our natural environment

Poutu dune lakes, Northland – photo: Peter Anderson

Our natural environment

The big breakaway

Illustration: Lynette Hartley

New Zealand was once part of a huge, ancient land mass. Known as Gondwana, this mega-continent eventually broke up to form Africa, South Africa, India, Australia, Antarctica and – New Zealand. Eighty million years ago, massive tectonic shifts jostled our islands away from this mass to become their own entity, home to at least two species of land dinosaur and freshwater crocodiles, the earliest ancestors of moa and kiwi, tuatara and at least three kinds of primitive frog. While the dinosaurs and crocodiles are thought to have become extinct 65 million years ago, some creatures remarkably survived through to human settlement. These included wattlebirds such as kōkako and huia, bats, the ancestors of wrens and wētā, a giant insect.

A guarantee of uniqueness in our flora and fauna came not only from the geographic isolation but also from the absence of marsupials and other mammals. New Zealand broke free from Gondwana prior to these animals evolving and the space they occupied in other ecosystems was taken up here by strange insects, reptiles and birds. Wētā and giant crickets grew into the biggest insects on Earth. One species of moa, *Dinornis giganteus,* was the tallest bird that ever lived. Several other bird species including some wrens, rails, ducks and the kākāpō became ground-dwelling due to the lack of predators.

These diverse ecosystems on land were surrounded by 18,000 km of coast in which lived fish, shellfish, sea birds and marine mammals. They continued to live without introduced animal or human predators until about 800 years ago – much longer than most other countries. Their isolated evolution has been described as the closest scientists will get to studying life on another planet.

Māori describe the birth of New Zealand in the vibrant stories of the union and separation of Ranginui (the sky father) and Papatuanuku (the earth mother), along with Maui's fishing expedition which hauled up the North Island and Aorangi/Aoraki's fated canoe which formed the South Island.

The legend of Rangi and Papa brings life to all our natural elements as well as Māori themselves through the actions of their offspring:

Tane	atua (god) of forests
Tumatauenga	atua of war and ceremony
Rongo	atua of cultivation
Tangaroa	atua of the seas
Tawhirimatea	atua of wind and storms
Haumietiketike	atua of land and forest foods.

References

Department of Conservation. *Te Pukenga Atawhai – Te Kete a te Rito.*

Department of Coservation and The Ministry for the Environment (2000). *The NZ Biodiversity Strategy.*

King, M., (1996) *Māori, A Photographic and Social History.* Reed.

King, M., (2003). *The Penguin History of New Zealand.* Viking.

What is biodiversity?

The word biodiversity is shorthand for 'biological diversity'. This means the number and variety of organisms found within a specific geographic region; the variability among living organisms, including variability within and between species and the variability within and between ecosystems.

Elements of biodiversity incorporate:

- Ecological diversity – the variety of ecosystem types such as forests, wetlands, lakes and oceans and the communities living in them. These communities interact with each other as well as the rest of their environment;
- Species diversity – the variety of species within a particular geographic area, such as the insects, plants, birds, fish and bacteria living in a wetland;
- Genetic diversity – the varied genetic make-up of individuals of a single species.

It is thought New Zealand has at least 80,000 native animals, plants and fungi. To date only about 30,000 have been described, named and classified.

Biodiversity on land

Ecosystems on land include natural and modified habitats and the native species living there. Biodiversity on land has two components – native and introduced biodiversity.

New Zealand's *native* biodiversity incorporates about 70,000 land-based species, including an estimated:

- 3080 plants
- 5800 fungi
- 10,000 insects
- 2600 arachnids (spiders and mites)
- 61 reptiles and
- 88 birds (land and fresh water) and
- Two species of bat.

We have only two native land mammals – the tiny long- and short-tailed bats. Many species *introduced* from outside New Zealand add to our overall biodiversity. These include:

- About 6000 plants
- About 1000 invertebrates
- 33 mammals
- 33 birds
- 20 fresh water fish
- three frogs and
- one lizard.

New Zealand has the highest number of introduced mammals of any country, the second highest number of introduced birds and more species of vascular plants (those having vessels which conduct fluids) in the wild than original native species. Although some introduced species are or could become pests, others play a valuable role in the functioning of ecosystems that have been changed or where native species have been lost.

Stilbocarpa weevil Photo: M. Meads

Awarua Bay, Southland

Coastal and marine biodiversity

Coastal and marine ecosystems include estuaries, inshore and offshore coastal areas and all the species living in them. About 15,000 marine species have been identified in New Zealand's waters, among them plants, bottom-dwelling organisms, fish, marine mammals and birds.

These species include:

- 84 seabirds
- 51 marine mammals
- 1131 fish
- 3666 molluscs (snails, shellfish and squid)
- 447 sponges
- 531 echinoderms (kina, starfish etc) and
- 850 seaweeds

Marine species make up almost a third of our total number of identified native species, with new species regularly being identified. Marine scientists estimate that as much as 60% of New Zealand's native biodiversity is found in the sea.

References

www.biodiversity.govt.nz

Department of Conservation and The Ministry for the Environment (2000).
The NZ Biodiversity Strategy.

Species 2000 project: www.niwascience.co.nz www.sp2000.org

Common dolphins Photo: T. Greene

It's rare, native and where?

The definitions of different plants (flora) and animals (fauna) can be pretty confusing so here's a quick guide to some of the most commonly-used terms:

Indigenous

Something which is naturally found in or **native** to a particular region or country.

Endemic

Restricted to a certain region or country and found nowhere else.

Migrant

A species which moves annually or seasonally between breeding and non-breeding areas either within New Zealand or overseas.

Threatened

Threatened species are grouped into three major categories – 'acutely threatened' (facing a very high risk of extinction in the wild); 'chronically threatened' (facing extinction but are buffered by a large total population or slow decline rate) and 'at risk' (their range is restricted or there are small, scattered sub-populations).

Extinct

A species is listed as extinct when there is no reasonable doubt that the last individual has died.

Ecosystem

A natural system formed by the interaction of organisms with each other and their environment.

Habitat

The environment in which a plant or animal usually lives.

Icons and oddities

New Zealand's geographic isolation and its evolution in the absence of predators are responsible for the characteristics of some of its special inhabitants. It's why we have ground-dwelling birds such as kiwi and kākāpō and why others, like kokakō, are poor flyers. Ancient tuatara and the strange parasitic flowering plant *Dactylanthus* (wood rose) were also able to survive along with the short-tailed bat, which prefers the ground.
Giant wētā and snails help complete this suite of icons and oddities which make New Zealand's biodiversity so distinctive.

Paradise lost – and halting the decline

Illustrations: Lynette Hartley

Bv the time James Cook's first expedition arrived in New Zealand in January 1770, about half our bird species were already extinct. The moa, many seabirds, native ducks and crows, flightless rails and wrens along with giant harriers, geese and the largest raptor ever known, Haast's eagle, were all gone. Further extinctions would be triggered by that same expeditionary visit, as the *Endeavour* was infested with Norway rats which readily found their way ashore. Even the earliest hunting, combined with the effects of introduced predators such as rats and dogs, was devastating for a country which had remained isolated for so long. The impact of European settlement was so great that one geographer has noted human modification of landscapes which occurred over four centuries in North America and 20 in Europe had taken place here in just one century. The trading which rapidly developed in sealing, whaling and timber in the early 1800s, was another major cause of decline.

New Zealand has one of the worst records on Earth of indigenous biodiversity loss. Along with the decline of our former large birds, by 1600 about a third of our original forests had been replaced by grass lands and from around 1850, the gathering pace of European settlement started a new round of forest destruction. Since then another third of those original forests has been converted to farm land and there has been extensive modification of wetlands, river and lake systems, dunes and coastal areas. Other bird species including the huia and laughing owl have also become extinct since European settlement. It is believed that in the last 7–800 years human activities and pests have caused the extinction here of:

- 32% of indigenous land and fresh water birds
- 18% of sea birds
- at least 12 invertebrates such as snails and insects
- three of seven frogs
- one fish, one bat and probably three reptiles and
- possibly 11 plants.

Naturally occurring fires and events such as volcanic eruptions have also contributed to this decline.

Today about 1000 of our known animal, plant and fungi species are considered threatened. Many populations of these threatened species have disappeared from areas they were once found. This pattern of local loss is the forerunner to species extinction. And species loss is often the result of a more pervasive loss – that of natural habitats and ecosystems. Changes in the way we use the land have had a dramatic impact on biodiversity through the development of farms, exotic forests, settlements and roads, creating a patchwork of ecosystem fragments. The way we use and manage the environment with an increasing focus on conservation is also changing but sustained, collective effort is still needed for New Zealand to halt the decline.

The value of biodiversity

New Zealand's natural world is the inspiration for it's national icons – the kiwi, silver fern and koru. Biodiversity is also its wealth. New Zealand bases much of its economy on biological resources whether farming or tourism. We all benefit from the services provided by healthy ecosystems: they produce raw materials, purify water, decompose waste, cycle nutrients and provide pollination and pest control. We tend to take such 'services' for granted simply because they're provided free by nature!

Aside from existing resource use, New Zealand's biodiversity represents a pool of untapped opportunities. An endemic sponge discovered off the Kaikoura coast (on the east coast of the South Island) that produces a cancer-fighting substance is just one example of other species which may have valuable uses.
The uniqueness of New Zealand's biodiversity provides a strong onus for looking after it – it cannot be conserved in nature anywhere else in the world.

New Zealand first pledged to play its part in halting the decline in global biodiversity at the Rio Earth Conference in 1992. The Government affirmed that biodiversity is vital to sustain life and

Photo: P. Schilov

also provides a unique basis for our culture and national identity. The New Zealand Biodiversity Strategy, produced in 2000, describes how we will go about 'turning the tide' to maintain and restore a full range of our remaining natural habitats and viable populations of all species. Its vision is:

- *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 hapū 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.*

The Department of Conservation is one key player in helping achieve the strategy's outcomes.

References

King, M., (2003). *The Penguin History of New Zealand.* Viking.

Molloy, L and Enting, B. (1982) *Ancient Islands: New Zealand's natural environments / photographs*. Port Nicholson Press.

Department of Coservation and The Ministry for the Environment (2000). *The NZ Biodiversity Strategy.*

From the mountains to the sea

The next sections of this kit provide information about the different kinds of environments in New Zealand and their incredible diversity. They're presented in the order of 'the mountains to the sea' to help describe their progressive connections to each other. This also reflects the natural effect of what starts on a mountain or ridge-top ultimately finding its way to the ocean.

Alpine and high-country areas

Mountains are among New Zealand's most dramatic landforms. The isolated volcanic massifs of Mt Taranaki and Tongariro National Park in the North Island contrast with the long spines of the South Island's magnificent Southern Alps / Kā Tiritiri o te Moana and the lofty Kaikoura Ranges. Geologically speaking, New Zealand's mountains are young with the main ranges thought to be less than two million years old. Apart from the volcanic mountains of the North Island, all our mountains which support alpine vegetation arose around the same time as a result of earth movements along a belt extending from Gisborne through the Southern Alps to Fiordland. The rocks that were subsequently uplifted differ greatly from place to place however, having a major influence on the kinds of communities that live on their slopes.

The 600 or so plant species which grow above the bushline comprise about 30% of New Zealand's total number of 'higher' plants ie those other than lichens, mosses, liverworts and algae). 93% of the alpine flora is endemic to New Zealand. These alpine survivors include edelweiss, buttercups (*Ranunculus)*, various cushion plants and spiky 'spaniards' (*Aciphylla*). About 25 alpine plant species are confined to rocky slopes and have special features such as taproots or waxy leaves to conserve moisture or withstand movement.

Illustration: Lynette Hartley

Alpine gentians Photo: J. Gardiner

Further down the slopes the amount of vegetation slowly increases to comprise a mixture of herb fields, snow tussocks, grassland and scrub. Carpet grass forms a very dense turf on some the South Island mountain slopes. The pricking spaniards or speargrasses, known well to wary trampers, also feature along with hebes, snow tōtara, mountain toatoa and astelia.

Lower on the slopes this often stunted cover gives way to more luxuriant vegetation. In many places in New Zealand the alpine zone's lower limit is marked by an obvious tree line, often composed of beeches, or in the absence of beech forest the trees may comprise tall alpine shrubs such as *Olearia*, *Dracophyllum* and mountain ribbonwood. While the bold kea is a showcase bird in high places of the South Island, others add to the diversity of lower alpine areas and can include the rifleman, robins, brown creeper and kākā. Pairs of handsome whio (blue duck), named for its distinctive whistle, are also found foraging for aquatic insects in the rapids of larger alpine and montane streams during summer.

Expansive areas of tussock lands in the open spaces of the South Island high country have developed as a result of early fires, thought to be of Māori origin, which allowed grasses to colonise land formerly forested. While native grasses were able to withstand the effects of browsers such as takahe, kākāpō and moa, they have subsequently been greatly reduced through fires and heavy stocking with sheep and cattle. Although much of this tawny landscape is still grazed, sustainability has become a focus for maintaining this predominantly indigenous habitat including tall and short tussock species, *Pimelia*, mingimingi (a small leaved shrub) and native brooms. The wildlife here features the rare black stilt / kakī, pipits and skylarks along with skinks, geckos and specialised insects.

Many mountains are highly sacred to Māori, forming part of their identity as tangata whenua and providing a link with their whakapapa (lineage). Some peaks are regarded as the head of an ancestor, therefore too sacred to stand on top of. Reference to a specific mountain, lake, bay or other significant geographical feature is an important part of mihi (formal greetings).

Whether the landscape is rich red volcanic rock, a glistening glacier or golden tussock it faces direct or indirect threats from human activity. Climbers and trampers may leave waste and rubbish, modify rock faces or tread on delicate vegetation. Animal pests such as deer, chamois and thar (tahr) relish montane and alpine vegetation while rabbits have become a major challenge in some grassland areas. Pest control, information and education are the main tools for helping control these threats and protecting some of New Zealand's greatest natural assets.

References

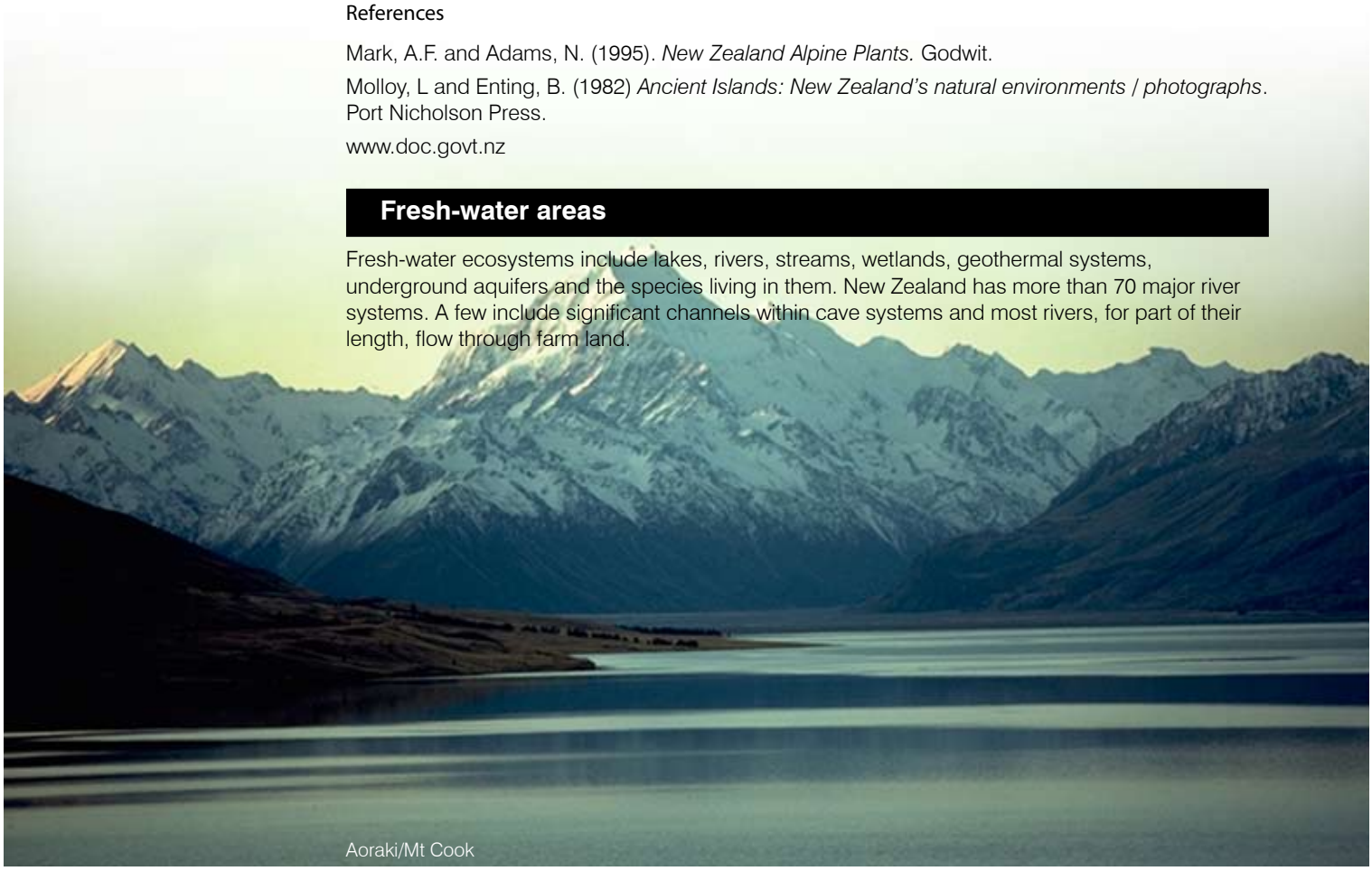
Mark, A.F. and Adams, N. (1995). *New Zealand Alpine Plants.* Godwit.

Molloy, L and Enting, B. (1982) *Ancient Islands: New Zealand's natural environments / photographs*. Port Nicholson Press.

www.doc.govt.nz

Fresh-water areas

Fresh-water ecosystems include lakes, rivers, streams, wetlands, geothermal systems, underground aquifers and the species living in them. New Zealand has more than 70 major river systems. A few include significant channels within cave systems and most rivers, for part of their length, flow through farm land.



Aoraki/Mt Cook

Illustration: Lynette Hartley

Lakes and rivers

There are over 770 lakes and innumerable ponds covering about 3400 square kilometres. Many lakes and ponds are also man-made and these, along with some natural lakes, are managed for commercial, industrial or domestic reasons such as power generation and water supply. As a consequence their biodiversity is extremely varied! New Zealand's 30 or so deep lakes have generally high water quality and while some support almost intact native ecosystems, many shallow lakes have been degraded by nutrient enrichment, a few to the extent they cannot support fish life. Invasive exotic plant species are extensive in most lakes.

Animal life

Most of our 29 native fish species are small, well-camouflaged creatures that stay close to river beds and can be hard to distinguish without knowing what to look for. Many have a marine stage in their life cycle, such as whitebait. Nearly 90% are not found anywhere else in the world and 10 species are considered threatened. Only three species grow to more than 2 kg in body weight (two eels and the giant kōkopu) and only eight native species are considered common: eels, torrentfish, various bullies and galaxiids such as īnanga (whitebait).

New Zealand also has about 450 identified insect species and at least 200 other kinds of invertebrates such as crustaceans in its fresh water habitats.

Wetlands

Wetlands contain some of New Zealand's most diverse ecosystems and range from tiny tarns high on mountains to swamps, bogs and marshes along with major wetlands such as Whangamarino in the Waikato. The extent today of wetlands is only 10% of their original cover. There is wide regional variation in the amount of wetland habitat loss, ranging from 63% in Southland to 99% in the Bay of Plenty. Wetlands might be regarded as steamy, smelly places but are among the world's most productive environments, providing an enormous food source for fish, birds and other animals and supporting many plant species.

Wetlands absorb large amounts of water and nutrients from outside sources and contain micro-organisms which efficiently decompose and recycle nutrients. They can also help control flooding, particularly in lowland areas.

Wetlands are also important to Māori, featuring in the history and culture of many hapū (sub-tribes) Wetland plants provide traditional materials for clothing, mats, medicine and dyes while some animals such as tuna (eels) are important traditional food sources. Wetlands have preserved many culturally significant artefacts, such as Kohika Pā in the Bay of Plenty which was excavated in 1975 after the landowner uncovered palisades.

The Convention on Wetlands (RAMSAR) is an inter-governmental treaty for the protection and wise management of wetlands and their resources. New Zealand became a party to the convention in 1976 and has five sites designated under it as Wetlands of International Importance:

- Waituna Lagoon Southland
- Farewell Spit Nelson
- Whangamarino Waikato
- Kopuatai Peat Dome Waikato
- Firth of Thames Waikato.

Geothermal water

New Zealand's geothermal areas, formed by a dramatic collision of the Earth's tectonic plates, support water features which are internationally rare. Hot springs and lakes, boiling mud, fumaroles and geysers form ecosystems of their own, most readily seen in and around Rotorua and Taupo in the central North Island. The Taupo volcanic zone incorporates the famous geothermal wonders of Waimangu, Waiotapu, Tokaanu, Ketetahi and Whakarewarewa, one of just two remaining geyser fields in the world. The associated plant life is unique to its harsh environment, featuring thermal orchids, mistletoe, prostrate forms of mānuka and colourful fungi.

These places hold a cultural and spiritual significance for Māori who used them for cooking, medicine and ritual.

New Zealand's wide variety of fresh water environments is housed by many different landforms.

Lake Rotohama, Waimangu Scenic Reserve

Invasive algae, Didymo
Photo: Biosecurity NZ

Kauri bark

Lakes nestle in craters left by ancient volcanic eruptions or moving glaciers. Rivers and streams flow down glacial and montane valleys or through terraces and fans, wetlands occupy depressions or areas left by former rivers. Others have been created through human activities ranging from dam building to drainage.

Aquatic pests

Many fresh water ecosystems are threatened by introduced pest fish or weeds which are often not detected until their extent makes them hard to control. Effective control technologies aren't always available and there are ongoing transfers and releases of unwanted exotic species. Aquatic weeds pose a particular threat because they are easily spread to new water ways and once established, either cannot be eradicated or pose major control problems. Introduced fish species, such as catfish, can also upset the balance of existing ecosystems.

References

Department of Conservation, BOP Conservancy, *Rotorua's Geothermal Treasures.*

Department of Conservation, BOP Conservancy*, Waterways and Wetlands of the Bay of Plenty.*

Department of Conservation and The Ministry for the Environment (2000).
The NZ Biodiversity Strategy.

Molloy, L and Enting, B. (1982) *Ancient Islands: New Zealand's natural environments / photographs*. Port Nicholson Press.

Rotorua District Council, Environment Bay of Plenty and Te Arawa Māori Trust Board,
A Strategy for the Lakes of the Rotorua District.

www.biodiversity.govt.nz

www.doc.govt.nz

Forests

Due to New Zealand's long isolation, its plants and forests are unique. Forest types range from the dense temperate rainforests of the West Coast, to the alpine forests of the Southern Alps, coastal forests such as those in the Catlins and Abel Tasman National Park and the majestic kauri forests of Northland.

Despite more than 70% of the original forests being cleared, those that remain represent the spectrum of types which have evolved throughout New Zealand.
The most obvious members of our forest communities are trees, which provide a framework for the rest of the forest system. The predominant trees are conifers, mostly podocarps, an ancient family of southern hemisphere trees centred on Australasia.

The composition of trees in the forest canopy is influenced by altitude, slope, rainfall, geology and human impacts. Changes in forest composition may be sudden or gradual, but some common forest types are:

Kauri-podocarp-broadleaf forests

- Majestic kauri, some over 1000 years old, feature only from Northland to the Kaimai-Mamaku Forest Park.
- Associated species include pūriri, kohekohe, nīkau palms, buttressed pukatea and kahikatea, flaxes and ferns.
- Kauri forests characterise northern New Zealand. In coastal areas they are accompanied by luxuriant coastal mangrove communities, which can grow to a height of several metres in places like Hokianga harbour.

Podocarp-broadleaf forests

- Includes tree species such as tawa, rewarewa and pukatea, shrubs like māhoe and five-finger and a range of ferns.
- Shaggy rimu are common in many lowland forests. Kahikatea is generally the tallest tree, often exceeding 60 metres. It likes wet areas where it develops buttressed roots for support.

Illustration: Lynette Hartley

- Variations of this forest type are found throughout New Zealand, although podocarp forests have been dramatically reduced through logging and land clearance.
- Extensive tracts remain along the West Coast of the South Island and in Otago and Southland.
- In some places forest types merge to create podocarp-beech-broadleaf forest.

Podocarp-broadleaf-beech forests

- They host a wide range of species and vary in composition depending on altitude.

Beech forests

- Beech forests occupy sites ranging from bogs to river terraces and sub-alpine mountain sides.
- There are five beech species; silver, red, black, hard and mountain beech, each flourish in particular environments. For example, mountain and silver beech are usually represented at the bush line, with red beech more common on fertile river flats and lower slopes. The eastern flank of the Main Divide is the stronghold of beech forest.
- These beech forests are closely related to beech forests in Chile and Tasmania, a relationship carried over from the break- up of Gondwana.

Threats

The main threats to forests ecosystems are introduced plant and animal pests. The logging of native forest is tightly restricted.
The chief threat to forest animals is introduced predators such as rats, stoats and cats. Possums can severely damage the forest canopy while deer can prevent forests from regenerating. Weeds such as wild ginger, old mans beard and banana passionfruit can smother native bush canopies.

Efforts to save the outstanding examples of podocarp forest at Whirinaki, Pureora and in the South Westland World Heritage Area are landmarks in New Zealand's conservation history.

References

Druett, J., (1983). *Exotic intruders: the introduction of plants and animals into New Zealand.* Heinemann.

Halkett, J., (1991). The *Native Forests of New Zealand.* GP Publications.

Molloy, L and Enting, B. (1982) *Ancient Islands: New Zealand's natural environments / photographs*. Port Nicholson Press.

Moon, G., (2001). *New Zealand: land of birds.* New Holland

Environment BOP. *Pest plants and pest animals of the Bay of Plenty.*

www.doc.govt.nz

www.projectcrimson.org.nz

Coastal and marine

Coastal and marine environments include dunes, estuaries, sea birds, marine mammals – and of course, fish! New Zealand's marine environment covers around 410 million hectares of ocean and our exclusive economic zone is the fourth largest in the world.

Illustration: Lynette Hartley

New Zealand has a particularly rich and complex seascape because of its:

- Extension over 30 degrees of latitude;
- position on an active geological plate boundary with resulting underwater landscape features;
- position in relation to major sub-tropical and sub-antarctic water masses and
- surface and deep-water current systems.

It's thought that New Zealand could have up to 10% of global marine biodiversity. New Zealand's isolation means that in the following marine groups there is a particularly high proportion of species found only here:

- Triplefins (small reef fish) 100%
- sponges 90%
- molluscs (shellfish) 86%
- bryozoans (lace corals) 60%
- seabirds 42%
- seaweeds 40%.

Among our marine mammals, the New Zealand sea lion and endearing Hector's and Maui's dolphin are found nowhere else in the world. And the second deepest part of the Earth's oceans is in the Kermadec Trench, north-east of mainland New Zealand.

New Zealand's coastal landscapes have their own diversity. There is often a contrast between the dynamic, wind-swept beaches of the west coast with long sweeps of more sheltered, sandy beaches in the east. Pīngao and spinifex help bind the dunes to provide stability while rocky shores may provide an anchor for red, green or brown seaweeds. While different species of gull constantly make their presence known, other common inhabitants of the coast include terns, godwits and oystercatchers. The shy, endangered New Zealand dotterel is usually well camouflaged against the sand whereas the striking royal spoonbill is much more obvious!

Our coasts are visited by a number of migratory species and provide habitat that is critical to the long-term survival of several of these, including some of our marine mammals and sea birds such as albatross and petrels. In contrast many of our own marine species spend part of their lives in international waters, especially the southern ocean, so the state of these areas is also important to New Zealand's biodiversity.

With marine mammal hunting 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 are also recovering. Eight species of baleen whales and 38 species of toothed whales (including dolphins) live in our seas and there is a vast range of different fish and plant species and other marine organisms from delicate, brightly-coloured nudibranchs to sunfish and magnificent marlin.

Our unique marine environment is enhanced by a rich variety of underwater landscapes.
While the margin of New Zealand's continental shelf is indented with over a hundred canyons, there are many shallow bays, harbour flats and estuaries all around our coast line and islands. The depth in the canyons attracts large predators such as giant squid and sperm whales – in shallow areas there are mangroves, sea-grasses and hundreds of rock-pool species. Fiordland is an area of seascapes found nowhere else in Australasia, where sheer rock walls carved from glaciers plunge to around 450 metres deep. Due to reduced light from the tea-like fresh water layer floating atop the sea here, deep water species such as black coral and glass sponges live at readily diveable depths. Nowhere else in the world are black corals so abundant or found so close to the surface.
The ongoing discovery of New Zealand's seamounts is revealing underwater pinnacles and plateaux which are home to many other species living at depth. These benthic (bottom dwelling) animals include corals, sea stars, sea cucumbers, anemones and crabs, in turn attracting fish such as orange roughy and oreo.

Although New Zealand's coastal waters and habitats are of generally high quality by international standards, they are under stress. Human activities are the main culprit, ranging from intensive shellfish gathering and inappropriate use of vehicles on beaches to increased coastal development, waste discharge, some commercial fishing levels, bottom trawling, the introduction of unwanted marine organisms and lack of awareness of the effects of activities.

Area-based marine protection is one way we can help protect marine biodiversity. Under the New Zealand Biodiversity Strategy, Government aims to have 10% of the marine environment in marine protected areas by 2010 with the desired outcome that the full range of marine habitats and ecosystems representative of New Zealand's marine biodiversity protected by 2020.
The Department of Conservation and Ministry of Fisheries are working together to implement these

goals.

References

Department of Conservation. *The Conservation of Whales in the 21st Century.*

Department of Conservation and The Ministry for the Environment (2000). *The NZ Biodiversity Strategy.*

Molloy, L and Enting, B. (1982) *Ancient Islands: New Zealand's natural environments / photographs*. Port Nicholson Press.

Moon, G., (2001). *New Zealand: land of birds.* New Holland

Department of Conservation and NIWA. (2005). *Protecting our Seas – Tiakina a Tangaroa: an overview of New Zealand's marine biodiversity conservation and the role of Marine Protected Areas.* Marine Conservation Unit, Department of Conservation.

www.biodiversity.govt.nz

www.doc.govt.nz

Islands

Besides North, South and Rakiura / Stewart Island, the New Zealand archipelago includes thousands of islands ranging from tiny rocky islets to 90,000-hectare Chatham Island. Some islands are famous for their outstanding natural values; Tūhua (Mayor Island) in the Bay of Plenty boasts obsidian, the Poor Knights (Northland) is known as the best sub-tropical dive location in the world and Whakaari (White Island) in the eastern Bay of Plenty is an active volcano. The Department of Conservation manages or has a conservation interest in about 220 islands which are larger than 5 ha, along with numerous small islets and rock stacks.

An animal species left on an island for millennia will gradually change to suit its conditions. New Zealand had no predatory land-mammals, so birds became tame. There was more danger from eagles and falcons by day than from owls by night, so many birds became nocturnal. Without the need to flee from predators or fly between food-sources, many insect-eating and browsing birds eventually lost their ability to fly. This worked well for them until humans and their attendant animals arrived: Large, tame, flightless birds are pitifully easy to hunt. The lighthouse keeper's cat on Stephens Island, for example, polished off New Zealand's only species of flightless wren.

The key to preserving vulnerable wildlife is to give them natural places without mammalian predators, namely islands. Many of New Zealand's smaller islands are biological treasure troves which offer the best hope of survival for hundreds of endangered plants and animals. The waters surrounding them provide protection from invasions of introduced species that hunt or compete with native wildlife. The Hauraki Gulf alone harbours over 50 islands and islets. New Zealand's southern waters, including those around Fiordland and further south, are dotted with over 1000 islands and rock-stacks, many playing a vital role in the protection of threatened species.

Most New Zealand islands are surrounded by sea, some are encompassed by lakes and a few, coined 'mainland islands', are surrounded by land. The latter are mainland sites that are managed intensively to control predators, providing enough protection for many species to successfully live and breed.

Marine islands

The New Zealand archipelago extends from the sub-tropical Kermadecs to the sub-antarctic Auckland Islands. The oceanic environment keeps their climates relatively temperate. Most islands

have been joined to the mainland and become separated with fluctuating sea levels, retaining their indigenous flora and fauna. As on the mainland however, the introduction of predators has taken its toll, as has farming, timber production and other commercial purposes.


Tieke/saddleback Photo: D. Veitch

Those species in serious decline have been deliberately moved to island santuaries to help their populations recover. Unless an island is already predator-free; the first task before introducing endangered wildlife is to eliminate all rats, cats, stoats and/or possums. This usually results in a spectacular recovery of existing native species. Sometimes DOC staff will create burrows or other shelter to give animals a helping hand. As populations become sustainable there may be further 'translocations' to other islands or back to the mainland.

Spectacular beneficiaries of this strategy include tīeke/saddleback, kiwi, kākāpō and tuatara.

The same approach is being used successfully on some lake-bound islands, one example is Mokoia Island in Lake Rotorua, a sanctuary for North Island robin and stitchbird/hihi.

Mainland islands


Kākāpō Photo: T. De Roy

Mainland islands are areas under intensive management for the purpose of restoring former natural habitats and ecosystems. They're called islands because they're often surrounded by very different ecosystems or geographic features which effectively isolate them. It is also because the techniques being used there have been learned and adapted from experience in restoring real islands, such as Kapiti and Little Barrier.
Mainland islands come in all shapes and sizes and are managed by different agencies. Examples of some managed by the Department of Conservation are Trounson (Northland), Boundary Stream (Hawkes Bay), Rotoiti (Nelson Lakes National Park) and Hurunui (Lake Sumner Forest Park, Canterbury). Others are managed by private organizations such as Karori Sanctuary (Wellington) and Maungatautiri in the Waikato. The famous ecologist David Bellamy has described these special sites as 'islands of survival'.


Great spotted kiwi Photo: R. Morris

Regardless of the type or location of island, the threats to biodiversity are mostly from visitors through risk of invasion (bringing in weeds or predators), physical impact (making tracks, lighting fires) or impacts on species and ecosystems (breeding colonies may move away from observation points). Rules around visiting islands are therefore often strict for very good reasons.

References

Department of Conservation and The Ministry for the Environment (2000). *The NZ Biodiversity Strategy.*

Moon, G., (2001). *New Zealand: land of birds.* New Holland

Molloy, L and Enting, B. (1982) *Ancient Islands: New Zealand's natural environments / photographs*. Port Nicholson Press.

www.doc.govt.nz


Rotoiti Mainland Island (foreground)