- Ministry of Fisheries;
- Ministry of Commerce;
- Te Puni Kokiri/Ministry of Maori Development;
- Ministry of Research, Science and Technology;
- Foundation for Research, Science and Technology;
- State Services Commission;
- Ministry of Foreign Affairs and Trade;
- Office of Treaty Settlements;
- Department of the Prime Minister and Cabinet;
- Department of Women's Affairs;
- Department of Internal Affairs; and
- The Treasury.

Involvement of all agencies with interests in biodiversity management was important to gain broad government ownership of the Strategy and to integrate biodiversity objectives across sectors. These agencies contributed to a Draft Strategy — "Our Chance to Turn the Tide" — which was released by Rt Hon. Jenny Shipley in January 1999 for public consultation.

Consultation

Consultation on the Draft Biodiversity Strategy ran from February to April 1999 and included workshops, meetings and hui with a broad range of agencies, groups and individuals involved in, or with interests in, biodiversity management. Around 50 consultation meetings were held during this period, throughout all regions of the country.

Target groups included: iwi and hapu; regional and city/district councils; conservation boards and the New Zealand Conservation Authority; Department of Conservation conservancies; fish and game councils; Queen Elizabeth II Trust; farming, forestry and horticulture sector groups; environmental and community groups; landowners; science and research organisations; and concerned individuals.

Following the theme of "opening a dialogue about biodiversity", the purpose of consultation was to seek:

- an emerging consensus on New Zealand's national biodiversity goals;
- a growing understanding of regional biodiversity issues and community needs; and
- feedback on the Draft Strategy.

Submissions

Just over 7800 submissions were made on the Draft Strategy. A large number of these (6900) were form letters petitioning the Prime Minister to "save the kiwi" and offering support for goal level 2 in the draft Strategy. A further 437 submissions were exclusively aimed at broadening the Strategy to provide for "valued introduced species". The remaining submissions (466) addressed a range of issues, primarily about the decline of New Zealand's indigenous biodiversity.

A Summary of Submissions report was prepared by Tonkin & Taylor Ltd, grouping and analysing issues raised in submissions.

Overall, the Draft Strategy received a broad level of support. Most groups and submitters concurred with the need for a national biodiversity strategy and its overall direction; there was also general support for many of the biodiversity issues identified and the actions to address these. Feedback from consultation and submissions have helped to improve the New Zealand Biodiversity Strategy by:

- confirming a set of national biodiversity goals and principles;
- refining, correcting, and adding to, a comprehensive set of biodiversity issue statements and corresponding action plans; and
- affirming roles and responsibilities in biodiversity management and priority actions for the first five years of implementation.

Glossary

Adaptive management: An experimental approach to management, or "structured learning by doing". It is based on developing dynamic models that attempt to make predictions or hypotheses about the impacts of alternative management policies. Management learning then proceeds by systematic testing of these models, rather than by random trial and error. Adaptive management is most useful when large complex ecological systems are being managed and management decisions cannot wait for final research results.

Alien species: *See Introduced species.*

Biological biodiversity (biodiversity): The variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (Convention on Biological Diversity). Components include:

> *Genetic Diversity:* The variability in the genetic make up among individuals within a single species. In more technical terms, it is the genetic differences among populations of a single species and those among individuals within a population.
>
> *Species Diversity:* The variety of species — whether wild or domesticated — within a particular geographical area. A species is a group of organisms which have evolved distinct inheritable features and occupy a unique geographic area. Species are usually unable to interbreed naturally with other species due to such factors as genetic divergence, different behaviour and biological needs, and separate geographic location.
>
> *Ecological (ecosystem) Diversity:* The variety of ecosystem types (for example, forests, deserts, grasslands, streams, lakes, wetlands and oceans) and their biological communities that interact with one another and their non-living environments.

Bioprospecting: The search among biological organisms for commercially valuable compounds, substances or genetic material.

Bioregion: A bioregion (short for biogeographic region) is an area that is defined according to patterns of ecological characteristics in the landscape or seascape. It provides a frameword for recognising and responding to indigenous biodiversity values.

Biosafety: The policies and actions taken to manage risks from the intentional introduction of new organisms, including genetically modified organisms, that could adversely affect biodiversity, people or the environment.

Biosecurity: The protection of people and natural resources, including biodiversity, from unwanted organisms capable of causing harm.

Biota: All the living organisms at a particular locality.

Biotechnology: Any technological application that uses biological systems, living organisms or derivatives thereof, to make or modify products or processes for specific use, including genetic engineering (Convention on Biological Diversity).

Border control: The policies and actions taken to prevent the accidental or illegal introduction of unwanted organisms across national borders. Border control includes pre-import pest control, certification, inspection and surveillance, and emergency responses.

Capacity: The technical and technological ability, skills, knowledge and organisational structure required to undertake management actions, and to collect and interpret information.

Coastal environment: An environment in which the coast is a significant element or part. The extent of the coastal environment will vary from place to place depending on how much it affects, or is affected by, coastal processes and the management issues concerned. It includes at least three distinct, but inter-related, parts: the coastal marine area, the active coastal zone, and the land back-drop.

Comprehensiveness: *See Protected area network.*

Conservation: As defined in the Conservation Act 1987 (in respect of conservation areas), the preservation and protection of natural and historic resources for the purpose of maintaining their intrinsic values, providing for their appreciation and recreational enjoyment by the public, and safeguarding the options of future generations.

In the Strategy (as in the Convention on Biological Diversity), the term conservation is used in a broader sense than in the Conservation Act. While distinguished from "sustainable use" and "sustainable management", conservation embraces both the protection and judicious use and management of biodiversity for the benefit of human society and for ethical reasons, including its intrinsic value and its importance in maintaining the life-sustaining systems of the biosphere.

Convention on Biological Diversity: An international agreement on biological diversity that came into force in December 1993. The objectives of the Convention are: the conservation of biological diversity; the sustainable use of its components; and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources.

Cultivar: A cultivated variety (genetic strain) of a domesticated crop plant.

Data: The facts that result from direct observations or measurements. They can take the form of raw results from monitoring — such as the number of species in a particular area.

Domesticated or cultivated species: Species in which the evolutionary process has been influenced by humans to meet their needs (Convention on Biological Diversity). In the context of this Strategy, they include both introduced and indigenous species that have been domesticated or cultivated.

Ecological condition: *See Good ecological condition.*

Ecological District: A local part of New Zealand where the features of geology, topography, climate and biology, plus the broad cultural pattern, inter-relate to produce a characteristic landscape and range of biological communities unique to that area. Two hundred and sixty-eight Ecological Districts in New Zealand have been identified and mapped (at 1:500 000 scale).

Ecologically sustainable fishing: Fishing which does not impair the ability of the target fish population to reproduce and which leaves a healthy aquatic ecosystem. In a healthy ecosystem ecological processes are maintained and the ability of all of the species present (or dependent on those present), to reproduce, is maintained.

Economic value: Economic value may be assigned according to the following components:

> ***Direct use value:*** The value of all goods and services derived from the direct use of biodiversity.
>
> ***Indirect value:*** The value derived from services from biodiversity (ecosystem services) that protect and support direct use activities.
>
> ***Passive value:*** The value of biodiversity in terms of potential future uses (option value), its existence for its own sake (existence value), and the willingness of present generations to pay to preserve biodiversity for the benefit of future generations (bequest value).

Ecosystem: An interacting system of living and non-living parts such as sunlight, air, water, minerals and nutrients. Ecosystems can be small and short-lived, for example, water-filled tree holes or rotting logs on a forest floor, or large and long-lived such as forests or lakes.

Ecosystem health: *See Healthy ecosytem.*

Ecosystem management: A management philosophy intended to sustain the integrity of ecosystems.

Endemic Species: An indigenous species which breeds only within a specified region or locality and is unique to that area. New Zealand's endemic species include birds that breed only in New Zealand, but which may disperse to other countries in the non-breeding season or as sub-adults.

Environment 2010 Strategy: A statement of the New Zealand Government's current strategy on the environment (released in September 1995).

Environmental domains: Areas with similar physical environmental conditions, as defined by factors (including solar radiation, temperature, moisture and geological substrate) that have been demonstrated to have high correlations with plant and animal distributions.

Environmental education: A multi-disciplinary approach to learning that develops the knowledge, awareness, attitudes, values and skills that will enable individuals and the community to contribute towards maintaining and improving the quality of the environment.

Environmental Performance Indicators (EPI) Programme: A Ministry for the Environment-led programme to develop and use indicators to measure and report on environmental condition. The indicators will provide a measure of the performance of environmental policies and decision making by systematically reporting on the state of the New Zealand environment. Indicators will also assist policy development and decision making.

Exclusive Economic Zone (EEZ): The area of ocean from the outside edge of the territorial sea (which covers inland waters, harbours and the area out to 12 nautical miles from the coast) out to 200 nautical miles from the coast. The resources of New Zealand's EEZ are under New Zealand control.

Exotic: *See Introduced species.*

Ex situ conservation: The conservation of species outside their natural habitat (Convention on Biological Diversity).

Feral species: A domesticated species that has become wild.

Gene: The functional unit of heredity; the part of the DNA molecule that encodes a single enzyme or structural protein unit.

Genetic diversity: *See Biological Diversity.*

Genetic erosion: Loss of genetic diversity between and within populations of the same species over time; or reduction of the genetic basis of a species due to human intervention or environmental changes.

Genetic material: All or part of the DNA of a genome or all or part of an organism resulting from expression of the genome.

Genetic resources: Genetic material of plants, animals or microorganisms (including modern cultivars and breeds, primitive varieties and breeds, landraces and wild or weedy relatives of crop plants or domesticated animals) that has value as a resource for people or future generations.

Genetically modified organisms: Organisms whose genetic make-up has been altered by the insertion or deletion of small fragments of DNA from the same or another species in order to create or enhance desirable characteristics.

Germplasm: The genetic material that carries the inherited characteristics of an organism.

Gondwana (or Gondwanaland): The southern supercontinent that started to break up about 150 million years ago, consisting of what are now South America, Africa, Antarctica, Arabia, Australia, India, Madagascar and New Zealand.

Good ecological condition: A state in which an ecosystem can sustain all indigenous species which occur naturally within it, including those most sensitive to the effects of human activities (and of pests and weeds). *See also Healthy ecosystems.*

Habitat: The place or type of area in which an organism naturally occurs. *See also Natural habitats and ecosystems.*

Hapu: Maori family or district groups, communities, a sub-tribe.

Healthy ecosystem: An ecosystem which is stable and sustainable, maintaining its organisation and autonomy over time and its resilience to stress. Ecosystem health can be assessed using measures of resilience, vigour and organisation.

Healthy functioning state: *See Good ecological condition.*

Import health standards: Standards that specify requirements for the importation of certain types of goods classified as "risk goods" because of their potential to harbour pests, diseases and weeds. Examples of imports that are classified as risk goods on the grounds of potential biosecurity risk are timber and used cars.

Indicator: A measure (for example, distance from a goal, target, threshold or benchmark) against which some aspects of performance can be assessed. The use of an indicator enables the significance of a statistic to be determined, for example, the extent to which an objective is met.

Indicator species: A species whose presence or absence is indicative of a particular habitat, community or set of environmental conditions.

Indigenous species: A plant or animal species which occurs naturally in New Zealand. A synonym is "native".

Indigenous vegetation: Any local indigenous plant community containing throughout its growth the complement of native species and habitats normally associated with that vegetation type or having the potential to develop these characteristics. It includes vegetation with these characteristics that has been regenerated with human assistance following disturbance, but excludes plantations and vegetation that have been established for commercial purposes.

Information: Data that has been organised, integrated, and to some extent analysed. It is data that is made meaningful as a result of collection, processing, organisation and interpretation in light of some hypothesis.

In-situ conservation: The conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties (Convention on Biological Diversity).

Introduced species: A plant or animal species which has been brought to New Zealand by humans, either by accident or design. A synonym is "exotic species".

Invasive species: An animal pest or weed that can adversely affect indigenous species and ecosystems by altering genetic variation within species, or affecting the survival of species, or the quality or sustainability of natural communities. In New Zealand, invasive animal pests or weeds are almost always species that have been introduced to the country.

Invertebrate: An animal without a backbone or spinal column. Insects, spiders, worms, slaters and many marine animals such as corals, sponges and jellyfish are examples of invertebrates. Invertebrates make up the vast majority of all animal species; only fish, amphibians, reptiles, birds and mammals are not invertebrates.

Iwi: Maori tribal grouping.

Knowledge: The theoretical or practical understanding, knowing and familiarity gained by experience.

Landcare Research: Manaaki Whenua/Landcare Research is the New Zealand Crown Research Institute that focuses on management of land resources for conservation and for primary production.

Mainland island: An area of land on mainland New Zealand, isolated by means of fencing or geographical features, and intensively managed for the purpose of protecting and restoring habitats and ecological processes. At present most mainland islands are public conservation land managed by the Department of Conservation. (See box on page 35).

Marine environment: Includes all areas in which the ocean and coast are significant parts, and all natural and biological resources contained therein. It includes the area from mean spring high water mark to the full extent of our EEZ (to 200 nautical miles offshore). Environments covered in the "marine environment" include estuarine, near-shore coastal, continental shelf, seamounts, and sea-trenches.

Mataitai: An identified traditional fishing ground which has special status under the Fisheries Act 1996 to protect customary fishing values. Restrictions may be placed on taking fish, aquatic life or seaweed in the reserve. A Maori Committee or kaitiaki can be empowered to make by-laws over the reserve.

Matauranga Maori: Maori traditional knowledge.

Monitoring: The act of measuring change in the state, number or presence of characteristics of something.

National policy statement: A statement of policy issued under section 52 of the Resource Management Act 1991 on matters of national importance that are relevant to achieving the purpose of the Act.

Native species: *See Indigenous species.*

Natural areas: *See Natural habitats and ecosystems.*

Natural character: The qualities of an area that taken together give it a particular recognisable character.

Natural habitats and ecosystems: Habitats and ecosystems with a dominant or significant indigenous natural character. They do not include modified areas, such as farm or forestry land, where the indigenous vegetation has largely been replaced, although these areas may still provide important habitat for indigenous species.

Naturalised: A species or other taxon originating from a region outside New Zealand, but reproducing freely and maintaining its position in competition with indigenous biota in New Zealand.

Nature Heritage Fund: (formerly Forest Heritage Fund) A contestable fund under the jurisdiction of the Minister of Conservation, established in 1990 to protect indigenous forests and other ecosystems that represent the full range of natural diversity originally present in the New Zealand landscape. (See box on page 40).

New organism: Any plant, animal or micro organism intentionally introduced to New Zealand for the first time or a new species developed through genetic engineering (genetically modified organism).

New Zealand Coastal Policy Statement: A national policy statement under the Resource Management Act 1991. It states policies in order to achieve the purpose of the Act in relation to the coastal environment of New Zealand.

Nga Whenua Rahui: A contestable fund under the jurisdiction of the Minister of Conservation, established in 1990 to help Maori landholders to protect indigenous forest and other ecosystems in a way that is responsive to their spiritual and cultural needs (See box on page 40).

NIWA: National Institute for Water and Atmospheric Research. NIWA is the Crown Research Institute providing a scientific basis for the sustainable management of New Zealand's atmosphere, marine and freshwater ecosystems and associated resources.

Production landscapes and seascapes: Areas which are used predominantly for the production of primary products, for example meat, fish, fibre and timber.

Protected area: A geographically defined area that is protected primarily for nature conservation purposes or to maintain biodiversity values, using any of a range of legal mechanisms that provide long-term security of either tenure or land use purpose. It may be either publicly or privately owned.

Protected area network: A network or system of protected areas. The principal criteria for New Zealand's protected area network are:

> *Comprehensiveness:* The degree to which the full range of ecological communities and their biological diversity are incorporated within protected areas.
>
> *Representativeness:* The extent to which areas selected for inclusion in the protected area network are capable of reflecting the known biological diversity and ecological patterns and processes of the ecological community or ecosystem concerned, or the extent to which populations represent or exemplify the range of genetic diversity of a taxonomic unit.

Protected Natural Area (PNA): A legally protected area, haracterised by indigenous species or ecosystems or landscape features, in which the principal purpose of management is retention of the natural state. In this Strategy, the term is used synonymously with "protected area".

Protected Natural Areas (PNA) Programme: A programme to identify and protect areas that represent the full range of indigenous biological and landscape features in New Zealand, thereby helping to maintain the distinctive character of the country. The PNA Programme is as much about the protection of biological and landscape features that are common or extensive within an ecological district as about protection of the district's unique or special features.

Ramsar Convention: An international convention to protect internationally important wetlands. It was agreed in 1971 and signed by New Zealand in 1976.

Representativeness: *See Protected area network.*

Resilience: The ability of a species, or variety or breed of species, to respond and adapt to external environmental stresses.

Restoration: The active intervention and management of degraded biotic communities, landforms and landscapes in order to restore biological character, ecological and physical processes and their cultural and visual qualities.

Species: A group of organisms capable of interbreeding freely with each other but not with members of other species. *(See also Species diversity under Biological Diversity).*

Survey: Systematically observing, counting or measuring characteristics at a defined location over a defined period of time.

Sustainable use: The use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations (Convention on Biological Diversity).

Sympathetic management: The management of land in a way that recognises or supports the needs of indigenous biodiversity. For example, exotic production forests can be managed in a manner that provides for the habitat of native bird species, such as kiwi. The effects of pastoral farming on freshwater habitats can similarly be minimised through the protection or planting of riparian vegetation.

Taiapure: Areas that are given special status to recognise rangatiratanga (as Taiapure-Local fisheries); management arrangements can be established (under the Fisheries Act 1996) for Taiapure that recognise the customary special significance of the area to iwi or hapu as a food source or for spiritual or cultural reasons.

Taxon: (pl. taxa) A named biological classification unit assigned to individuals or sets of species, for example species, sub species, genus or order.

Threatened species: A species or community that is vulnerable, endangered or presumed extinct. The Department of Conservation has assessed threatened species in New Zealand (using criteria relating to taxonomic distinctiveness, status of the species, threats facing the species, vulnerability of the species, and human values), and ranked them into three categories (A, B and C) of priority for conservation action.

Unwanted organism: Any organism capable of causing unwanted harm, including animal pests, weeds and diseases. (This is a wider definition than sometimes used in New Zealand, for example as in the Biosecurity Act 1993).

Vascular plants: Include ferns, flowering plants and trees, but do not include mosses and liverworts.

Vertebrate: Animal with backbone; amphibians, reptiles, birds, mammals and fish. *See Invertebrate.*

Waterbody: A body of water forming a physiographic feature, for example, lake, wetland and estuary.

Suggestions for further reading

The following list is a selection of suggested further reading on New Zealand's biodiversity and its conservation and sustainable management. Some of these documents contain information used in preparing this Strategy. Most items are easily accessible through public libraries.

Atkinson, I.A.E. and Cameron, E.K. 1993. Human influence on the terrestrial biota and biotic communities of New Zealand. ***Trends in Ecology and Evolution*** 8: 447-451.

Blaschke, P. M. and Green, K. (eds) 1998. ***Biodiversity Now.*** Selected papers from joint societies' conference, Wellington, July 1997. Department of Conservation, Wellington.

Department of Conservation 1998. ***Restoring the Dawn Chorus. Department of Conservation Strategic Business Plan.*** Department of Conservation, Wellington.

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Gunningham, N. and Young, M.D. 1997. ***Toward Optimal Environmental Policy: The Case of Biodiversity Conservation.*** Ecology Law Quarterly 24: 243-298.

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King, C.M. (ed) 1990. ***The Handbook of New Zealand Mammals.*** OUP, Auckland.

McFadgen, B. and Simpson, P. R. (comps) 1996. ***Biodiversity. Papers from a seminar series, Science and Research Division, Department of Conservation, June-July 1994.***

Ministry for the Environment 1995. ***Environment 2010 Strategy. A Statement of the Government's Strategy on the Environment.*** Ministry for the Environment, Wellington.

Ministry for the Environment 1997. ***The State of New Zealand's Environment, 1997.*** Ministry for the Environment, Wellington.

Nelson, W.A and Gordon, D.P. 1997. ***Assessing New Zealand's Marine Biological Diversity — a challenge for Policy Makers and Systematists.*** NZ Science Review 54: 3-4.

New Zealand Conservation Authority 1997. ***Maori customary use of native birds, plants and other traditional materials: Interim report and discussion paper.*** New Zealand Conservation Authority, Wellington.

Park, G.N. 1995. Nga Uruora: ***The Groves of Life. Ecology and History in a New Zealand Landscape.*** Victoria University Press, Wellington.

Rudge, M.R. (ed) 1989. ***Moas, mammals and climate in the Ecological history of New Zealand.*** New Zealand Journal of Ecology 12 (supplement).

Te Puni Kokiri 1994. ***Biodiversity and Maori.*** Te Puni Kokiri, Wellington.

Towns, D. A., Daugherty, C.H. and Atkinson, I.A.E. (eds) 1990. ***Ecological Restoration of New Zealand Islands.*** Department of Conservation, Wellington.

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