

New Zealand's Fifth National Report to
the United Nations Convention on
Biological Diversity

Reporting period: 2009–2013

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Executive summary

This Fifth National Report provides a summary of the New Zealand Government's implementation of the United Nations Convention on Biological Diversity for the reporting period 2009 to 2013 and provides a mid-term review of the implementation of the Strategic Plan for Biodiversity 2011–2020.

The broad coverage of the Convention on Biological Diversity (CBD) ensures that New Zealand's implementation of it necessarily involves a wide range of actors, statutes, instruments, and activities. While some primary tools are used to guide implementation—such as the New Zealand Biodiversity Strategy (NZBS)—global acceptance of the critical role that biological diversity plays across all sectors means that all sectors have a part to play. The interface between biodiversity and other policy areas means that CBD implementation does not only take place in the context of global change, but will also be strongly influenced by factors such as economic and social interests.

New Zealand's Fifth National Report to the CBD aims to provide comprehensive information on the nature and extent of implementation from 2009 to 2013, as well as progress toward the 2020 Aichi Biodiversity Targets.

Part I of the report provides a broad overview of changes and trends in biodiversity since 2009. New Zealand's biodiversity is globally unique, which confers upon it a multitude of values—both nationally and internationally. The multi-faceted relationship between Māori and our natural heritage bestows important socio-cultural values on our biodiversity, and New Zealand's strong primary production and tourism sectors also ensure that economic values can be obtained from our biological wealth.

Land cover in New Zealand has remained relatively static and with good ecological integrity, and our environment has benefited from a growing network of protected areas, which constitute around one-third of the country's land area. However, since many of our parks and reserves are in the mountains, there are still challenges in ensuring that rare lowland ecosystems are adequately represented in public protected conservation lands. Freshwater quality has been adversely affected by the expansion of some primary industries in some parts of the country. Efforts to manage and conserve threatened species have been maintained and have become more targeted in an attempt to address the ongoing deterioration in conservation status for many indigenous species.

While managing the threats to indigenous species is a big challenge, there have been some big successes, particularly in ridding conservation islands of introduced pests.

In the past 4 years, a surge of activity has been commenced to understand and map ecosystem services provided by our biological heritage, with a view to promoting better environmental, social, and economic outcomes. This work is being undertaken by government agencies, Crown Research Institutes, academia, and others, and will provide important inputs into decision-making processes.

Part II of the report provides an overview of New Zealand's biodiversity framework. New Zealand's implementation of the CBD was guided primarily through the NZBS. Published in 2000, the NZBS was intended to be a 20-year document to guide activities for CBD implementation. With the adoption in 2010 of the Strategic Plan for Biodiversity and the 2020 Aichi Biodiversity Targets, the Government has initiated a process to refresh the NZBS to include these elements (completion of which is expected by the end of 2014).

Implementation of the CBD will go far beyond what is included in the NZBS, however. With biodiversity being mainstreamed into other policies and sectors, implementation will also be progressed through other instruments. Many of these instruments have been around for decades (e.g. the Resource Management Act 1991, Biosecurity Act 1993). However, additional new tools have also been, and are being, developed that advance New Zealand's progress toward the Aichi Biodiversity Targets, such as the Living Standards Framework developed by Treasury and establishment of the government-wide Natural Resource Sector group.

Part III of this report provides details regarding our progress toward the Aichi Biodiversity Targets and contributions to the relevant 2015 targets of the Millennium Development Goals. Discrete elements of most targets have already been largely met, such as those for terrestrial protected areas and subsidy/incentive reform. Other targets are ongoing efforts, such as those for managing invasive alien species and for maintaining the genetic diversity of species. Yet others are in progress, e.g. the target

relating to the update of national biodiversity strategies and action plans. More progress is required in the elements of targets relating to freshwater or inland water quality or protection. This is an issue that is well recognised in New Zealand and around which various levels of government (as well as other actors) are taking action.

Part I—An update on biodiversity status, trends and threats, and implications for human wellbeing

1. Why is biodiversity important for New Zealand?

New Zealand's biodiversity has been identified as some of the most distinctive in the world. The multiple values of New Zealand's biodiversity—both nationally and internationally—derive from a confluence of factors, such as our relative size and location in the Southern Hemisphere, and the evolutionary history of our flora and fauna (Trewick et al. 2007). Isolation means that the evolution of our biodiversity has taken some strange twists and turns, sometimes literally. For example, we have the world's only flightless parrot (kākāpō, *Strigops habroptilus*); a bird with nostrils at the end of its beak (kiwi, *Apteryx* spp.); another bird with a bill that curves sideways (wrybill, *Anarhynchus frontalis*); a primitive frog that lays eggs that hatch into adult frogs (*Leiopelma* species); and a huge insect that fills a role played in other habitats by small rodents (giant wētā, *Deinacrida* spp.). New Zealand's indigenous biodiversity is highly endemic. Of our native species, all of the frogs and reptiles, over 90% of insects, 80% of vascular plants, 50% of fungi, and 25% of bird species do not naturally occur anywhere else. Such high levels of endemism mean that New Zealand species perform an important role in our ecosystems (Mouillot et al. 2013); and the extinction of such species can not only have immense cascading effects, but are also a loss to global natural heritage.

Our biodiversity is also important to human wellbeing from social and cultural perspectives.

Māori consider themselves to be kaitiaki (guardians) of the natural world, and have an inseparable obligation to protect the life-supporting capacity of the environment to sustain both present and future generations. Māori cosmogony places special value on the environment and biodiversity, which links people and all living and non-living things. Many species are of particular cultural significance, e.g. for weaving, kai (food) and rongoa (medicines).

These species and the related activities reflect connection and kinship with the natural world. Loss of these species has profound repercussions: 'Cultural consequences include severance of links between people and the food species, reduced connections between people in the community, erosion of ways that kinship is maintained, severed transmission of cultural knowledge, and impaired health and tribal development' (Jonathan et al. 2013). Understanding and valuing the Māori worldview is an essential step towards a bicultural approach to successful biodiversity management.

New Zealand's natural environment and its biological wealth are also important for sustainable economic growth and development. Strong primary and tourism sectors are the backbone of our economy, reflecting the value of sustainable consumptive and non-consumptive use of our natural heritage. In 2012, 70% of all goods exported (worth NZ\$46 billion) were primary products (Statistics New Zealand et al. 2013). Key contributing sectors include dairy (25% of total goods exported), meat (11%), and logs and timber (7%). The seafood industry annually exports between \$1.2 and \$1.5 billion worth of seafood products, including an aquaculture contribution of about \$200 million per year (MPI 2013; Statistics New Zealand et al. 2013).

A further NZ\$9.6 billion of export earnings came from international tourism—the main attraction for visitors being New Zealand's natural environment. New Zealand's economy has also benefited from other non-extractive uses of our landscapes and biodiversity, including high-profile and successful movie and television productions such as *The Lord of the Rings* and *The Hobbit* trilogies.

New Zealand's natural heritage also provides a wide and valuable range of ecosystem services. While work on calculating the value of these services is ongoing, a preliminary study has estimated that New Zealand's land-based ecosystem services contributed \$57 billion to human welfare in 2012 (Patterson & Cole 2013). This study assessed that the main categories of these ecosystem services and values were supporting services (\$22b), regulating services (\$15b), provisioning services (\$28b), cultural services (\$1b), and passive values (\$12b).

2. What major changes have taken place in the status and trends of biodiversity in New Zealand?

New Zealand has experienced significant changes to its lands and the trends in biodiversity. Since their arrival, humans have modified the biodiversity and ecosystems within New Zealand. The

following section will discuss changes in the status and trends in land cover, freshwater, the marine environment, and species (terrestrial, freshwater, and marine).

Land cover

A quarter of the country is under native forest cover, with indigenous forests covering 5.177 million hectares of the 8.6 million hectares of public conservation land. Non-forested environments cover 3.292 million hectares (about 38.3%) (Bellingham et al. 2013).

A Biodiversity Monitoring and Reporting System (described in more detail in Part II) was developed to assess whether the ecological integrity of public conservation lands is being maintained at a national scale. The system assesses three components:

- Indigenous dominance—the level of indigenous influence on the composition, structure, biomass, trophic and competitive interactions, mutualisms, and nutrient cycling in a community;
- Species occupancy—the extent to which any species capable of living in a particular ecosystem is actually present at a relevant spatial scale; and
- Ecosystem representation—the abiotic aspects of ecosystems. This measures the distribution of indigenous biota across environmental gradients derived from data layers based on climate, soils, and geology.

Studies have indicated that the ecological integrity of public conservation land remains good, with forested environments having the greatest integrity (MacLeod et al. 2012). The most recent assessment is based on: (1) an unbiased sample of 79 non-forested and 76 forested environments on public conservation land; (2) expert-driven threat listings of ecosystems; and (3) land tenure and management information (Bellingham et al. 2013). Indigenous plant species were found to dominate exotic species on public conservation land (ibid.). Possums (*Trichosurus vulpecula*) and ungulates were found in 81% and 75% of forested samples, and 40% and 46% of non-forested samples, respectively (ibid.). Earlier assessments found that plant species that are highly palatable to browsers, e.g. kāmahī (*Weinmannia racemosa*), are regenerating (MacLeod et al. 2012). Native bird species dominated both forested and non-forested environments, but had a more patchy distribution in non-forested environments, where some locations were dominated by introduced species (Bellingham et al. 2013).

Freshwater

For Māori, water is a taonga (a treasure). The connection to an ancestral mountain and river or water body is a core tenet of Māori identity. With the preponderance of New Zealand's economy being based on the primary sector, related activities have led to considerable changes in the land and water. Although effluent and pollutants are now controlled much more stringently than they were in the past, the expansion of primary industries has affected the quality of freshwater. Thus, the management of freshwater has become an important issue affecting biodiversity in New Zealand.

Overall, water quality remains good by international standards. However, quality varies around the country, depending on local land use, climate, and geology. Seventy-five percent of waterways have stable or improving water quality. However, there are increasing signs of declining water quality in some waterways, with the three water pollutants of greatest concern being pathogens, sediment, and nutrients (PCE 2012). Ongoing anthropogenic changes affecting freshwater ecosystems are:

- Loss of freshwater habitats, particularly lowland wetlands
- Pollution of freshwater systems
- Hydrological changes from water extraction or diversion
- Physical alteration, e.g. channelisation or clearance
- Loss of connectivity between water bodies
- Invasion of alien species

Monitoring and reporting is carried out at both national and regional level for various purposes. The national state of New Zealand's freshwater is reported on in terms of variables including freshwater demand, groundwater quality, river condition, and lake water quality, which are discussed below.

Freshwater demand

National weekly water allocation increased by one-third between 1999 and 2010. In 2010, the majority of consumptive weekly allocations were for irrigation (46%) and hydro generation (41%). The

remainder was shared among public drinking water supply, industry, and stock watering (Aqualinc Research Ltd 2010).

Groundwater quality

New Zealand has two major but mutually exclusive national-scale groundwater quality issues (Daughney & Randall 2009). Firstly, nitrate and/or microbial pathogens contaminate oxygen-rich groundwater in unconfined aquifers, especially in the Waikato, Southland, and Canterbury. Secondly, naturally elevated concentrations of some minerals (NH₄-N, Fe, and/or Mn) are found in many regions (especially Manawatu, Wanganui, Hawke's Bay, and Bay of Plenty), particularly in oxygen-poor groundwater extracted from deeper wells in confined aquifers.

The Ministry for the Environment (MfE) monitors the health of New Zealand's aquifers (groundwater bodies) using the concentrations of nitrate and bacteria (*Escherichia coli*) in 973 aquifers as indicators.

Over the period 1995 to 2008, groundwater quality was found to be either consistent over time or changing slowly (parameter values changed less than 2.5% per year) at two-thirds of the monitoring sites, probably due to the natural processes of water-rock interaction (Daughney & Randall 2009). The remaining one-third showed significant changes in nitrate levels. Of these, more had increasing (deteriorating) trends in nitrate levels (20% of all sites) than decreasing (improving) trends (11.9% of all sites) (ibid.). These patterns appear to reflect human influence, such as the leaching of fertiliser and stock effluent.

Attempts to identify and interpret time trends in groundwater quality are complicated by year-to-year changes in regional data collection and reporting. The national median nitrate level of monitored groundwater was 1.7 milligrams per litre. Almost 5% of monitoring sites exceeded the drinking water guideline of 11.3 milligrams per litre (ibid.).

The median *E. coli* level was assessed at 700 of the 973 groundwater monitoring sites. *Escherichia coli* is the main bacteria used because it indicates the presence of faecal matter from warm-blooded animals; however, other bacterial indicators are also used. For the period 1995 to 2008, 77% of monitored sites had median bacterial levels that complied with the health-related drinking water guideline of less than 1 *E. coli* unit per 100 millilitres of water sampled; and 98% of the monitored groundwater sites showed no change in concentrations of bacteria between 1995 and 2008 (Daughney & Randall 2009; Fig. 1).

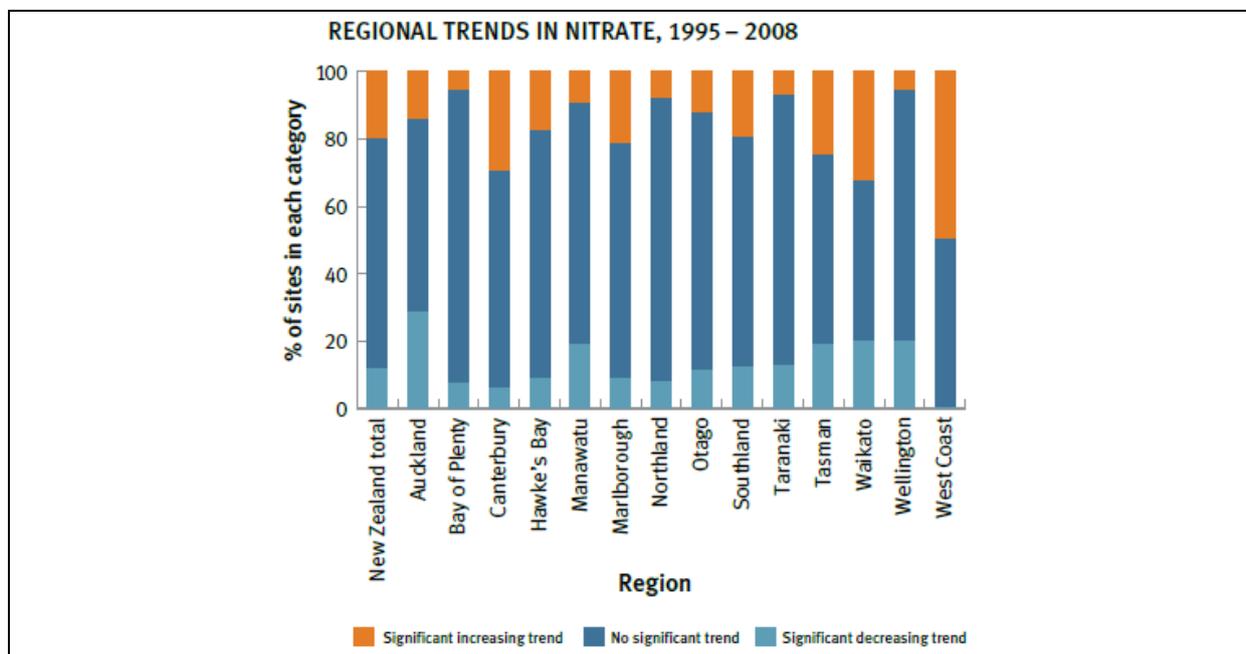


Figure 1 Regional trends in nitrate, 1995–2008 (Daughney & Randall 2009)

River condition

The Ministry for the Environment's River Condition Indicator (MfE 2013) reports on the current state and trends in the condition of river environments using the following three sub-indicators:

- Nutrients:
 - Nitrogen (as nitrate and ammonia)
 - Phosphorus (as total and dissolved reactive)
- Macroinvertebrates (diversity of aquatic animals based on their tolerance to pollution, e.g. insects, crustaceans, molluscs, worms, and leeches)
- Bacteria (estimated by concentration of *E. coli*)

Figure 2 shows the 10-year trend in the monitored parameters at the monitored sites.

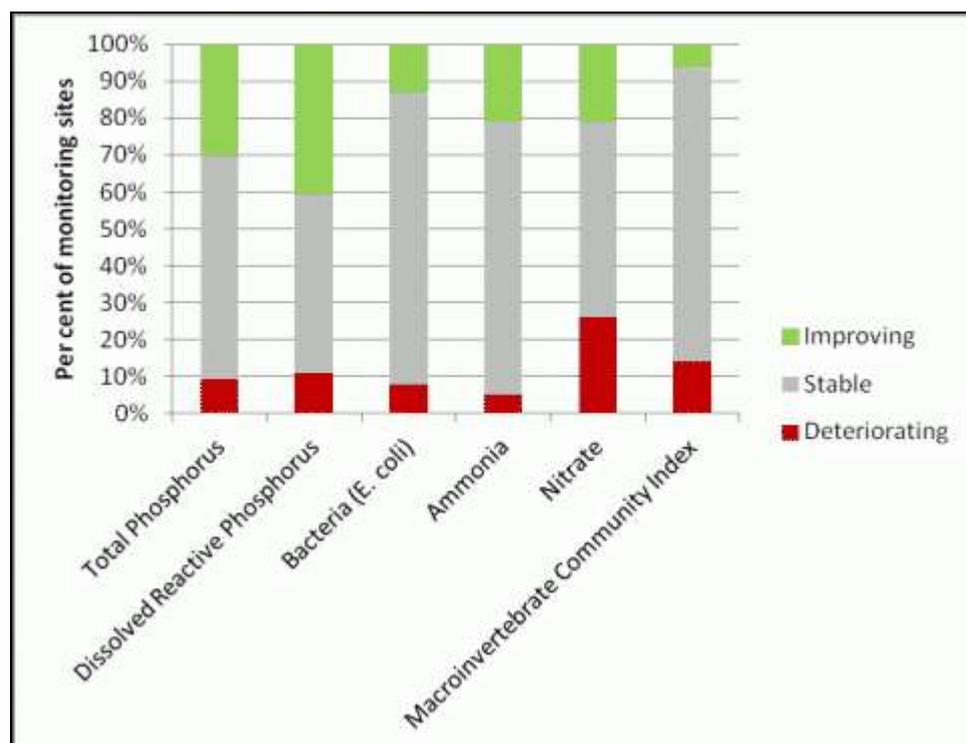


Figure 2 Summary of the 10-year trend analysis (MfE 2013)

Nitrate concentrations were increasing at about a quarter of the monitored sites, while phosphorus trends were improving at 30% and deteriorating at 10% of monitored sites (MfE 2013). No significant trend was detected for ammonia at the majority of monitored sites (74%), but for those with a trend there were more improving trends (21%) than worsening (5%) (ibid.). Rivers and streams downstream of urban and pastoral areas tended to have the highest concentrations of nutrients and bacteria, and the lowest macroinvertebrate health. However, water quality at the relatively small number of monitored sites in urban areas was generally improving. Macroinvertebrate condition showed no change at most sites, but declined in more places than it improved (ibid.).

Didymo (*Didymosphenia geminata*) is an exotic alga that has invaded South Island waterways, impacting on their biodiversity and recreational values. It was first reported in New Zealand in the Lower Waiau River in 2004 and is currently found in over 150 South Island rivers, but does not occur in the North Island. Under the Biosecurity Act 1993, the entire South Island is a Controlled Area and people are legally obliged to prevent its spread.

Lake water quality

The majority of New Zealand's 3,820 lakes that are larger than 1 hectare are not monitored. The lake water quality of 112 large lakes with known problems are monitored using an indicator based on two indices: the Lake Trophic Level Index (which measures phosphorus levels, nitrogen levels, visual clarity, and algal biomass) and the Lake Submerged Plant Indicators (which measures aquatic plant structure and composition). The most recent Lake Trophic Level assessment was undertaken for 112 lakes in 2010 (Verberg et al. 2010; Fig. 3):

- 11% were hypertrophic and highly degraded
- 44% had high to very high levels of nutrients, meaning that the water quality was degraded
- 33% had low or very low levels of nutrients and so were regarded as healthy

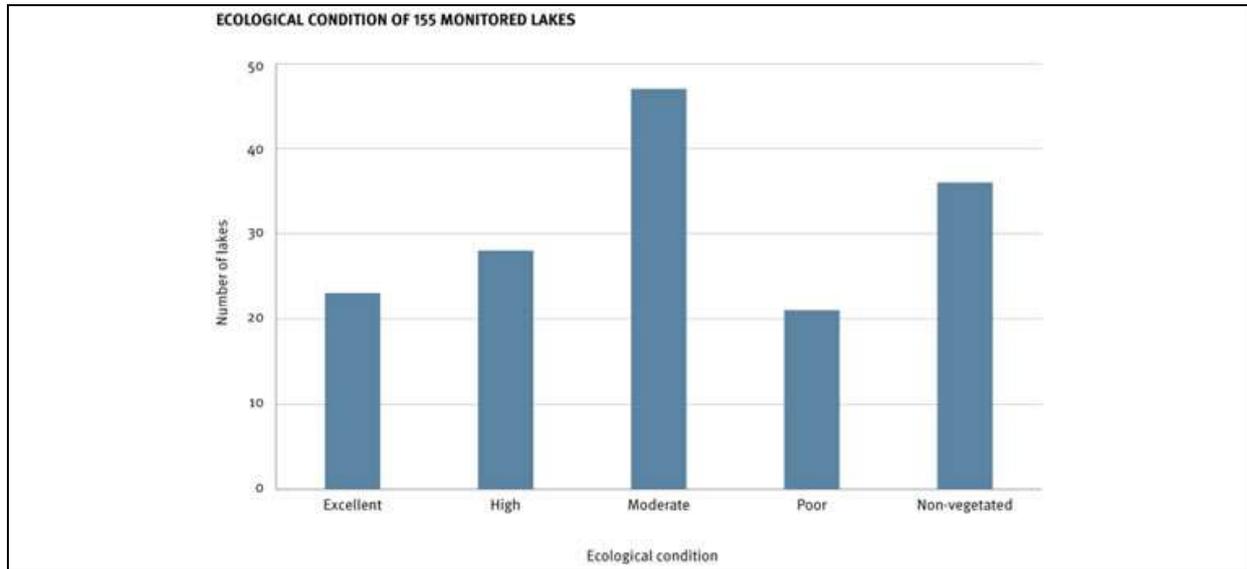


Figure 3 Ecological condition of 155 monitored lakes (Verberg et al. 2010)

The Lake Submerged Plant Indicators was assessed for 155 lakes in 2010 (Verberg et al. 2010):

- 37% had poor ecological condition or no submerged plants
- 33% had high or excellent ecological condition

Marine environment

A network of marine protected areas is being developed to provide for the maintenance or recovery of New Zealand's marine biodiversity. There are currently 34 marine reserves (no-take) ranging in size from 0.93 km² to 7,480 km². They cover a total area of 12,790 km², or 7% of New Zealand's Territorial Sea. The protected areas are located all around New Zealand's coast, although a large proportion occur around offshore islands over 500 km from the mainland.

One marine protected area—the Tāwharanui Marine Reserve in the North Eastern Biogeographic Region—has been strengthened. Since 2008, the proportion of the Western North Island Biogeographic Region designated as marine protected areas increased by 0.05% (MfE 2012).

Further protection of New Zealand's Territorial Sea is continuing. A new marine reserve in Akaroa Harbour will come into effect in June 2014. The Subantarctic Islands Marine Reserves Bill, which will take effect from March 2014, will create three new marine reserves in the Subantarctic Biogeographic Region, around Campbell Island/Motu Ihupuku, Antipodes Island, and the Bounty Islands, totalling 452,691 hectares. Applications for five marine reserves on the South Island's West Coast are also underway.

Threatened species

The New Zealand Threat Classification System is used to assess the threat status of NZ taxa (species, subspecies, varieties and forma), with the status of each taxon group being assessed over a 3-year cycle. It differentiates three threatened species categories (Nationally Critical, Nationally Endangered, or Nationally Vulnerable) based on estimates of the existing population size or area of occupancy and ongoing or predicted rates of declines in a population due to existing threats. In 2008, the New Zealand Threat Classification System methodology was revised to improve its utility.

A comparison of threat classification data between 2005 and 2008–2011 is provided in Table 1. Twelve threatened taxa had improved in status (mainly due to successful species management), while 59 had worsened. Over 2,700 indigenous species are known to be at risk from insufficient or degraded habitat, plant and animal pests, or the adverse effects of human activities. Results from the most recent New Zealand Threat Classification System assessment suggest an ongoing deterioration in status for many indigenous species in the taxonomic groups assessed.

Status changes are partially a result of increased species knowledge. For example the 2008 assessment of native vascular plants assessed the threat status of 2,530 plants while the latest review assessed an extra 50 plants and lists the threat status of 2,580 plants. This increase was due to an increase in our knowledge of New Zealand's native plant life. When the 2008 assessment was conducted scientists thought there was just one species of Cook Scurvy Grass (*Lepidium oleraceum*). New research recently published recognises that there are 11 species of Cooks Scurvy grass, all now separately recognised in the threat classification.

There are insufficient data to determine the status of almost 4,000 additional species that are less well known, such as marine invertebrates and fungi.

No taxa were found to have become extinct between the 2005 and 2008–2011 assessment cycles. The difference in figures is due to only listing extinctions since 1800 AD (European settlement) in the 2005 assessment, while all extinctions since 1000 AD (human settlement) were included in the 2008–2011 assessment. There are at least 70 New Zealand taxa that have not been seen for more than 20 years and are thought to be extinct, but are still listed as Data Deficient due to the need to be very certain before classifying a species as extinct.

Data from the next 3-yearly assessment cycle (2012–2014) will progressively become available at www.doc.govt.nz/publications/conservation/nz-threat-classification-system/nz-threat-classification-system-lists-2012-14/.

Table 1 Comparison of threatened species summary data between the 2005 and the 2008–2011 assessment cycles (Hitchmough 2013)

Status	2005	2008–11
Nationally Critical	383	417
Nationally Endangered	232	175
Nationally Vulnerable (formerly Vulnerable and Serious Decline)	53+55	207
Total Threatened	723	799
Declining	202	220
Recovering	–	28
Relict	–	154
Naturally Uncommon (formerly Sparse and Range Restricted)	349+1514	2339
Total At Risk 2008–11	2065	2741
Total Threatened and At Risk	2788	3540
Data Deficient	3031	3940
Extinct	33 (since 1800 AD) ¹	40 (since 1000 AD) ²

Freshwater fisheries

The loss and degradation of freshwater ecosystems has been accompanied by the decline of a wide range of freshwater species. In the 2009 assessment, of the 54 native fish species that use freshwater systems, 1 was classed as extinct, 21 at risk of extinction, 14 as declining, 5 as naturally uncommon, 1 had insufficient data to make an assessment, and 12 were not threatened. Since the last classification in 2005, no fish species had improved in conservation status and 14 were moved to a more threatened class. In some cases, changes were due to more information being available, but the trend is of continuing decline in indigenous fish species.

Based on a recommendation by the Parliamentary Commissioner for the Environment, an independent panel of experts was convened to assess the status of New Zealand's eel fisheries, particularly longfin eels (*Anguilla dieffenbachia*). The panel agreed that there is a high probability that the longfin eel population has been substantially reduced relative to its pristine biomass given the

¹ Extinctions since 1800 AD (European settlement)

² Extinctions since 1000 AD (human settlement)

biology of the species, and the duration and extent of culling, habitat modification, damming, and fishing (Haro et al. 2013). However, the panel noted that it is quite unlikely that the longfin eel stock has already experienced a decline as dramatic as that seen in the northern temperate (European and American) eel stocks (ibid). The panel also found that although longfin eel numbers declined up to the late 2000s, their numbers appear to have stabilised in recent years (ibid). In the South Island, there are also examples of recent increases in standardised catch rates in some areas. For shortfin eels (*A. australis*), numbers also declined during the 1990s, but this was then followed by a substantial increase starting in the mid-2000s. Work has begun to improve the underlying science, strengthen existing monitoring tools, address recommendations relating to non-fisheries sources of mortality, and develop future management options for the fishery.

Work is also underway to address non-fisheries sources of mortality. The Minister for Primary Industries will consider those options and the recommendations made by the PCE and independent panel in the first quarter of 2014 to inform future management of freshwater eels. Updates on those decisions will be made available on the MPI website (www.mpi.govt.nz).

Marine fisheries

Marine fisheries are generally managed through the New Zealand Quota Management System (QMS). The QMS helps to ensure the sustainable utilisation of fisheries resources through the direct control of harvest levels for each species in a nominated geographical area. A fish species can consist of numerous geographically isolated and biologically distinct populations. Currently, there are 638 fish stocks (including fish, invertebrates, and algae) in the QMS, compared to 629 fish stocks in 2009. Around 350 of these fish stocks are significant stocks.

The commercial fish catch increased from 431,389 tonnes in 1990 to a peak of 652,311 tonnes in 1998, and decreased to 424,693 tonnes in 2009. It is now at around 450,000 tonnes per annum.

In 2013, there was sufficient information to report on the status of 169 of the 350 significant stocks managed under the QMS, compared to 132 in 2009. Eighty-two percent of these stocks were above the 'soft limit' (i.e. at a biomass level above which a stock is deemed to be overfished), which is similar to the 2009 figure (81%).

Eighteen percent (25) of these fish stocks were considered to be overfished compared to 19% (21) in 2009. The 25 stocks considered to be overfished are southern bluefin tuna (*Thunnus maccoyii*) and Pacific bluefin tuna (*T. orientalis*); three stocks of black cardinalfish (*Epigonus telescopus*); five stocks of bluenose (*Hyperoglyphe antarctica*); six stocks or sub-stocks of orange roughy (*Hoplostethus atlanticus*); three stocks or sub-stocks of snapper (*Pagrus auratus*); two stocks or sub-stocks of scallops; and one stock or sub-stock each of oyster, paua (*Haliotis* spp.), John dory (*Zeus faber*), and rig (*Mustelus lenticulatus*). Eleven of these 25 stocks are considered to be collapsed.

3. What are the main threats to biodiversity?

The major pressures contributing to the decline of biodiversity in New Zealand are well recognised and can be grouped into five broad categories: competition, predation, herbivory, habitat modification, and human activities. These different categories of threat have been factored into the development of an indicator species approach to monitoring indigenous species generally (Monks et al. 2013).

Competition

Competition between native plants and invasive weed species and also exotic and native animals has changed New Zealand's indigenous biodiversity. More than 30,000 plant species have been introduced to New Zealand, 2,500 of which have established in the wild. There are many examples of invasive weeds threatening native biodiversity, both directly, by competing and excluding native species, and indirectly, by altering ecosystem processes and functions (Wotton & McAlpine 2012). Weeds affect terrestrial, marine, and freshwater systems. Invasive macro-fungal weeds can compete with native fungi, e.g. the invasive fly agaric mushroom (*Amanita muscaria*) in beech forests.

Predation

Introduced predators have caused species declines across most animal groups in forest, freshwater, and coastal ecosystems in New Zealand.

Introduced mammalian predators (e.g. stoats *Mustela erminea*, weasels *M. nivalis*, ferrets *M. putorius furo*, cats *Felis catus*, rats *Rattus* spp.) are a major cause of decline in native faunal populations (e.g.

birds, invertebrates, lizards, and aquatic fauna). Predation can skew the male to female ratio in bird populations, as females incubating eggs on nests are particularly prone to predation; hedgehogs (*Erinaceus europaeus*) have a high impact on lizard populations; and rat predation severely impacts on seabirds. The extinction or extremely low densities of seabirds and large terrestrial birds has permanently altered or extinguished some ecosystem function. Uncontrolled dogs also impact on marine birds and other animals, and on ground-nesting birds such as kiwi in forests.

Pest fish threaten New Zealand's streams, rivers, lakes, and wetlands, and are increasing their range in New Zealand. There are as many as 22 introduced fish species in New Zealand. Major pest fish species include gambusia (*Gambusia affinis*), koi carp (*Cyprinus carpio*), rudd (*Scardinius erythrophthalmus*), and brown bullhead catfish (*Ameiurus nebulosus*). A complete list of the freshwater pests of New Zealand can be found at www.niwa.co.nz/sites/default/files/pest_guide_Indscp_feb_2013_.pdf, which also summarises information on recent introductions and spread. Trout, which were introduced as sport fish, have had the most dramatic impact on native fish species in New Zealand, as in other parts of the world where they have established (Woodford & McIntosh 2013).

Herbivory

Introduced herbivores have modified native vegetation structure and communities, leading to a decline in plant populations through increased plant mortality or decreased seed production. Mammalian browsers reduce foliar cover, contribute to canopy dieback and regeneration failure, and threaten some particularly palatable species. Deer and possums affect forest structure and composition. Selective browsing of palatable species by introduced herbivores (deer, possums) can lead to a forest that is composed of unpalatable species, which, in turn, affects bird food sources, leaf litter quality and quantity, and nutrient recycling, and hence invertebrate herbivores and, ultimately, their predators (Bellingham & Lee 2006).

Recent trends in forest condition show that no significant change in the frequency or distribution of non-native plants in native forests has been recorded over the past decade. There is evidence that in some environments ecosystem health is likely to be stable, albeit at a historically reduced and therefore less resilient state (DOC 2013).

Habitat modification

Land use change, clearance, fragmentation, fire, and forest conversion can also adversely affect biodiversity, particularly species in threatened environments. Although many alpine areas and native forests are formally protected, other distinctive habitats and ecosystems (i.e. 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 rivers) are not protected. This allows easily accessible areas to be converted for urban, agricultural, and pastoral purposes. The conversion of wetlands for human land uses through drainage, ploughing, burning, and spraying has been estimated to have led to the loss of 90% of all New Zealand's native wetlands and the integrity of many native ecosystems since the arrival of humans. As a consequence, the ecological integrity of more than 50% of our wetlands is only half of what a healthy wetland should be (Ausseil et al. 2011).

Human activities

Several human activities can have negative impacts on biodiversity, including:

- Harvesting: Fishing (in the marine environment, and also in freshwaters for eels and whitebait) has a range of ecological effects, including the modification or destruction of habitats and removal of large numbers of both target and non-target (bycatch) species. Bottom trawling, which impacts benthic habitats including vulnerable marine ecosystems, occurs on 85,222–166,233 km² of New Zealand's sea area per annum (from a total of over 4 million km²).
- Pollution: Wastes from industry and households (including sewage and pollutants in urban stormwater, and nutrient runoff) are having effects; however, the trends in different waste products are highly variable. Sedimentation associated with land use is one of the most important land-based stressors on the marine environment (MacDiarmid et al. 2012). It can influence species and habitats through its suspension in the water column and subsequent deposition, which can smother flora and fauna, and also change the characteristics of the benthic sediment, the light penetration of the water column, and possibly the quality of food (Morrison et al. 2009; MacDiarmid et al. 2012).

- Agriculture: Agricultural practices can have several effects, including the pollution of surface and groundwater; the destruction of wetland and native lowland forest for farm development; indirect damage to freshwater and estuarine habitat through the contamination and nutrient pollution of surface and groundwater; the loss of native biodiversity (through the damage or destruction of native habitat); soil erosion, soil contamination, and damage to the soil structure; and the discharge of greenhouse gases (Baskaran et al. 2011).
- Recreation: Some recreational activities have negative impacts, e.g. four-wheel-drive vehicles on beaches and sand dunes disturb nesting seabirds and damage vegetation.
- Water use: Dams, water extraction and diversion is having a detrimental impact on river health, and affects the habitat of whitebait, eels, and threatened species like some of the non-migratory galaxiids (Quinn & Stroud 2002).
- Trade and transportation: Other invasive species, such as invertebrate pests and plant pathogens, arrive via trade and passenger transportation, e.g. *Phytophthora* species, which include the causal agent of kauri dieback disease.

Climate change is likely to exacerbate many of these pressures (McGlone & Walker 2011). In the marine environment, it will cause ocean acidification and increased sea temperatures (MacDiarmid et al. 2012). It could also lead to increasing biosecurity impacts from new species invasions.

4. What are the impacts of biodiversity changes for ecosystem services, and what are the socio-economic and cultural implications of these impacts?

Research into the socio-economic and cultural implications of biodiversity change is currently underway, with investigations into the linkages between human wellbeing, indigenous biodiversity and ecosystems, and conservation management. Some of these implications are highlighted below.

Socio-economic implications of impacts

Lincoln University manages a database that contains information on more than 850 studies relating to ecosystem services and valuation (see www.lincoln.ac.nz/Documents/Ecosystem-Services/2010-Bibliography-Ecosystem-Valuation-Database.pdf for a list of the studies in this database). The economic values calculated in many of these studies have been analysed and reported, and the values have been standardised temporally and spatially so that each value is reported in US dollars (2001 & 2007) per hectare per year.

Numerous economic impact analyses have investigated the value of land under conservation management in New Zealand. These have tended to focus on the impacts of specific regions.

For example, one study by Wouters (2011) examined concession-based tourism in three national parks (Tongariro National Park, Abel Tasman National Park, and Fiordland National Park), and calculated that for every dollar of turnover generated by tourism, a further 40 cents, 60 cents, and 30 cents circulated in the economy (FNP), respectively (ibid. 2011).

Another study looked at the value of wildlife viewing on the Otago Peninsula (Tisdell 2007). This estimated that the gross annual turnover of enterprises directly involved in wildlife viewing was \$6.5 million per annum. However, when increased local expenditure on accommodation and food was factored in, this value increased by an extra \$100 million. Overall, it was found that the economic impact of wildlife on Dunedin's regional economy has increased by more than 11-fold in the last 20 years.

A similar study looked at the economic impacts of the Cape Rodney Okakari Point (Leigh) Marine Reserve in 2008 (Hunt 2008). This study estimated the impact of the Marine Reserve at \$18.6 million per year. \$12.1 million was spent in the Reserve, while the remainder was measured as a flow-on effect on the District's economy, including the creation of 173 full-time equivalent positions, ten of which were in marine reserve-related activities.

A different but important angle is the link between biodiversity and health, which has also been investigated in New Zealand. Blaschke (2013) reviewed literature regarding the relationship between conservation and health and wellbeing, with a particular focus on public conservation areas. He put forward a number of conclusions, *inter alia*: the type of health and wellbeing effects provided by nature and green spaces; how green spaces impact on health and wellbeing; caveats about the nature of research conducted to date; and research needs for the future.

Studies have also investigated the losses in value caused by adverse changes in biodiversity (e.g. as a result of pests). For example, an assessment has been completed of the potential present value impacts of didymo on New Zealand's commercial eel fisheries; municipal, industrial, and agricultural water intakes; community, municipal, and domestic drinking water; local recreation values; international and domestic tourism expenditure; local and national existence values; and existence values associated with the extinction of native species. The study assessed the time period from 2004/05 to 2011/12 and estimated that the impact was between NZ\$57 million and \$285 million.

Similarly, Nimmo-Bell (2009) assessed the total economic cost of pests to New Zealand's primary sector as approximately NZ\$2.1 billion per year. Forty percent of this cost was attributed to defensive expenditure (e.g. quarantine and border control, surveillance, research, pest control, and eradication programmes) and 60% was attributed to output losses. Combined, this value is about 1.86% of GDP.

Work has also been underway to assess other aspects of the socio-economic impacts of changes in biodiversity in New Zealand. For example, Baskaran et al. (2011) looked at the relative values (i.e. marginal willingness-to-pay) attached by society to the reduction of detrimental environmental impacts caused by the intensification of dairy farming (e.g. impacts such as nitrate leaching to streams and rivers, methane gas emissions, demands for surface and groundwater for irrigation, and reduced variety in pastoral landscapes). Baskaran et al. (2011) calculated that the estimated mean weighted willingness-to-pay for an improved dairy landscape was \$8.78 per household.

Another angle of important social research has been the value of specific conservation activities, such as volunteering. An example of such work is a survey of 362 Department of Conservation community partners (Hardie-Boys 2010). This survey identified the types and benefits of partnership arrangements, and estimated the value of the resources they contribute to conservation activities. The study looked at 6,232 volunteers who gave 174,812 hours of labour over a year. This equated to around 233 full-time equivalent volunteers. The volunteers carried out a wide range of activities, with 58.3% involved in ecological restoration, 57.8% in conservation awareness and publicity, and 55.3% in pest control. Their total annual income was found to be around \$12 million. For every \$1 of government funding received by groups, they also received on average \$1.34 of income from non-government sources. The total financial value contributed by the groups over 12 months was estimated at \$15.8 million.

Cultural implications of impacts

Mātauranga Māori refers to the knowledge base that underpins Māori culture. The interface between New Zealand biodiversity and mātauranga Māori means that changes in biodiversity will necessarily have cultural impacts. Froude (2011) considered these types of impacts in her study of wilding conifers in New Zealand. She assessed that wilding conifers can affect cultural landscapes that are important for Māori. They can block access to cultural sites, make it difficult to show remnants of cultural sites (including trails, markers, and reasons for place names), and adversely affect the sites themselves, making it difficult to pass on traditions.

Moller et al. (2009) investigated the cultural implications of changes in biodiversity from various angles. The authors focused on tītī (muttonbird, *Puffinus griseus*) and traditional knowledge associated with the harvest. One issue they examined was the changing roles of those who hold traditional knowledge about the birds. The study found, *inter alia*, that ecological changes are affecting the predictability of the breeding cycle, which casts doubt on 'the reliability of traditional ecological knowledge and institutional memory for understanding ecosystem change'. At the same time, they also observed evidence of adaptation to these changes.

Part II—The national biodiversity strategy and action plan (NBSAP), its implementation, and the mainstreaming of biodiversity

5. What are the biodiversity targets set by New Zealand?

The current New Zealand biodiversity targets are an integral part of the New Zealand Biodiversity Strategy (NZBS; DOC & MfE 2000). The NZBS was published in 2000 to fulfil, in part, our commitments under the CBD. It established a strategic framework for action, aimed at conserving, sustainably using, and managing New Zealand's biodiversity. The strategy contains four principal

goals (grouped into ten thematic areas which are to be delivered through 45 objectives supported by 147 actions):

Goal 1: 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
- 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 2: Treaty of Waitangi

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

Goal 3: 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 4: 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

More detailed information about the NZBS is available in New Zealand's Fourth National Report and on the Department of Conservation website (www.cbd.int/doc/world/nz/nz-nr-04-en.pdf and www.doc.govt.nz/about-doc/role/international/convention-on-biological-diversity/biodiversity-in-nz/).

6. How has New Zealand's NBSAP been updated to incorporate these targets and to serve as an effective instrument to mainstream biodiversity?

The New Zealand Biodiversity Strategy (NZBS; DOC & MfE 2000) was published with an intended 20-year lifespan; however, a domestic review in 2005—as well as adoption of the 2020 Aichi Biodiversity Targets and related commitments—has necessitated a refresh of the Strategy. The revised NZBS will include biodiversity targets that reflect new international commitments under the CBD.

The revised NZBS will include an Action Plan that incorporates the new Aichi objectives, actions, and targets. It will be designed to mainstream biodiversity across government and society; reduce direct pressures on biodiversity and promote sustainable use; provide ecosystem services to benefit all; and enhance implementation of the NZBS. The revised Strategy will also incorporate:

- New information on status and trends of biodiversity;
- New issues, including the impacts of climate change on biodiversity and the importance of ecosystem services to prosperity;
- Progress against NZBS outcomes, objectives, targets, and actions to date; and
- Key recommendations from the 2005 review of the NZBS, including a more effective monitoring framework.

7. What actions has New Zealand taken to implement the Convention since the 4NR and what have been the outcomes of these actions?

The New Zealand Biodiversity Strategy (NZBS; DOC & MfE 2000) is the main vehicle for implementing New Zealand's obligations under the Convention. Since submission of the Fourth National Report in 2009, the Government has continued to take actions that implement the broad range of commitments under the Convention. Several policies with extensive impacts across a range of CBD areas are described below. Details about implementation of the Aichi Biodiversity Targets—which covers the various thematic and cross-cutting areas under the CBD—are included in Part III.

Marine-related policies

Since 2006, marine-related work in New Zealand has focused on improving the regulatory regime for environmental impacts in our Exclusive Economic Zone (EEZ). This focus is important because there

are no means of assessing and regulating the environmental effects of many activities when they are undertaken beyond the territorial seas (12 nautical miles). The Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 seeks to fill that regulatory gap and manage the previously unregulated adverse environmental effects of activities in the EEZ and continental shelf. This legislation aims to protect our oceans from potential environmental risks of activities such as petroleum exploration, seabed mining, marine energy generation, and carbon capture developments.

The New Zealand Coastal Policy Statement was updated in 2010. The Coastal Policy Statement provides direction for local authorities about how certain matters to do with coastal management should be dealt with in Resource Management Act planning documents. The updated statement supports better environmental outcomes, with updated and more specific policy on key matters such as the preservation of natural character, protection of outstanding natural landscapes and features, protection of indigenous biodiversity and habitats, control of sedimentation and other discharges, improvement of water quality, adoption of a precautionary approach where appropriate, and monitoring.

Biodiversity Monitoring and Reporting System

New Zealand is progressively implementing a system to monitor and report on biodiversity as part of an ongoing programme to develop a nationally consistent and cohesive approach to managing biodiversity across all of New Zealand's land and waters. The Biodiversity Monitoring and Reporting System will provide consistent and comprehensive information about biodiversity across public conservation lands and, with the participation of New Zealand's other biodiversity managers, has the ability to deliver the full New Zealand picture. It will:

- Provide a foundation of sound data to better inform effective management planning and policy development;
- Improve understanding and reporting on the health of New Zealand's biodiversity and trends in ecological integrity;
- Reduce reliance on anecdotal evidence and expert advice by delivering factual evidence to inform decisions and report on progress towards outcomes;
- Improve comparability between projects and allow the assessment of interventions;
- Help to further identify which areas of work should be focused on; and
- Help New Zealand to meet national and international reporting requirements.

The system is based on different layers of information that operate at different scales, with varying levels of detail and coverage: Tier 1—Broad-scale monitoring for a national context; Tier 2—Nationally consistent monitoring of managed places and species on land, in freshwater, and in the ocean to report on management effectiveness; Tier 3—Intensive, targeted monitoring for research and evaluation (see www.doc.govt.nz/documents/science-and-technical/drds338entire.pdf).

The components of the measures that comprise the system are shown in Table 2.

Table 2 Summary of indicators and measures used to assess ecological integrity (MacLeod et al. 2012)

Component	Indicator	Measure	Information source
Indigenous dominance	Exotic weed and pest dominance	Distribution and abundance of exotic weeds and animal pests considered a threat—Weeds	An unbiased sample of locations ($n = 328$) within native forests on public conservation land
		Distribution and abundance of exotic weeds and animal pests considered a threat—Pests	An unbiased sample of locations (n possums = 69; n ungulates = 68; n lagomorphs = 68) within native forests on public conservation land
Species occupancy	Composition	Size-class structure of canopy dominants	An unbiased sample of locations ($n = 327$) within native forests on public conservation land
		Demography of widespread animal species—Birds	An unbiased sample of locations ($n = 70$) within native forests on public conservation land
		Representation of plant functional types	An unbiased sample of locations ($n = 327$) within indigenous forests on public

			conservation land
Ecosystem representation	Environmental representation and protected status	National change in extent and integrity of threatened naturally uncommon and significantly reduced habitats	Expert-driven assessment of threat listing considered for naturally uncommon ecosystem types ($n = 72$) across New Zealand
		Proportion of threatened naturally uncommon and significantly reduced habitats under protection	Threatened naturally uncommon ecosystems ($n = 45$) across New Zealand reviewed in the context of land tenure and management information

This system will enable the objective selection of and data collection for a range of indicator species that represent taxonomic diversity, ecosystem types, key environmental pressures, and threat status. Trends in 25 widespread native taxa and 250 threatened taxa will be measured over the next 6 years.

When this programme is fully implemented, New Zealand will be able to accurately report trends relating to these selected and representative taxa. Access to new, regularly updated, and more easily shared biodiversity data will result in better natural environment decisions and outcomes.

For more information about the system see

www.landcareresearch.co.nz/publications/researchpubs/biodiv_inventory_system_review_framework.pdf#search= and

www.landcareresearch.co.nz/publications/researchpubs/report_extract_inventory_monitoring.pdf.

State of the Environment reporting system

In 2013, Cabinet agreed to issue instructions to draft an Environmental Reporting Bill. The proposed Bill sets out the roles, scope, and timing for the publication of comprehensive environmental reports.

Environmental reports will be published by the Ministry for the Environment and Statistics New Zealand on a rolling 6-month cycle, providing information on air, climate and atmosphere, freshwater, marine, and land, with biodiversity and ecosystems as a theme across all domains. Once every 3 years, a synthesis report covering all domains and linkages between them will be published.

A pressure-state-impact framework will be used for reporting. This framework will be populated with indicators. Where appropriate, indicators will be aligned with international reporting (e.g. OECD Green Growth indicators). Indicators will draw upon existing information held across central government and regional councils. Gaps where information is not currently available will be prioritised for data investment over the coming years.

Community participation

New Zealand is seeking to grow conservation by working more closely with partners. Working efficiently in partnership with iwi, local communities, and businesses will allow more conservation activities to be undertaken on both public and private land, and will increase the amount of conservation being done across New Zealand.

Species recovery

In situ conservation work to conserve biological diversity, particularly of endemic species, using an ecosystem-based approach continues, with at least 28 recovery plans (single- or multi-species) for priority threatened species and two formal recovery plan reviews published between 2000 and 2013. Species recovery effort has become more strategic and directed towards agreed goals and objectives. Implementation is usually supported by corresponding recovery groups, which are comprised of internal and external specialists and stakeholders who advise on the preferred course of action, best practice, current state of knowledge, and balance between local and national interests. Improved outcomes have been achieved for the threatened Archey's frog (*Leiopelma archeyi*) through the successful management of key agents of decline, such as rats, and the translocation of populations to increase their distribution and establish new populations in predator-managed habitats. Similar positive outcomes were achieved for some mudfish and galaxiid fish species, where national planning and implementation has led to increased understanding, landowner and other stakeholder engagement, restoration of key habitats, and protection of significant populations.

Funding has been specifically allocated to protect kiwi and to establish five kiwi sanctuaries where there are significant populations of the two most endangered taxa, rowi (*Apteryx rowi*) and Haast tokoeka (*Apteryx australis* 'Haast'), as well as brown kiwi (*Apteryx mantelli*), which is the species suffering the greatest rate of decline. The sanctuaries are contributing significantly to the recovery of

kiwi by achieving substantial population increases (with a modelled growth of 9.1% per annum for Northland brown kiwi, 10.1% per annum for Coromandel brown kiwi, and 8.9% per annum for rowi). The tokoeka population is projected to increase by 30% within the next 5 years. The Western brown kiwi sanctuary continues to develop more effective management tools to protect kiwi, predominantly through the use of aerial 1080.

8. How effectively has biodiversity been mainstreamed into relevant sectoral and cross-sectoral strategies, plans, and programmes?

Central government

Resource Management Act:

New Zealand's principal legislation governing the use of natural resources is the Resource Management Act (RMA). National Policy Statements (NPS) are tools available under the RMA that prescribe objectives and policies on matters of national significance, such as the need to maintain our indigenous biological diversity. A NPS on indigenous biodiversity has been drafted that would require local authorities to manage the effects of activities through district and regional plans, and resource consent decisions (or to be satisfied that effects are managed by other methods). This is to ensure that there is no net loss of significant indigenous biodiversity. This draft NPS contains a list of criteria for identifying areas of indigenous vegetation and habitats of indigenous animals that have been recognised as being rare and/or threatened at a national level. It has not been finalised.

Natural Resource Sector:

The Natural Resource Sector (NRS) group has been established to effectively coordinate efforts across government agencies that are responsible for the environment, conservation, land use and primary industry, Māori economic interests, economic development, and science and innovation.

The NRS has developed a set of policy principles to ensure that policy development is coordinated and, wherever possible, does not impinge on another agency's area of responsibility. The policy principles take into account economic, environmental, social, and cultural considerations. Recently, the NRS released a Natural Resources Analytical Framework (<http://nrs.mfe.govt.nz/content/natural-resources-framework>). The goal of this Framework is to craft robust and resilient policy that promotes the effective kaitiakitanga (stewardship) of New Zealand's natural resources, including biodiversity. The Framework has been developed to help improve analysis and advice on natural resource issues; and, importantly, it puts people at the centre of the policy development.

Business Growth Agenda—Building Natural Resources workstream:

The Building Natural Resources workstream aims to make better use of New Zealand's abundant natural resources to grow the economy and look after the environment. These efforts are focused on two outcomes: allocating resources effectively, promptly, and for the most productive uses; and improving the quality of the country's natural resource base. This workstream has seven areas of focus:

- Increasing value from our freshwater assets
- Building growth from more efficient land and resource use
- Making the most of our abundant energy and minerals potential
- Realising greater value from our marine and aquaculture resources
- Transitioning to a low-emissions economy
- Harnessing the productive potential of Māori resources
- Maintaining and advancing biodiversity

A progress report on this workstream was published in December 2012, providing updates on a number of actions under each of these areas of focus. The progress report can be found at www.mbie.govt.nz/pdf-library/what-we-do/business-growth-agenda/bga-reports/BGA-Natural-Resources-report-December-2012.pdf

Living Standards Framework:

Another central government initiative that mainstreams biodiversity is Treasury's 'Living Standards Framework'. This Framework aims to measure New Zealand's progress in achieving higher living standards across a comprehensive range of material and non-material factors that impact on wellbeing. Biodiversity is included as one of the natural capital stocks, along with climate and water,

and all of these are considered in the Framework. The sustainability of living standards for both present and future generations is also a key part of the Framework. Further details on this Framework can be found at www.treasury.govt.nz/abouttreasury/higherlivingstandards.

Statistics New Zealand—Sustainable Development approach:

Statistics New Zealand has developed a programme to measure progress on the basis of sustainable development. The programme incorporates biodiversity and the current indicator measures the distribution changes of seven native species over time. In the future, measurement and reporting will be extended to include 25 widespread native taxa and 250 threatened taxa to provide better representation of taxonomic diversity, ecosystem types, key environmental pressures, and threat status. In 2010 it was found that the species' distributions had not changed markedly. Information on this work can be found at www.stats.govt.nz/browse_for_stats/environment/sustainable_development.aspx.

Valuing natural capital / natural capital assessment:

In 2013, a conference on Valuing Nature was held that examined the shift in perspectives on natural capital, which is the foundation of our economy, prosperity, and wellbeing. The conference significantly increased awareness of the importance of biodiversity, ecosystem services, and our relationship to both. A business case is now being drafted to undertake a Natural Capital Assessment in New Zealand (along the lines of that undertaken in the UK, but tailored to New Zealand's unique needs). The assessment will be a valuable tool in measuring national-level progress toward many of the Aichi Biodiversity Targets.

Regional government

A number of regional governments have put in place regional plans to manage biodiversity, and the pressures on it, within their jurisdiction. Two examples are given below.

Horizons Regional Council—'The One Plan':

Horizons Regional Council has developed 'The One Plan' to manage natural resources in its region for the next 10 years. This integrates six separate plans and regional policy statements into one document and has four key environmental areas: water quality, water quantity, threatened native biodiversity, and land management.

Biodiversity is protected via regulations to prevent the destruction of rare, threatened, and at-risk habitats. Funding and advice is provided to landowners to identify whether habitat areas exist, and to fence and protect bush remnants and wetlands. For more information see www.horizons.govt.nz/about-us/one-plan/.

Bay of Plenty Regional Council—Biodiversity Programme:

The Bay of Plenty Regional Council started a Biodiversity Programme in 2009 to empower landowners and community groups to protect valuable sites of native biodiversity across the region. Assistance is provided through two avenues: sites with particularly high biodiversity values on private land have been identified, and the Regional Council will work in partnership with landowners who would like to protect these sites; and help will be available to landowners who want to protect small bush remnants that have not been identified as being of outstanding value but which are still of great significance to them.

The number of managed high-value ecological sites has increased from 54 in 2009 to 79 in the 2012/13 financial year. Since the programme began, 65,071 metres of fencing have been erected around biodiversity sites. Monitoring is undertaken by the Council using baseline vegetation plots and yearly bird counts. However, it is too soon to establish any trends in outcomes with a high degree of certainty (N. Willems Bay of Plenty Regional Council, pers. comm.). For more information see www.boprc.govt.nz/environment/land/biodiversity-programme/.

9. How fully has New Zealand's NBSAP been implemented?

The most recent independent review of the implementation of the New Zealand Biodiversity Strategy (NZBS; DOC & MfE 2000) and progress toward the objectives and goals was undertaken in 2005. In short, the review found that of the 43 priority actions in the NZBS, 35% had achieved significant progress and 23% moderate progress (Green & Clarkson 2005). The achievements were noted as:

- New classification systems for marine, terrestrial, and freshwater systems;
- Better coordination of management for biosecurity;
- Development of the Marine Protected Area policy;
- Development of the Strategy for Managing the Environmental Effects of Fishing;
- Creation of the contestable Advice and Condition Funds to assist private landowners' efforts to protect indigenous biodiversity;
- Establishment of the Mataranga Kura Taiao Fund;
- Establishment of the Terrestrial and Freshwater Biodiversity Information System; and
- Establishment of the National Aquatic Biodiversity Information System.

The review also highlighted a number of areas where further work is required to meet the objectives and goals set out in the NZBS. The report made a series of recommendations targeted at the ten themed areas of the NZBS. More detail about the 2005 review can be found in the Fourth National Report.

Part III—Progress towards the 2015 and 2020 Aichi Biodiversity Targets, and contributions to the relevant 2015 targets of Millennium Development Goals

10. What progress has been made by New Zealand toward the implementation of the Strategic Plan for Biodiversity and its Aichi Biodiversity Targets?

The progress that has been made to achieve the Aichi Biodiversity Targets is described below.

Strategic Goal A: Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society



Target 1

By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.

Awareness and perceptions of biodiversity have been measured regularly in New Zealand through at least two mechanisms: the seventh survey of people's perceptions of the state of the New Zealand environment, which was undertaken by Lincoln University (and which has been undertaken regularly since 2000); and the annual national survey on how New Zealanders perceive the state and management of natural resources, which was undertaken for the Department of Conservation. Public engagement with biodiversity can also be gauged by volunteer (individual and group) activity in the conservation sector, as well as educational initiatives.

Lincoln University survey: In total, 2,200 people responded to the 2013 survey. The quality of the New Zealand environment was measured on five-point Likert scales ranging from 'very good' to 'very bad'. 72.8% of respondents considered the state of the New Zealand environment to be 'adequate' to 'good'. New Zealand's natural environment was rated to be 'good' or 'very good' when compared with other developed nations. Three specific resources (air—55.7%, native bush and forests—55%, and natural environment in towns and cities—65.2%) scored very positively, with mean Likert scores of 3.56, 3.54, and 3.86, respectively. Rivers and lakes, marine fisheries, and wetlands continued to be perceived to be in the worst state, with 23% of respondents rating them as bad or very bad. Farm effluent and runoff was rated as the least well-managed environmental problem. Water-related issues were rated as the most important environmental issue facing New Zealand. Respondents rated maintaining in-stream values more highly than developing water resources, with integrated approaches that combine economic, regulatory, and voluntary instruments most favoured (Hughey et al. 2013).

Department of Conservation survey: This survey asks the public about their engagement and attitudes to conservation. In 2012/13, 7,307 New Zealanders were surveyed—5,014 via an online or postal survey with a response rate of 46.4% (The Nielson Company 2013) and 2,293 via a telephone

survey (Colmar Brunton 2013). Overall, conservation was seen as an important issue for those participating in the 2013 survey, with 78% saying that conservation was important to them personally. However, the importance of conservation to respondents personally has declined year on year—86% agreed in 2011 (by selecting 4 or 5 out of 5 on a five-point scale), 83% agreed in 2012, and 78% agree in 2013 (Fig. 4). The study also found that there are several groups that tend to be less engaged in conservation. These groups include those aged under 25 years; those who have not visited a Department of Conservation area in the last 12 months; and those who live in the West Coast Conservancy (west coast of the South Island). In addition, the study found that respondents from households with an annual income of over \$60,000 are more likely to view conservation as important.

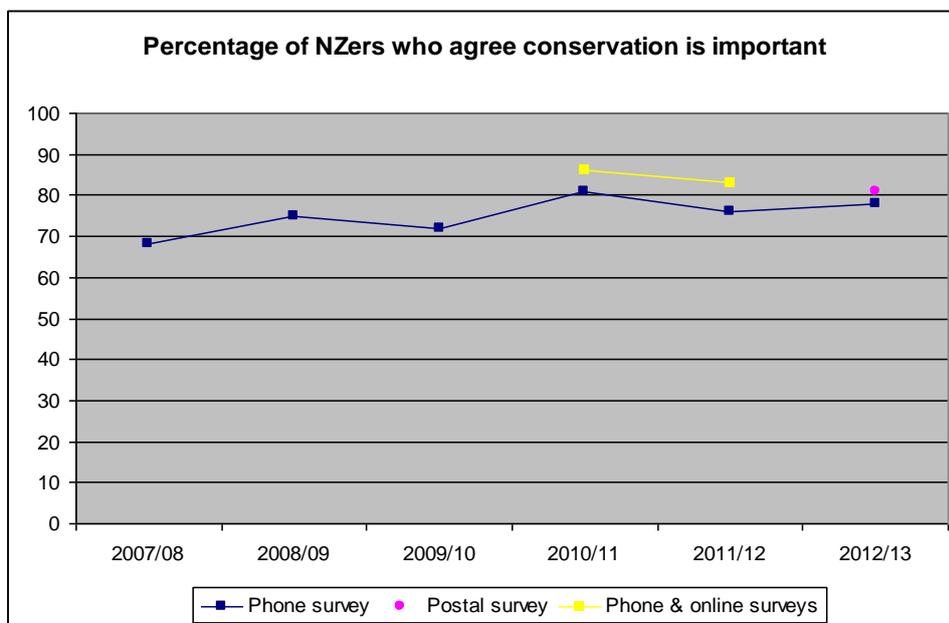


Figure 4 Percentage of New Zealanders who agree that conservation is important (DOC 2013)

Respondents were asked how important they perceived conservation to be compared with other issues. In 2013, 74% considered it to be about the same as or more important than other issues, compared with 76% in 2012 and 78% in 2011 (DOC 2013). Table 3 shows the proportion of respondents who identified various benefits of conservation.

Table 3 Identified benefits of conservation (Colmar Brunton 2013)

Benefit of conservation	2011 (%)	2012 (%)	2013 (%)
Protecting/preserving the environment	37	45	49
Protecting/saving species	37	39	36
Protecting the environment for future generations	31	31	26
To protect New Zealand's clean green image	19	15	17
To have a clean/healthy/safe environment	5	11	14
Access to/maintaining recreational areas	7	11	13
To ensure ecological sustainability	10	11	9
To ensure the survival of the planet	7	10	7
Protection of quality of life	10	6	5
Tourism benefits	6	3	5
Don't know	7	6	7

In 2013, respondents were asked about their active participation in various conservation activities. Results were as follows: donated money to a conservation cause (26%); actively sought information about an issue (24%); helped raise awareness about an issue (21%); spent time helping on a conservation project (15%); expressed your opinion about an issue through online forums (14%);

been a member of a group or organisation (13%); formally expressed your opinion about an issue (7%); other (4%); none of the above (42%).

Another metric of how people value and engage with biodiversity is through volunteer (individual and group) activity in the conservation sector. A database is being developed to manage volunteers who are associated with the Department of Conservation and to be able to collect data on these volunteers. Current information on the number of volunteers who participate in Department of Conservation programmes is shown Table 4.

Table 4 Department of Conservation (DOC) volunteer participation (unpublished DOC data)

	2010/11	2011/12	2012/13
No. of volunteers who participate in DOC volunteer programmes	11,923	11,816	15,130
No. of workday equivalents contributed by people volunteering in DOC programmes	32,507	31,806	35,075
No. of partnerships run during the year by DOC	508	548	584
No. of DOC partnerships that involve Māori	135	151	183

Volunteer group activity also suggests the extent to which people are aware of and engage in biodiversity issues. There are various organisations in New Zealand that support volunteer and community groups in this regard. For example, the NZ Landcare Trust works with farmers, landowners, and community groups to improve the sustainability of landscapes and waterways through landowner and community involvement in sustainable land management. There are over 360 established landcare groups around New Zealand (both supported and unsupported by the NZ Landcare Trust): Northland—106, Auckland—22, Waikato—77, Bay of Plenty—60, Manawatu—21, Marlborough—21, Canterbury—34, Southland—20 (NZ Landcare Trust 2013).

In addition, there are more than 75 community-based biodiversity sanctuaries in New Zealand, which are primarily community led (www.sanctuariesnz.org/). These aim to eradicate the full suite of pests (or achieve near-zero pest densities) from their chosen areas, reintroduce missing species (including many rare and endangered species), and involve local communities in their restoration. In 2012, there were 47 mainland sites totalling 37,230 hectares and 16 near-shore or freshwater islands totalling 18,250 hectares. Kiwis for Kiwi is an initiative for New Zealanders to help protect kiwi and the places in which they live. There are more than 80 community-led projects underway, many of which involve iwi (Māori tribes).

Another organisation—Nature Space—allows individuals and landowners undertaking ecological restoration in New Zealand to record and share their efforts. As of October 2013, 195 groups had joined Nature Space, notifying they had 26,151 members, had planted 1,156,738 plants, and had killed 14,750 possums and 2,740 stoats.

There are also a number of educational initiatives that educate and engage people about biodiversity. Examples include:

- **Enviroschools:** This initiative supports schools and pupils to be active citizens, and contributes to ecological regeneration and the creation of healthy, resilient, and sustainable communities. Students explore the relationship between people and the environment, and learn about the environmental, social, cultural, and economic aspects of sustainability. Overall, it is estimated to have a reach of a quarter of a million children and young people through 30% of New Zealand's schools and kura, with a growing participation from the early childhood sector.
- **Weedbusters:** This is a weed awareness and education programme that aims to protect New Zealand's environment from the increasing weed problem by educating people and encouraging them to take weed control action.
- **Sustainable Coastlines:** This initiative empowers people to understand and protect the marine environment. Information has been presented to over 25,000 participants who have gone to collect more than 123,000 kg of rubbish during beach clean ups.
- **NatureWatch:** This is an online vehicle for people to post photos, records, and observations about any life form, and to seek answers from experts about its identity and ecology.



Target 2

By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.

New Zealand is focusing effort on developing ways to integrate biodiversity values at all levels, and some progress has been made in integrating biodiversity into relevant national strategies, plans, and programmes at the national and local level.

National level

Biodiversity values have been incorporated into New Zealand's principal legislation governing the use of natural resources and the environment, the Resource Management Act (RMA) since 1991. The RMA takes a whole ecosystem approach to the sustainable management of resources, including for biodiversity. The key themes are sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and avoiding, remedying, or mitigating any adverse effects on the environment. The RMA is managed through local councils and requires them to actively develop a policy framework to control actual or potential effects on the maintenance of indigenous biological diversity. This has led to the development of local plans to manage areas of habitat of importance for biodiversity. This is supported by a suite of environmental impact assessment, conservation, and land use planning tools aimed at taking into account and balancing the objectives of sustainable management, biodiversity, and ecosystem services, which are enshrined in legislation.

In 2013, Cabinet agreed to issue instructions to draft an Environmental Reporting Bill. The proposed Bill sets out the roles, scope, and timing for the publication of comprehensive environmental reports. Reports will be published on five environmental domains: air, climate and atmosphere, freshwater, marine, and land, with biodiversity and ecosystems as a theme across all of these domains. Where relevant, indicators will align with those used in international reporting programmes, such as the OECD Green Growth indicators.

The New Zealand Treasury has produced the Living Standards Framework (www.treasury.govt.nz/abouttreasury/higherlivingstandards), which goes beyond GDP to incorporate a range of material and non-material factors that impact on wellbeing (including natural capital) in its definition of Living Standards. This Framework is centred on four main capital stocks—financial/physical, human, social, and natural. It describes the interrelationships among the stocks and flows, and highlights the need for responsible management in order to improve the living standards of both current and future New Zealanders. It identifies biodiversity, as well as the atmosphere, freshwater, soil, and fish stocks, as being of particular importance to living standards in New Zealand.

Regional level

Regional councils have incorporated biodiversity into local planning documents or biodiversity programmes, e.g. the Bay of Plenty Regional Council has been running a Biodiversity Programme since 2009. Horizons Regional Council has developed 'The One Plan' to manage natural resources in its region for the next 10 years. This blends six separate plans and regional policy statements into one document, and has four key environmental areas: water quality, water quantity, threatened native biodiversity, and land management. In terms of biodiversity, there are rules to stop the destruction of rare, threatened, and at-risk habitats, and landowners need permission to remove or alter a rare, threatened, or at-risk habitat. Funding and advice is provided to landowners to identify whether habitat areas exist, and to fence and protect bush remnants and wetlands. A study of the potential cost-benefit and economic impact of The One Plan identified that the nutrient management provisions to be implemented will have a neutral economic impact on the Tararua and Coastal Rangitikei areas of the Horizons Region (Bell 2013).

Other initiatives

In 2013, a conference on Valuing Nature was held that examined the shift in perspectives on natural capital, which is the foundation of our economy, prosperity, and wellbeing. The conference significantly increased awareness of the importance of biodiversity, ecosystem services, and our relationship to both. A business case is now being drafted to undertake a Natural Capital Assessment

in New Zealand (along the lines of that undertaken in the UK, but tailored to New Zealand's unique needs). The assessment will be a valuable tool in measuring national-level progress toward many of the Aichi Biodiversity Targets.

There is a general undervaluing of biodiversity in economic thinking, analysis, and decision-making in New Zealand with one study finding that non-market valuations were seldom used to make management decisions in conservation (NZIER 2013). Patterson & Cole (2013) estimated that New Zealand's land-based ecosystem services contributed \$57 billion to human welfare in 2012. They assessed that the main categories of these ecosystem services and values were supporting services (\$22b), regulating services (\$15b), provisioning services (\$28b), cultural services (\$1b), and passive values (\$12b). Other examples where economic tools were used include:

- Nimmo-Bell 2009: An assessment of the total economic costs of pests to New Zealand's primary sector. Costs were estimated to be approximately \$2.1 billion per year.
- NZIER 2006: *Didymosphenia geminata* economic impact assessment. Final report to Biosecurity New Zealand.
- Froude, V.A. 2011: Wilding conifers in New Zealand. Status report. Prepared by Pacific Eco-Logic Ltd for the Ministry of Agriculture and Forestry.

New Zealand is still investigating options to ensure that consistent valuation methodologies are applied, but also recognises that no single method will be sufficient to ascribe the full suite of qualitative and quantitative analyses that are required (see Dymond (2014) for further discussion).

	<p>Target 3 By 2020, at the latest, incentives, including subsidies, harmful to biodiversity are eliminated, phased out or reformed in order to minimize or avoid negative impacts, and positive incentives for the conservation and sustainable use of biodiversity are developed and applied, consistent and in harmony with the Convention and other relevant international obligations, taking into account national socio economic conditions.</p>
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New Zealand applies a multi-pronged approach to addressing incentives and subsidies.

Agriculture, which is an integral and dominant part of New Zealand's economy, is market-driven and has operated without direct subsidies or price and income support for nearly 30 years. There are also no direct subsidies to the fishing industry or to commercial forest management. Subsidy reform initially had a positive impact on biodiversity by reducing the use of fertilisers and pesticides, and decreasing pollution levels in rivers and reducing the farming of land with lower agricultural values. However, with the intensification of agriculture, especially dairy farming, in recent years, pollution and biodiversity concerns have renewed.

Market incentive tools are also used. The Emission Trading Scheme (ETS) covers all sectors as of 2013. However, not all sectors have obligations to surrender units, e.g. agriculture just has to report on levels of emissions. Applied to forestry, it encourages the replanting of forests, mainly as production forests, and the promotion of regeneration of shrublands. The ETS also limits the ability to deforest areas of forest land and there are financial penalties where Crown cover drops below 30% of a hectare and/or areas are reduced by more than 2 hectares within a 5-year period. Two additional schemes exist as an option to earn revenue from carbon forests (Permanent Forest Sink Initiative and the Afforestation Grants Scheme).

Some regional councils have reduced indirect subsidies by limiting farming intensity to protect freshwater quality, e.g. the Waikato Regional Council has put a cap on nitrogen use to protect Lake Taupo (Taupomoana) and Horizons Regional Council is working to protect the Manawatu River from further degradation.

A nutrient trading scheme operates to reduce the nitrogen load to Lake Taupo (Taupomoana) by 20%. Farms occupy only 18% of the land near Taupo but contribute more than 90% of the nitrogen input to the lake (Rutherford & Cox 2009). The scheme uses the Overseer® model to determine how much nitrogen is leaving farms and entering the lake. The percentage reduction in nutrients will be set and the transfer of discharge consents between land-users will be allowed for within the bounds set by the cap on nutrient inputs. Community sewage is controlled outside the market. Forestry companies are excluded from the market because exports from forestry are similar to the natural and

uncontrollable exports from native forest and scrub. There is an \$81.5 million fund to protect lake water quality and purchase nitrogen discharge allowances and/or farmland (ibid).

Internationally, New Zealand works on the reform of harmful subsidies through the Friends of Fossil Fuel Subsidy Reform, a group of non-G20 countries that supports the reform of inefficient fossil fuel subsidies, and the Friends of Fish group, which is looking at fisheries subsidies and their contribution to the worsening state of global fish stocks.

New Zealand takes a cautious approach to the development of incentive measures, as the impacts of incentives in encouraging certain behaviours can be unpredictable and outcomes vary. Most of what is classified as 'support' relates to food safety and recovery from adverse events. Positive incentives include funding for biodiversity protection on private land, such as the QEII Trust, Nature Heritage Trust, and Nga Whenua Rahui. A sustainable farm forestry fund is used to fund tree plantings along riparian margins. The Biodiversity Advice and Condition Funds, and Community Environment Fund provide financial support to landowners and community groups undertaking biodiversity activities.

Ecological compensation, encompassing biodiversity offsets and mitigation, is increasingly being offered in New Zealand as a form of environmental redress and is set as a condition of approval for development to occur. Brown et al. (2013) investigated compliance with 245 conditions relating to ecological compensation set under the Resource Management Act across 81 case studies. They found overall compliance in 64.8% of cases, demonstrating that the anticipated benefits from ecological compensation mechanisms are not being achieved in approximately one-third of cases.

Since 2009, there has been a multiagency programme of work to investigate the concept of biodiversity offsetting in New Zealand. Biodiversity offsets seek to counter-balance the unavoidable impacts of development on biodiversity by enhancing the state of biodiversity elsewhere, and are defined as:

Measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve no net loss and preferably a net gain of biodiversity on the ground. (BOP 2012).

What differentiates biodiversity offsetting from other forms of impact management is that it requires:

- A mitigation hierarchy to be followed to identify the residual adverse effects that may be offset;
- Explicit measurement and balancing of biodiversity that is predicted to be lost and gained; and
- A goal of no net loss and preferably a net gain of biodiversity to be reasonably demonstrated and then achieved on the ground.

Guidance on Good Practice Biodiversity Offsetting in New Zealand is to be released in early 2014 as a non-statutory document to inform developers and decision-makers about good practice in demonstrating no net loss via a robust biodiversity offsetting process. It is supported by a series of detailed technical resources that are intended for offset designers, and practitioners will provide tools to address the drawdown of natural capital associated with development projects.

Other relevant tools in New Zealand include funding for research; agreements and accords among sector organisations; technical assistance; community-based measures; and private sector initiatives. As outlined in previous national reports to the CBD, New Zealand operates a number of contestable funds to encourage, among other environmental outcomes, the conservation and sustainable use of biodiversity. This includes government funding for projects on indigenous biodiversity conservation, advice on biodiversity for land managers, and sustainable management and farming funds. Projects often undertake work that is valuable to the wider community or applicable beyond the local scale through the transfer of information or technology, using a mixture of market and non-market values as part of selection criteria.



Target 4

By 2020, at the latest, Governments, business and stakeholders at all levels have taken steps to achieve or have implemented plans for sustainable production and consumption and have kept the impacts of use of natural resources well within safe ecological limits.

Sustainable production

The Building Natural Resources workstream of the Government's Business Growth Agenda aims to make better use of New Zealand's abundant natural resources to grow the economy and look after the environment. The Green Growth Advisory Group advises the Government on the alignment of environmental and economic outcomes and greening New Zealand's growth.

The 2012 Building Natural Resources progress report sets out actions the Government is taking to improve resource management, focusing on two key outcomes: allocating resources effectively, promptly, and for the most productive uses; and improving the quality of the country's natural resource base (More information is provided in Part II of this report.)

The Sustainable Business Council is a CEO-led group of companies that play a leading role in creating a sustainable future for business, society, and the environment. Through the activities of groups such as the Sustainable Business Council, businesses become more aware of opportunities associated with 'greening' the economy. There has been growth in effort in the business, tourism, and research sectors at mainstreaming biodiversity and ecosystem services, and balancing values across environmental, socio-cultural, and economic drivers to improve social wellbeing and ensure sustainable practices.

An example of business balancing these values is the Sustainable Dairying: Water Accord. New Zealand's largest dairy company, Fonterra, has developed this Accord, under which the dairy cooperative members are required to protect riparian margins from stock and reduce effluent flow into waterways. Compliance under the previous accord (Dairying and Clean Streams Accord) was found to be variable in 2010/11. Through a partnership agreement, the Department of Conservation and Fonterra are working together with the local community to improve the natural habitats of five key waterways in significant dairying regions around New Zealand to make a difference to the water quality in five sensitive catchments: Kaipara Harbour, Firth of Thames, Waikato Peat Lakes, Lake Ellesmere (Te Waihora), and Awarua-Waituna (www.doc.govt.nz/getting-involved/partnerships-and-donations/partnerships/fonterra-partnership/).

Sustainable consumption

The Waste Minimisation Act was introduced in 2008 to encourage a reduction in the amount of waste we generate and dispose of in New Zealand, and to lessen the environmental harm of waste. It aims to benefit our economy by encouraging better use of materials throughout the product life cycle, promoting domestic reprocessing of recovered materials and providing more employment. It also puts a levy on all waste disposed of in facilities where waste (including household waste) is disposed of to generate funding to help local government, communities, and businesses reduce the amount of waste, and also helps and, when necessary, makes producers, brand owners, importers, retailers, consumers, and other parties take responsibility for the environmental effects of their products through product stewardship schemes.

A Waste Minimisation Fund was established in 2009 under the Waste Minimisation Act to fund waste minimisation projects and increase resource efficiency, and reuse, recovery and recycling, and to decrease waste to landfill. Businesses have accessed funding to help their production become more sustainable. The amount of funding awarded has increased in recent years: \$7,787,413 in 2009, \$12,201,298 in 2010/11, \$13,908,746 in 2011/12; \$10,229,542 was awarded in the 2012/13 financial year (MfE 2013).

Product stewardship schemes are initiatives that help reduce the environmental impact of manufactured products. When a product stewardship scheme is introduced, anyone involved in the product life cycle, such as producers, brand owners, importers, retailers, and consumers, accepts responsibility for its environmental effects. There are now 11 accredited Product Stewardship Schemes in New Zealand (Table 5).

Table 5 Product Stewardship Schemes in New Zealand (MfE)

Product Stewardship Scheme	Product addressed
Holcim Geocycle	Used oil
Glass Packaging Scheme	Glass packaging
Plasback	Agricultural plastics (including bale wrap, silage wrap, silage pit covers, twine, animal feed/nutrition, and crop bags)
Refrigerants Recovery	Chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and hydrofluorocarbons (HFCs)
Agrorecovery Rural Recycling Programme	Agrichemicals and agricultural plastic containers
Paintwise	Paint and paint packaging
ROSE NZ (Recovery of Oil Saves the Environment)	Used lubricating oil
Interface Re-entry Programme	PVC-backed carpet tiles
Kimberly Clark NZ's Envirocomp Product Stewardship Scheme for Sanitary Hygiene Products	All brands of nappies, feminine hygiene products, and adult incontinence products
Fonterra Milk for Schools Recycling Programme	End-of-life packaging generated through the delivery of the Fonterra Milk for Schools Programme
The Glass Packaging Forum's Public Place Recycling Programme	End-of-life collection of packaging (and where applicable food waste) away from home

Strategic Goal B: Reduce the direct pressures on biodiversity and promote sustainable use



Target 5
By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced.

General land cover

The New Zealand Land Cover Database is a digital map of the land surface of the country. It is created by grouping together similar classes of data that can be identified in satellite images. It can be combined with other geographic information to reveal new information on patterns and trends of land use and land cover. Land cover changes between 2002 and 2009 are shown in Table 6. Data from imagery collected in 2012 will be available for assessment in late 2014.

Table 6 Native land cover changes from 1997 to 2009 (www.mfe.govt.nz/issues/land/land-cover-dbase/)

Native land cover type	1997 (ha)	2002 (ha)	2009 (ha)
Alpine grass/herbfield	224,400	224,400	224,379
Broadleaved native hardwoods	546,200	539,600	539,555
Depleted grassland	250,500	250,500	250,466
Fernland	51,800	51,700	51,710
Flaxland	6,500	6,500	6,450

Grey scrub	72,500	72,400	72,402
Herbaceous freshwater vegetation	88,800	88,700	88,674
Herbaceous saline vegetation	19,300	19,200	19,216
Native forest	6,459,400	6,457,000	6,456,940
Mangrove	26,000	26,000	26,033
Mānuka and/or kānuka	1,191,600	1,186,200	1,186,103
Matagouri	29,500	29,500	29,535
Sub-alpine shrubland	385,400	385,400	385,284
Tall tussock grassland	2,397,100	2,394,600	2,394,695
Total native vegetation cover	11,748,900	11,731,700	11,731,442
Alpine gravel and rock	698,000	698,100	698,145

Indigenous forest cover

Another metric that can be used to assess land cover is intactness and protection of indigenous forest. This has been measured in New Zealand by using Morphological Spatial Pattern Analysis, which is a customised sequence of mathematical morphological operators targeted at the description of the geometry and connectivity of the image components (See <http://forest.jrc.ec.europa.eu/download/software/guidos/mspa/> for more information and an explanation of terms).

Of the 6,968,000 hectares of indigenous forest in New Zealand, 5,165,000 is considered core (74%). This gives an edge to core ratio of 1:7 (D. Brown Department of Conservation pers. comm.).

Of the 5,169,00 hectares of indigenous forest on public conservation lands, 4,295,000 is considered core (74%). This gives an edge to core ratio of 1:10 (ibid). Forty-eight percent of indigenous forest outside public conservation lands is core with an edge to core ratio of 2:5 (ibid).

Ecosystems

Seventy-two naturally uncommon ecosystems have been recognised in New Zealand. Using criteria proposed by the IUCN, Holdaway et al. (2012) provided a threat status for these ecosystems. Forty-five of the 72 are ranked as under threat and fall into three categories: Critically Endangered, Endangered, and Vulnerable. Their current status is listed in Table 7.

Table 7 Status of the 45 threatened naturally uncommon ecosystems in New Zealand (Holdaway et al. 2012)

Critically Endangered	Endangered	Vulnerable
Shell barrier beaches (chenier plain)	Active sand dunes	Coastal cliffs on mafic rocks
Coastal turf	Dune deflation hollows	Screes of calcareous rocks
Old tephra plains (frost flats)	Stony beach ridges	Young tephra plains and hill slopes
Inland sand dunes	Shingle beaches	Boulder fields of calcareous rocks
Outwash gravels	Stable sand dunes	Cliffs, scarps, and tors of mafic rocks
Inland saline	Coastal cliffs on calcareous rocks	Cliffs, scarps, and tors of calcareous rocks
Leached terraces	Ultramafic sea cliffs	Moraines
Fumeroles	Volcanic dunes	Lake margins
Geothermal stream sides	Sandstone erosion pavements	Blanket mires
Geothermal heated ground	Frost hollows	Estuaries
Geothermal hydrothermally altered ground	Volcanic boulder fields	
Seabird guano deposits	Sinkholes	
Seabird burrowed soil	Dune slack	

Marine mammal influenced sites	Domed bogs (<i>Sporadanthus</i>)	
Cave entrances	Lagoons	
Ephemeral wetlands	Braided riverbeds	
Gumlands	Seepages and flushes	
Damp sand plains		

	<p>Target 6 By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits.</p>
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The Fisheries Act 1996 provides the legal framework for fisheries management in New Zealand and provides for the utilisation of fisheries resources. The Act aims to maintain resources at a sustainable level so that adverse effects on the environment are avoided, remedied, or mitigated. It provides for the fishing interests of all fishing groups—commercial, recreational, and customary Māori.

Over 450,000 tonnes of commercial fish are removed from the marine environment per annum. The basis for New Zealand’s management of commercial fisheries is the Quota Management System (QMS), which is based on Individual Transferable Quotas (ITQs) within a Total Allowable Catch (TAC). The TAC takes into account recreational fishing, customary Māori uses, and other sources of fishing-related mortality. The remainder is available to the commercial sector as the Total Allowable Commercial Catch (TACC) that the commercial fishing industry can catch during that year. Commercial fishing vessels must be registered under the Fisheries Act 1996, but vessel numbers are not restricted. By 2016, all vessels operating within the EEZ will need to be New Zealand flagged.

Fisheries 2030 is a Cabinet-endorsed goal and plan of action that guides the management of New Zealand’s fisheries (www.fish.govt.nz/NR/rdonlyres/4DD60325-CADD-4E5C-92BF-A6E17C202A54/0/fisheries2030report.pdf). It seeks to achieve improved economic benefit through the smarter use of fisheries resources, and provides for increased non-commercial benefits, while protecting the health of the fishery and the marine environment. The goal is to have New Zealanders maximising benefits from the use of fisheries within environmental limits. Under this goal, two outcomes are sought:

- Use: Fisheries resources are used in a manner that provides the greatest overall economic, social, and cultural benefit; and
- Environment: The capacity and integrity of the aquatic environment, habitats, and species are sustained at levels that provide for current and future use.

Stock status

There are currently 638 fish stocks (including fish, invertebrates, and algae) in the QMS. Considerable research effort goes into collecting data that can be used to assess the status of the most important stocks.

The Harvest Strategy Standard for New Zealand Fisheries (www.fs.fish.govt.nz/Page.aspx?pk=113&dk=16543) guides the management of our fish stocks. It specifies four measures that are used to evaluate the status of New Zealand’s fish stocks and fisheries, with management prioritising the first three of these:

- The *soft limit*—a biomass level below which a stock is deemed to be ‘overfished’ or depleted and needs to be actively rebuilt;
- The *hard limit*—a biomass level below which a stock is deemed to be ‘collapsed’ and so fishery closures should be considered in order to rebuild a stock at the fastest possible rate;
- The *overfishing threshold*—a rate of extraction that, if exceeded, will lead to the stock biomass declining below management targets and/or limits; and
- The *management target*—usually a biomass level, but sometimes a fishing mortality rate, that stocks are expected to fluctuate around, with at least a 50% probability of achieving the target.

In 2013, there was sufficient information to report on the status of 169 of the 350 significant stocks managed under New Zealand's Quota Management System.

Of the 139 stocks with known status relative to the soft limit (the lower bound on the desirable population size), 114 (82%) were determined to be above the soft limit (i.e. *NOT* overfished) based on a recent assessment or evaluation. In terms of tonnage of landings, 96.2% of stocks of known status were above the soft limit in 2013. Data since 2009 are shown in Fig. 5.

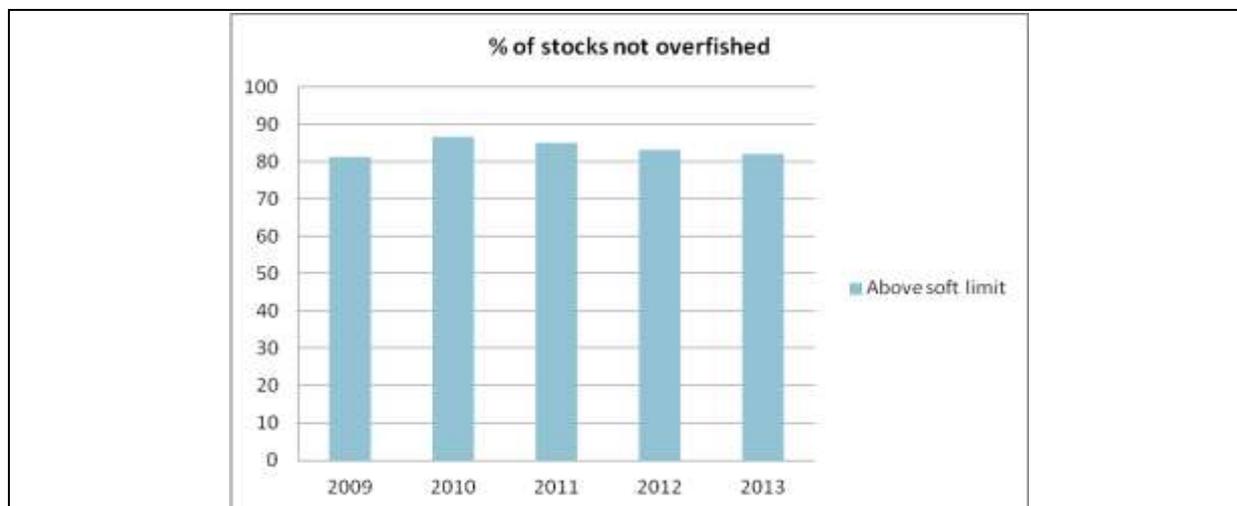


Figure 5 Summary of stock status above the soft limit—not overfished, 2009–2013

The complete 2013 Stock Status for individual species can be found at <http://fs.fish.govt.nz/Page.aspx?pk=113&dk=23412>.

Of the 169 stocks of known status relative to the *hard limit*, 93.5% were above the limit, which is similar to the previous 4 years. Of the 117 stocks of known status relative to the *overfishing threshold*, 82.1% were below the threshold (i.e. biomass levels are not under threat), reflecting a continually positive trend since 2009. In terms of the tonnage of landings of known status, the percentage below the *overfishing threshold* was 95.5% in 2013.

At the time of their most recent assessment, 25 (of 139) stocks were considered to be below the *soft limit* (and therefore overfished): southern bluefin tuna and Pacific bluefin tuna (highly migratory species that are seasonally present in New Zealand waters); three stocks of black cardinalfish; five stocks of bluenose; six stocks or sub-stocks of orange roughy; three stocks or sub-stocks of snapper; two stocks or sub-stocks of scallops; and one stock or sub-stock each of oyster, paua, John dory, and rig. Eleven of these 25 stocks were also considered to be below the *hard limit* (collapsed).

In all cases where fisheries were below the *soft* or *hard limit*, corrective management action has been, or is being, put in place to rebuild the stocks. Rebuilding programmes or TAC/TACC reductions are in place in these fisheries to allow them to rebuild to target levels.

Trawling

The area trawled by commercial vessels increased from 85,448 km² in 1990 to a peak of 166,233 km² in 1998. In 2000, the New Zealand Government established 18 area closures to protect 25 representative seamounts covering 81,000 km² of the Exclusive Economic Zone (EEZ) from all trawling and dredging. In 2007, a further 1.2 million km² of largely deep, un-trawled waters was closed to bottom trawling and dredging in Benthic Protection Areas (Fig. 6). New Zealand has closed 32% of its EEZ from bottom trawling and dredging, including 28% of seamounts (52% of those over 1000 metres in height) and 88% of active hydrothermal vents.

(*Procellaria cinerea*) (8); albatrosses (5); storm petrels (3); smaller albatrosses (2); petrels, prions, and shearwaters (2); fulmars, petrels, prions, and shearwaters (2); common diving petrel (*Pelecanoides urinatrix*) (2); cape petrels (*Daption capens*) (2); southern royal albatross (*Diomedea epomophora*) (1); southern black-backed gull (*Larus dominicanus*) (1); short-tailed shearwater (*Puffinus tenuirostris*) (1); seabirds (1); prions (1); grey-backed storm petrel (*Garrodia nereis*) (1); giant petrels (1); fairy prion (*Pachyptila turtur*) (1); Westland petrel (*Procellaria westlandica*) (1); Procellaria petrels (1); and Campbell black-browed albatross (*Thalassarche impavida*) (1) (Abraham & Thompson 2012).

A National Plan of Action for Seabirds has been developed to reduce seabird bycatch (www.fish.govt.nz/en-nz/Environmental/Seabirds.htm). It sets out a strategic framework to ensure that seabirds are adequately protected from any risks associated with fishing. A number of regulatory and non-regulatory mitigation measures currently apply in most New Zealand trawl and longline fisheries. These measures correspond closely to best practice as described by the Agreement on the Conservation of Albatrosses and Petrels (ACAP). New Zealand also has an ongoing monitoring and research programme and a risk assessment framework for identifying at-risk seabird species and the fisheries in which they are caught.

Sharks

Around 70 of the 113 species of shark recorded in New Zealand waters are caught by fishers, with 11 managed under the QMS (which constitutes 90% of the total shark catch). Seven species are fully protected (basking (*Cetorhinus maximus*), whale (*Rhincodon typus*), oceanic white tip (*Carcharhinus longimanus*), great white (*Carcharodon carcharias*), and deepwater nurse (*Odontaspis ferox*) sharks, as well as manta (*Manta spp.*) and spinetail devil (*Mobula japonica*) rays).

A National Plan of Action (NPOA) for the conservation and management of sharks has been proposed (www.mpi.govt.nz/Default.aspx?TabId=126&id=2063). Its objective is to maintain the biodiversity and the long-term viability of all New Zealand shark populations by recognising their role in marine ecosystems, ensuring that any utilisation of sharks is sustainable, and that New Zealand receives positive recognition internationally for its efforts in shark conservation and management. A ban on shark-finning in New Zealand waters is proposed, which would begin with a first tranche of shark species being covered from 1 October 2014, a second tranche from 1 October 2015, and blue sharks (*Prionace glauca*) from 1 October 2016. A review will also be put in place to ensure that the protection or management frameworks for each shark species are appropriate and adequate within the context of objectives of the NPOA.

Marine mammals

Specific measures are in place to manage the effects of potentially threatening processes on a number of marine mammal species including:

- A bycatch limit for New Zealand sea lions in the southern squid fishery;
- An industry code of practice designed to reduce bycatch of marine mammals in all New Zealand deepwater fisheries;
- A 'Code of Conduct for minimising acoustic disturbance to marine mammals from seismic survey operations', released in 2013;
- Set net and trawl fishing restrictions in some inshore areas to reduced bycatch of Hector's and Maui's dolphin; and
- Increased observer coverage in set net and trawl fisheries, including areas where set netting is prohibited without an observer on board.

In 2012 and 2013, the Maui's dolphin portion of the Hector's and Maui's dolphin Threat Management Plan was reviewed, and decisions were announced in November 2013. Changes made to protection measures include, *inter alia*, additional set net fishing restrictions under the Fisheries Act, additional observer coverage in certain fisheries and in certain locations; and establishment of a collaborative Maui's Dolphin Research Advisory Group.



Target 7

By 2020 areas under agriculture, aquaculture and forestry are managed sustainably, ensuring conservation of biodiversity.

The overarching piece of legislation that is designed to achieve environmental outcomes and to sustainably manage natural resources, including agriculture and aquaculture, is the Resource Management Act (RMA) 1991. (See Target 2 for more information about the RMA.)

Agriculture

New Zealand's agricultural sector is based on pastoral farming—mainly dairy, beef, and sheep farming, with smaller areas under horticulture, cropping, and viticulture—and occupies over half of the country's total land area. Sustainable management of the agricultural sector and associated natural ecosystems is therefore important for economic, social, and cultural reasons.

The agricultural sector in New Zealand is based on exotic species rather than indigenous species. With regard to the sustainable management of New Zealand's agricultural system, the main areas of concern can be described as the sustainable use of resources (inputs) in agriculture and the potential impacts (outputs) of activities on wider natural ecosystems.

Threats to sustainability include soil imbalances and nutrient build up, water quality and availability, climate risks (including climate change), and potential pest or disease incursion. A key part of New Zealand's agricultural system is the management of water resources, as production practices such as dairy farming have intensified and increased pressure on the environment. Adverse environmental outcomes for water bodies often affect biodiversity, and can include contamination by sediment, nutrients, and bacteria, resulting in the growth of algae and impacts on dissolved oxygen levels, impacts on fish life, and contamination of drinking water.

Water management in New Zealand is administered by 16 regional councils through the RMA framework. A group of stakeholders initiated the Land and Water Forum in 2009, a collaborative policy process for freshwater management reform that is partly funded by the Government. This process helped to facilitate current water reform policies, including a National Policy Statement on Freshwater Management, which was introduced by the Government in 2011 to assist regional councils in setting objectives and limits for water use, and which required overall water quality to be maintained or improved for each region. Ongoing policy work is seeking to provide further support for water management planning and to encourage greater consistency between regions. This involves establishing national values and standards for objective setting, and providing intervention powers to ensure that local planning provides adequately for the national interest. The Government is taking a range of initiatives to assist councils and stakeholders in implementing water policy reforms. This includes producing guidance material, partnering programmes, developing good management practice toolkits for farmers, funding scientific research, and developing nutrient management and land use modelling tools to reduce environmental impacts while enabling economic growth and development.

An example of a government-industry agreement is the Sustainable Dairying Water Accord. (See Target 4 for more information about this Accord.)

Aquaculture

Sustainable aquaculture development is ensured through statutory instruments such as the Freshwater Fish Farming Regulations (for land-based aquaculture), the Resource Management Act, and the New Zealand Coastal Policy Statement. In addition, regional plans determine the most suitable locations for establishing marine farms, while the consenting process considers the farm's potential environmental effects, as well as its possible cultural and social effects. The system aims to deliver sustainable aquaculture management and ensures the conservation of biodiversity by avoiding development in important ecological areas.

Forestry

New Zealand has about 6.3 million hectares of tall indigenous forest. Approximately 74% of this (5.2 million hectares) is within the protected area network and is fully protected from commercial harvesting. There are further 1.8 million hectares of shrubland and scrub land.

The Forests Act 1949 (in particular its amendment in 1993) applies to the remaining 1.1 Million hectares of forest, and promotes the sustainable management of indigenous forests through specific controls on commercial timber production and export from indigenous forests on private lands. Under the Forests Act, indigenous timber on private land can only be produced from forests that are managed in a way that maintains continuous forest cover and ecological balance. Management systems must ensure that the forests continuously provide a full range of products and amenities, in perpetuity, while retaining the forests' natural values. Only single trees and small groups of trees can be felled for timber production. Less than 0.1% of the volume of wood produced by New Zealand comes from privately held indigenous forests.

Approximately 50,000 hectares of indigenous forest on private land are currently managed under nearly 50 management plans, with an allowable annual harvest of 78,000 m³ standing volume. The number of permits changes, but typically there are about 400 registered permits at any one time. They produce a range of timbers for use in furniture and speciality areas. Approximately 250,000 hectares of indigenous forest on private land have the potential to be sustainably managed (www.mpi.govt.nz/forestry/forestry-in-nz/indigenous-forestry accessed 2013).

There are also a number of collaborative forest industry and environmental group initiatives focused on forestry environmental issues, which help to ensure that production forestry is sustainable. These include the Forest Owners' New Zealand Environmental Code of Practice for Plantation Forestry (revised 2007) and the New Zealand Forest Accord (1991), which is an agreement between the forest industry and conservation groups on limiting the clearance of indigenous forests and guiding where afforestation takes place.

The Conservation Act 1987 applies to Crown conservation areas, which includes indigenous forests in Government control that are managed for conservation, habitat and species protection, and other non-timber purposes.

The widespread planting of forests for wood production began in the mid-1920s to ensure the maintenance of a timber supply while progressively phasing out the harvesting of indigenous forests. From the mid-1920s to 1990, around 1.4 million hectares of planted production forests were established. Since 1990, it is estimated that a further 0.566 million hectares have been established, almost exclusively on pastoral land. *Pinus radiata* (radiata or Monterey Pine) dominates the planted production forests (around 90% by area), followed by Douglas fir (*Pseudotsuga menziesii*) (6% by area). Significant areas of New Zealand's hill country carry unstable soils. Afforestation and indigenous forest regeneration programmes help to stabilise soils and counter the effects of erosion and flooding. In other cases, forested water catchments provide water supply and on farmlands, trees provide shelter for stock and landscape.

While planted commercial forests are mainly owned and managed by the private sector, a significant proportion of planted forests have also been transferred from the Government to Māori iwi (tribes). This transfer is through Treaty of Waitangi settlements (the settlement of historical claims against the Crown). Māori have a strong social, cultural, and spiritual connection with forests that has shaped the place and values of indigenous forests in New Zealand society. Māori participation in the commercial plantation forestry sector is also significant.



Target 8

By 2020, pollution, including from excess nutrients, has been brought to levels that are not detrimental to ecosystem function and biodiversity.

New Zealand has been implementing a range of policy tools that are relevant to this target. A key focus has been to reform New Zealand's freshwater management system. As production practices such as dairy farming have intensified, there has been increased pressure on the environment and on water resources. Overall, New Zealand's water quality is still good by international standards, but this varies a great deal around the country depending on local land use, climate, and geology. There are increasing signs of potential risks for New Zealand's ecosystems, for the economy, for tourism and recreation, for food gathering and mahinga kai, and for the country's international reputation

In recognition of declining water quality and quantity, the Fresh Start for Fresh Water reform programme was initiated in 2009, and the National Policy Statement for Freshwater Management was gazetted in 2011. This requires local councils to: (a) maintain or improve the overall quality of fresh water within a region; and (b) safeguard the life-supporting capacity of freshwater, ecosystem processes, and indigenous species, including their associated ecosystems (ecosystem health). In March 2013, the Government proposed a series of freshwater management reforms. These proposals build on and incorporate the advice of stakeholders in freshwater, including industry, energy producers, iwi (tribes), environmental NGOs, and scientists. The proposals include a regulated National Objectives Framework, which sets bottom lines to ensure that all rivers and lakes are suitable for ecosystem health and human contact. Some of these proposals will require amendments to the National Policy Statement for Freshwater Management. (For more details see www.mfe.govt.nz/issues/water/).

Management of nutrients varies nationally, with some councils implementing local plans to manage nutrient flows into significant waterways (e.g. Horizons One Plan, which weaves together six separate plans and the Regional Policy Statement (www.horizons.govt.nz/about-us/one-plan/overview/background/)). Nutrient management plans are based on determining the maximum sustainable nutrient inflows that can be supported and then allocating permits within the catchments for activities that lead to nutrient runoff; or requiring consent for changes to activities that may lead to additional runoff.

At Taupo, the target has been set to reduce the nitrogen load by 20%. Farms occupy only 18% of the land but contribute more than 90% of the manageable nitrogen input to Lake Taupo (Taupomoana). The Taupo market consists of Māori trusts, farmers, and the Lake Taupo Protection Trust (LTPT), but does not include foresters or lakeside communities. Community sewage will be controlled outside the market. The Trust administers an \$81.5 million fund to protect lake water quality and will stand in the market to purchase nitrogen discharge allowances (NDA) (Rutherford & Cox 2009). To date, the LTPT has reached a contracted reduction of 151 tonnes of nitrogen, which is only 19 tonnes short of the target of 170 tonnes and over 4 years ahead of schedule.

The Rotorua Lakes Restoration Programme has a \$144.2 million budget for the restoration of four priority lakes—Rotorua/Te Rotorua nui ā Kahumatamomoe, Rotoiti/Te Roto kite ā Ihenga i ariki ai Kahu, Rotoehu, and Ōkareka. This project is currently exploring a preferred framework for allocating nitrogen to land use activities in the Lake Rotorua/Te Rotorua nui ā Kahumatamomoe catchment and an incentives scheme to support a reduction in pastoral nitrogen loss.

In 2011, as part of a package of water reform initiatives, the Fresh Start for Fresh Water Clean-up Fund was established with \$15 million of funding over 2 years to address the legacy of historical contamination of lakes, rivers and streams, and to enable clean-ups of major waterways to be advanced. Six projects are being undertaken through the fund—Lake Ellesmere (Te Waihora), Manawatu River, Wairarapa Moana, Wainono Lagoon, Waituna Lagoon, and Lake Brunner.

Sector, industry, and community-led initiatives, such as water management and non-government standards on fertiliser and agrichemical use, are supported by private and government funding to encourage and develop sustainable land use practices, including the protection of biodiversity on private land. The Government provides various sources of contestable funding, such as the

Biodiversity Advice and Condition Funds, Sustainable Farming and Management Funds, and an Irrigation Fund.

The Sustainable Dairying: Water Accord described under Target 4 also contributes toward achievement of this target.

	<p>Target 9 By 2020, invasive alien species and pathways are identified and prioritized, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment.</p>
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New Zealand has a strong focus on managing biosecurity risk before and at the border, due to both our natural resource based economy and unique indigenous biota. There is also significant monitoring to ensure that already-introduced animal pests and weeds are controlled, and any new threats are detected and controlled. The direct output losses caused by pest impacts on primary production have been estimated at \$1.15 billion per year.

Meeting the 2020 target will require continuing vigilance in order to recognise and respond to new or enhanced threats from invasive alien species, and management of three separate but interrelated zones of activity:

- Outside New Zealand's borders: Where biosecurity risks emerge, they can be mitigated at source, and information on intelligence and surveillance is gathered and exchanged. Meeting the 2020 target will require continuing development and use of international treaties and negotiated multi-lateral agreements that take account of the threats and responsibilities related to invasive alien species threats in pathways, such as through trade access and people movements.
- Pathways and borders: This concerns the biosecurity risk posed by goods and organisms arriving at, and entering, New Zealand. This is the final point at which people, goods, and craft are given approval to enter into or depart from New Zealand, including all the activity to manage risk prior to or at the border. This includes export trade inspection and official assurances.
- Within New Zealand: This involves managing the impacts (including limiting the spread) of pests and diseases that have crossed the border, including those that have already established in New Zealand. Management requires collaboration between central and local government agencies, industry, community groups, and the general public. Local and regional councils undertake regionally specific planning interventions (including developing strategies) to manage invasive pest species. This devolution allows better targeting of interventions to local conditions. Crown Research Institutes such as Landcare Research, AgResearch, Scion, and Plant and Food Research also provide national best practise guidance.

At a national level, the Biosecurity Act is the primary legislation that exists to provide a range of powers, duties, and obligations, while the Biosecurity Strategy for New Zealand aims to ensure that New Zealanders, our unique natural resources, and our plants and animals are all kept safe and secure from damaging pests and diseases. An array of other statutory instruments supports the prevention of invasive species incursions in New Zealand, including the Resource Management Act (RMA) 1991; Hazardous Substances and New Organisms Act 1996; Conservation Act 1987; National Parks Act 1980; Reserves Act 1977; and Marine Reserves Act 1971. These Acts prohibit alien species from being introduced to conservation land without authorisation, though they have little bearing on the natural spread of such species into these areas. They also provide the basis for a wide range of pest management policies and programmes.

The Pest Management Proposed National Plan of Action 2010–2035 (www.biosecurity.govt.nz/files/biosec/consult/pmpa2010-2035.pdf) is currently undergoing a consultation process. It proposes key improvements that are needed to ensure that New Zealand's pest management systems meet the country's needs for the next 25 years.

In addition, a number of new initiatives have been implemented to boost biosecurity readiness and response, including government-industry agreements, and the Biosecurity Surveillance Strategy. New Zealand's marine border controls are at risk due to a lack of capacity, which has forced a triage

approach (systems are only treated if an impact is highly likely); a lack of explicit inter-agency arrangements for comprehensive border management; and a significant lack of management tools for key pathways (for example, hull fouling).

There are currently 11 National Interest Pest Responses that aim to eradicate selected established pests from New Zealand (Table 8). These pests were selected for national response because of their potential to have a significant impact on our economic, environmental, social, and cultural values.

Table 8 Current National Interest Pest Responses

Species	Response goal
<i>Salvinia molesta</i>	Eradication
<i>Eichhornia crassipes</i>	Eradication
<i>Sorghum halepense</i>	Eradication
<i>Moraea flaccida</i>	Eradication
<i>Ehrharta villosa</i>	Eradication
<i>Phragmites australis</i>	Eradication
<i>Hydrilla verticillata</i>	Eradication
<i>Ceratophyllum demersum</i>	Eradication and exclusion from the South Island
<i>Bryonia cretica</i>	Eradication
<i>Trichoglossus haematodus</i>	Control to zero density
<i>Zizania latifolia</i>	Eradication in Auckland, Waikato, Wellington regions, and outlier populations in Northland; containment of intransigent populations in Northland

In terms of other initiatives, regional pest management strategies are in place in all regions. These address environmental pests and weeds to varying degrees.

A citizen-led initiative is the New Zealand Biosecurity Institute, which is an incorporated society with membership open to anyone interested in biosecurity issues. This society works to raise awareness of the Institute and of biosecurity issues, and encourages the development and application of best practice in biosecurity;

Pest plants

More than 30,000 plant species have been introduced to New Zealand, approximately 2,500 of which have naturalised in the wild. Of these, more than 300 plants are listed as environmental weeds, meaning that they impact detrimentally on the structure, functions, or composition of New Zealand's indigenous plant communities, waterways, and fauna.

Monitoring for specific plant and animal pest programmes is in place, but further research and analysis is needed to develop measures to be used at a national level. New tools for control and eradication, rapid species identification, and surveillance and risk profiling are always needed as pressures associated with global trade continue to increase. Smarter remote sensing technologies allow for wider coverage and reduce costs associated with management. There are ways of engaging the public using smart phone technology and online identification tools.

Table 9 shows the result of the Biodiversity Monitoring and Reporting system assessment of weed species in 328 forest plots on public conservation land. There was no significant difference in either the number of weed species or native species between 2002/03 and 2009–2012.

Table 9 Biodiversity Monitoring and Reporting System Assessment of weed species

	2002/03 measurement	2009–2012 measurement
No. of native species	704	731
No. of weed species	122	127

The National Pest Plant Accord is a cooperative agreement between the Nursery and Garden Industry Association, regional councils, and government departments. It has biosecurity responsibilities to stop the spread of pest plants through the casual and nursery trade. The 5-yearly

review of the Accord's species list occurred in 2011. As a result, 13 new species were added as unwanted organisms (Table 10); these cannot be sold, propagated, or distributed in New Zealand (refer below).

Table 10 Plant species added to the list of unwanted organisms in 2011/12 (www.biosecurity.govt.nz/nppa)

Scientific name	Common name(s)
<i>Asparagus plumosus</i>	asparagus fern
<i>Carex pendula</i>	drooping sedge, Otahuna sedge
<i>Cestrum aurantiacum</i>	orange cestrum
<i>Cestrum elegans</i>	red cestrum
<i>Cestrum fasciculatum</i>	red cestrum, early jessamine
<i>Cestrum nocturnum</i>	queen of the night
<i>Clerodendrum trichotomum</i>	clerodendrum
<i>Juglans ailantifolia</i>	Japanese walnut
<i>Kennedia rubicunda</i>	dusky coral pea, coral pea, running postman
<i>Maytenus boaria</i>	Chilean mayten, mayten, maiten
<i>Passiflora apetala</i>	bat-wing passion flower
<i>Pithecoctenium crucigerum</i>	monkey's comb, monkey's hairbrush
<i>Polypodium vulgare</i>	polypody, common polypody

Pest management is now showing examples of sound strategic thinking by focusing on eradicating or containing potential pests, and controlling pests at priority sites to protect particular values. Over 492,000 hectares of weed control occurred on Crown conservation land in 2012/13 (Table 11).

Table 11 Weed control undertaken on public conservation land (DOC 2013)

Significant output measures	2008/09 actual	2009/10 actual	2010/11 actual	2011/12 actual	2012/13 actual	2013/14 target
Weeds ecosystem: hectares sustained over time	1,496,788	1,653,010	1,748,522	1,806,266	1,752,995	1,781,967
Weeds ecosystem: hectares treated per year	482,193	504,013	475,439	475,568	492,263	494,902

Over 70 invasive freshwater plants have been introduced into New Zealand, with most New Zealand lakes, rivers, streams, and wetlands affected by at least one introduced pest species. The majority of these species were likely introduced via the aquarium and ornamental pond trade. In response, NIWA has successfully cultivated 17 species of native aquatic plants as alternatives for aquaria (www.niwa.co.nz/news/niwa-fights-against-one-of-new-zealand%E2%80%99s-biggest-biosecurity-invasions).

Pest animals

Currently, 184,000 hectares of public conservation land are under possum control, 1,300,000 hectares are under goat (*Capra aegagrus hircus*) control, and 378,000 hectares are under deer control. Table 12 shows the amount of control that has occurred over the last 5 years and the target for the current financial year.

Table 12 Pest control on Crown conservation land (DOC 2013)

Significant output measures	2008/09 actual	2009/10 actual	2010/11 actual	2011/12 actual	2012/13 actual	2013/14 target
Possums: hectares sustained over time	1,099,627	1,023,846	1,080,120	1,024,448	1,010,770	1,042,536

Possoms: hectares treated per year	187,562	285,338	223,523	234,636	184,179	206,015
Goats: hectares sustained over time	2,388,567	2,184,817	2,221,403	2,357,373	2,310,738	2,283,451
Goats: hectares treated per year	1,466,340	1,468,262	1,313,036	1,410,088	1,353,319	1,378,198
Deer: hectares sustained over time	769,111	720,495	732,203	732,203	549,638	506,288
Deer: hectares treated per year	409,294	360,120	375,724	367,376	376,010	378,314

There are 22 introduced freshwater fish species, and over 150 pest species in New Zealand harbours and marinas that could spread and threaten the aquatic environment.

Controlling established pests and weeds represents over half of the country's total expenditure on biosecurity, while the Department of Conservation spends \$53 million on managing pests and weeds, and regional councils spend \$26 million. A summary of animal and plant pest control expenditure for 2010 to 2012/13 is provided in Table 13.

Table 13 Animal and plant pest control expenditure on public conservation land (DOC 2013)

	2013/12 (\$000)	2012/11 (\$000)	2011/10(\$000)	2010/09 (\$000)
Possum control	10,664	13,811	14,752	15,704
Deer control	1,324	1,206	1,547	1,283
Goat control	6,018	5,873	6,779	5,984
Other terrestrial animal pests	8,689	8,799	7,348	6,956
Aquatic animal pest control	669	1,221	1,303	1,136
Weed control	16,919	18,290	19,087	18,892
Specific pest and disease response	1,473	2,119	1,164	1,014

At the local level, all regional councils have regional pest management plans to control plant and animal pests in pest-led programmes. These include pests that affect biodiversity, as well as other aspects of the environment, primary production, health, etc. However, the emphasis varies between councils. Many of the management plans include the equivalent of biodiversity site-led programmes, to support pest management in priority ecosystems/places whether on private or council-managed public land. The basis for identifying these places varies considerably.

Island invasive species eradication

New Zealand has succeeded in eradicating pests from many of its offshore islands. At least 70 island restoration projects are being undertaken by the Department of Conservation and community groups. On some islands, school groups are involved (e.g. Mokoia Island in Lake Rotorua/Te Rotorua nui ā Kahumatamomoe and Limestone Island in Whangarei Harbour), while others are run as partnerships with local support groups (e.g. supporters of Tiritiri Matangi Island and Friends of Mana Island). A few are carried out on islands that are privately owned (e.g. Waikawa Island).

Approximately 150 vertebrate pest eradications have been undertaken on offshore islands since 2000. The removal of alien predators from islands has increased the habitat for indigenous species that are sensitive to introduced mammals from 2,000 hectares to at least 35,000 hectares, benefiting more than 70 species of native vertebrates and numerous invertebrates and plants (Bellingham et al. 2010; www.newzealandecology.org/nzje/).

As knowledge and technology improves, so does our ability to remove pests from larger islands. For example, by developing rat eradication techniques on small islands such as Stanley Island (100 hectares) and Tiritiri Matangi Island (196 hectares), we have been able to successfully remove kiore (Pacific rats *Rattus exulans*) from Codfish Island (1,396 hectares) to protect the kākāpō population as

well as indigenous ecosystems. In the largest eradication globally at the time, Norway rats (*Rattus norvegicus*) were also removed from Campbell Island/Motu Ihupuku (11,300 hectares) to protect indigenous species (Towns & Broome 2003).

	<p>Target 10 By 2015, the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification are minimized, so as to maintain their integrity and functioning.</p>
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New Zealand has no shallow-water, reef-building coral species. However, a diverse range of other coral species exists in New Zealand's Exclusive Economic Zone (EEZ), along with a range of other species and ecosystems that may be impacted by climate change or ocean acidification. Deepwater corals, including bamboo corals, bubblegum corals, and gorgonians, have been recorded throughout New Zealand's EEZ. A number of corals, including black and red corals, also occur in shallow water around New Zealand, and there are at least 38 endemic species of coral around the subtropical Kermadec Islands.

All black corals, gorgonian corals, stony corals, and hydrocorals in the family Stylasteridae are protected in New Zealand waters under Schedule 7A of the Wildlife Act. Furthermore, New Zealand's National Coastal Policy Statement guides local authorities in their ongoing management activities, including those associated with indigenous biological diversity, harmful aquatic organisms, and enhancement of water quality.

Some habitats supporting corals and other species and ecosystems are protected from some anthropogenic impacts in a variety of ways, including through legislation and policy, marine protected areas, benthic protection areas, and seamount closures where some fishing methods are restricted.

New Zealand has 34 marine reserves, within which fishing and other take of marine life is prohibited. Important marine reserves for coral protection in New Zealand are the Fiordland marine reserves and the Kermadec Islands Marine Reserve. Fiordland's ten marine reserves range in size from 93 to 3,672 hectares and total over 10,000 hectares of inner fiord marine habitat. The Kahukura (Gold Arm) Marine Reserve protects abundant red and black corals. A 2,007-hectare marine reserve at Wet Jacket Arm, Moana Uta, has the highest known density of black coral of any site in the fiords. The Kermadec Islands Marine Reserve covers 745,000 hectares and protects a full range of coastal habitats in the Kermadec Islands biogeographic region. Thirty-eight endemic coral species are protected, including large plate corals which do not form reefs, unlike elsewhere in the Pacific.

A review of protected deep-sea coral species in the New Zealand region (www.doc.govt.nz/documents/conservation/marine-and-coastal/fishing/protected-coral-information-review.pdf) presents a comprehensive summary of research information on the distribution of the main protected taxa, an examination of likely factors that determine their distribution, and a list of all coral species in New Zealand waters.

<p><i>Strategic Goal C: Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity</i></p>	
	<p>Target 11 By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes.</p>

Terrestrial protected areas

New Zealand has more than 17,000 protected areas covering around one-third of the total land area, as shown in Table 14.

Table 14 Terrestrial protected areas (sourced from Landcare Research's PAN-NZ database on protected areas, October 2013)

Protected areas	2009 (ha)	2013 (ha)	Percentage of total land area
National Parks	3,106,415	3,115,976	11.61%
Stewardship areas	2,649,588	2,526,617	9.41%
Conservation Parks	1,958,313	1,541,281	5.74%
Amenity Areas, Ecological Areas, Nature Reserves, Sanctuary Areas, Scientific Reserves, Scenic Reserves, Wilderness Areas, Wildlife Management Areas, and Wildlife Refuges	968,847	1,054,046	3.93%
Department of Conservation Recreation Reserves	232,263	237,401	0.88%
Regional Parks, government and local purpose reserves*	1,019,666	1,116,096	4.15%
Private protected areas (QEII and Nga Whenua Rahui covenants)	243,952	270,108	1.01%
Total	10,179,044	9,861,525	36.73%

* Preliminary estimate only; values reported likely to be overestimates and data might spatially overlap with some of the other datasets

Although public conservation land in New Zealand is proportionally large by international standards, it is not yet representative of the breadth of ecosystem types and habitats found here (Fig. 8). In response, the Department of Conservation is maximising its efforts towards six Outcome Objectives (DOC 2013):

- A full range of New Zealand's ecosystems is conserved to a healthy functioning state
- Nationally threatened species are conserved to ensure persistence
- Nationally iconic natural features are maintained or restored
- Nationally iconic species are managed to ensure their populations are maintained or restored
- Locally treasured natural heritage is maintained or restored through partnerships
- Public conservations lands, waters, and species are held for current and future generations.

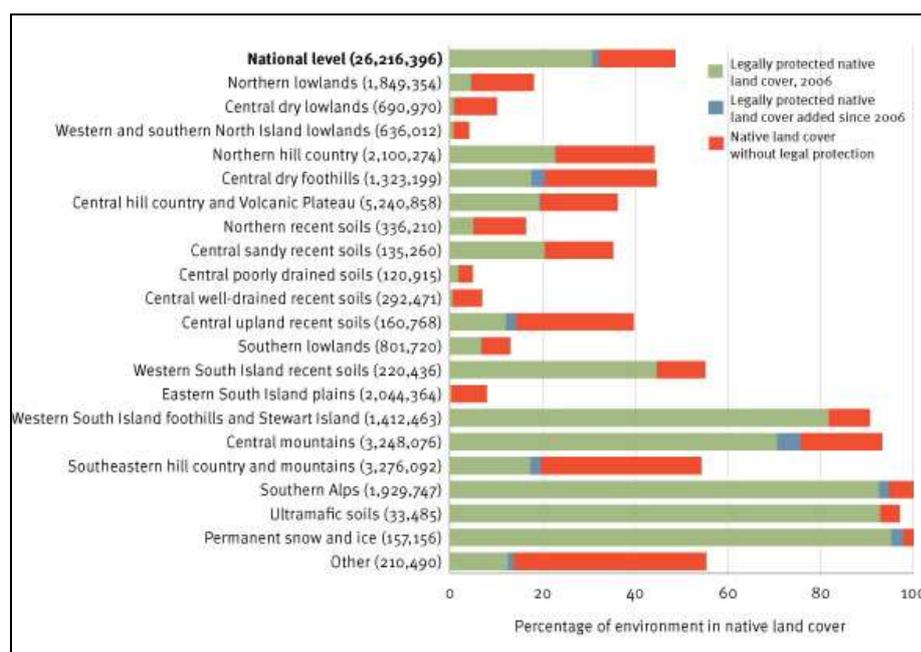


Figure 8 Native land cover and legally protected native land cover by land environment (MfE 2009)

The greatest increase in protection between 2004 and 2012 was for those ecosystems that are least threatened and already best protected. For example, the tenure land review of Crown pastoral leasehold lands that is currently underway has played a large part in increasing the protection of higher altitude native grasslands from 12.8% of their original (1840) cover in 2007 to 15.4% of their original cover today. Mid- to low-altitude grasslands that are of greatest value to pastoral production and have been severely modified, and so are degraded as habitat for indigenous species, are now under-protected relative to their past extent because they have passed into private ownership (www.pce.parliament.nz/publications/all-publications/change-in-the-high-country-environmental-stewardship-and-tenure-review).

Covenants are an important mechanism for protecting important habitats, ecosystems, and species that occur on private land, such as lowland forests, sand dunes, streams, wetlands, and sub-alpine grasslands. These ecosystems are under-represented in protected areas. The three most common covenants are via the Queen Elizabeth II National Trust, the Nature Heritage Fund, and Nga Whenua Rahui. Nga Whenua Rahui has helped covenant around 165,000 hectares of Māori-owned land.

There are 3,803 Queen Elizabeth II National Trust covenants covering approximately 105,000 hectares. Figure 9 shows the increase in these covenants since 1985.

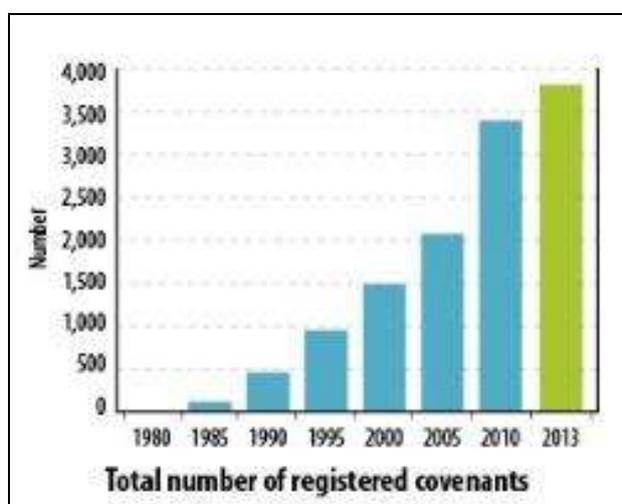


Figure 9 Queen Elizabeth II National Trust covenants, 1985–2013 (www.openspace.org.nz/)

Inland water protected areas

The target of protecting at least 17% of New Zealand’s inland water bodies has been exceeded, with approximately 27% (or 534,892 hectares) protected, as shown in Table 15. These protected areas include six Ramsar sites of international importance.

Table 15 Protected inland water bodies

Inland water bodies	Total hectares	Protected	Percent protected
Estuarine open water	94,269	7,227	8%
Lake and pond	358,654	120,374	34%
River	81,970	18,025	22%
Grand total	534,893	145,626	27%

Coastal and marine protected areas

New Zealand is also progressing toward meeting the 10% target for protection of coastal and marine areas, although further work is needed to ensure that ecological representativeness and equitable management objectives are met.

Marine protection in New Zealand is guided by the Marine Protected Areas Policy and Implementation Plan (MPA Policy). For MPA planning purposes, the New Zealand Territorial Sea has been divided into 14 bioregions and MPA planning is being undertaken by regional forums consisting of stakeholders with an interest in the marine environment in each of these bioregions.

To date, two MPA planning processes have been completed—one for the subantarctic islands and another for the West Coast of the South Island. For the subantarctic islands, three new marine reserves and two additional marine protected areas have been proposed. The Subantarctic Islands Marine Reserves Bill is expected to be passed in early 2014 and would create three new marine reserves around Campbell Island/Motu Ihupuku, Antipodes Island, and the Bounty Islands. For the West Coast of the South Island, five new marine reserves have been proposed and are currently progressing through the statutory process. Additional marine reserves have also been proposed via other processes.

There are currently 34 marine reserves in New Zealand, ranging in size from 0.93 km² to 7,480 km². They cover a total area of 12,790 km², or 7% of New Zealand's Territorial Sea (Table 16). Additional marine protected areas and other types of protected or managed areas such as marine mammal sanctuaries and fisheries closures are also in place. A recent analysis of New Zealand's marine protected area network within the Territorial Sea has shown that while some biogeographic regions and the habitats within them are well represented in the network, additional protected areas are required to ensure adequate representation of New Zealand's biodiversity within marine protected areas (DOC & MPI 2011).

Table 16 Coastal and marine protected areas in the New Zealand Territorial Sea

Coastal and marine protected areas	Area (km ²)	Percent protected (of Territorial Sea)
Marine reserves (34)	12,796	7.061%
Other marine protected areas	2,073	1.14%
Marine mammal sanctuaries (6)	2.35 million	13%

	<p>Target 12 By 2020 the extinction of known threatened species has been prevented and their conservation status, particularly of those most in decline, has been improved and sustained.</p>
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The New Zealand Threat Classification System (NZTCS) is used to assess the threat status of NZ taxa (species, subspecies, varieties and forma), with the status of each taxon group being assessed over a 3-year cycle. It differentiates three threatened species categories: Nationally Critical, Nationally Endangered, and Nationally Vulnerable. These categories are based on estimates of the existing population size or area of occupancy and the ongoing or predicted rates of decline in a population due to existing threats. In 2008, the New Zealand Threat Classification System methodology was revised to improve its utility.

Results from the most recent assessment under the New Zealand Threat Classification System, based on data gathered over a 3-year cycle, are given in Tables 1 and 17. Over 2,700 indigenous species are known to be at risk from insufficient or degraded habitat, plant and animal pests, or the adverse effects of human activities. Results from the most recent New Zealand Threat Classification System assessment suggest an ongoing deterioration in status for many indigenous species in the taxonomic groups assessed.

Some status changes are a result of increased species knowledge. For example the 2008 assessment of native vascular plants assessed the threat status of 2,530 plants while the latest review assessed an extra 50 plants and lists the threat status of 2,580 plants. This increase was due to an increase in our knowledge of New Zealand's native plant life. When the 2008 assessment was conducted scientists thought there was just one species of Cook Scurvy Grass (*Lepidium oleraceum*). New research recently published recognises that there are 11 new species of Cooks Scurvy grass, all now separately recognised in the threat classification.

There were insufficient data to determine the status of almost 4,000 additional species that are less well known, such as marine invertebrates and fungi.

The Department of Conservation is targeting 'data deficient' species to assist in the quantification of threat status and data from the next 3-yearly assessment cycle (2012–2014) will progressively

become available at www.doc.govt.nz/publications/conservation/nz-threat-classification-system/nz-threat-classification-system-lists-2012-14/.

No taxa were found to have become extinct between the 2005 and 2008–2011 assessment cycles. The difference in extinction figures is due to only listing extinctions since 1800 AD (period of European settlement) in the 2005 assessment, while all extinctions since 1000 AD (human settlement) were included in the 2008–2011 assessment. There are at least 70 New Zealand taxa that have not been seen for more than 20 years and are thought to be extinct, but are still listed as Data Deficient due to the need to be very certain before classifying a species as extinct.

Between 2005 and 2008–2011, 12 threatened taxa improved in status due to successful species management (one bat species, eight bird species, and three wētā species), while 59 worsened. Locations with the least indigenous cover support a disproportional number of the most threatened species. Species here are concentrated in small refuges, and have reduced regeneration, compromised genetic structure, and limited resilience. The percentage of freshwater fish classified as threatened rose from 53% to 67%.

Since 2008–2011:

- Of 417 extant bird species, 77 (18.4%) were ranked as Threatened (comprising 25 Nationally Critical, 18 Nationally Endangered, and 34 Nationally Vulnerable), and 92 (22.1%) were At Risk (comprising 17 Declining, 13 Recovering, 17 Relict, and 45 Naturally Uncommon)
- Twenty bird taxa have moved to a more threatened status
- The status of 12 bird taxa improved, mainly as a result of successful conservation management
- Seventy-seven bird species were assessed as being threatened with extinction, which was the same as in 2008; however, 25 rather than 24 taxa were now classified as being Nationally Critical (www.doc.govt.nz/documents/science-and-technical/nztcs4entire.pdf)

Two species of skink (grand *Oligosoma grande* and Otago *O. otagense*) were moved to Nationally Critical in 2008–2011. This decline was attributed to the increasing threat of rabbit-driven predator irruptions and the conversion of sheep farms to dairy farms, which destroy habitats. However, in the 2012–2014 assessment cycle, their status has improved back to Nationally Endangered due to recovery following successful management. This finding shows that success can be achieved not only on islands but also on the mainland.

No major changes in frog fauna status were recorded between 2009 and 2013, with four species threatened and ten taxa at risk (www.doc.govt.nz/documents/science-and-technical/nztcs5entire.pdf). Other status changes are as a result of increased species knowledge.

The need for fungal conservation has gained increased recognition since the Fourth National Report. This can, in part, be attributed to the inclusion of the previously neglected fungal kingdom in threat assessments by the Department of Conservation. In addition, New Zealand researchers are active in the recently formed International Society for Fungal Conservation, which has raised awareness globally about threatened fungi and the ecological relevance of fungi.

Table 17 A summary of the number of taxa identified as threatened during the 2008–2011 assessment cycle (Roberts 2013)

Species group	Threatened		
	Nationally Critical	Nationally Endangered	Nationally Vulnerable
Algae	1	0	0
*Bats	1	1	2
*Birds	24	15	38
Bryophytes	31	10	4
*Freshwater fish	4	3	7
Freshwater invertebrates	11	2	1
*Frogs	1	0	2
Fungi	62	20	6

*Lichens	4	4	3
Marine fish	0	0	0
Marine invertebrates	10	2	21
*Marine mammals	5	3	0
*Reptiles	6	3	8
Beetles	35	7	3
Bird lice	4	0	8
Diptera	0	0	1
Earthworms	0	0	0
Hemiptera	9	0	0
Hymenoptera	2	0	0
Lepidoptera	13	9	27
Minor invertebrate groups	9	0	6
*Nematodes	3	0	1
*Orthoptera	1	2	3
Snails	36	39	19
*Spiders	3	1	0
*Vascular plants	155	62	72
Total	430	183	230

* In these groups, the entire known flora, fauna, or fungi have been assessed. In all other groups, only taxa nominated as likely to be threatened have been assessed. Note: Results of the 2012 assessment of vascular plants and 2007 assessment of algae, freshwater invertebrates, and marine fish are also included.

There has been an increased focus on actively managing high-priority species in response to the growing understanding of the conservation status of many threatened species. 111 threatened species are now under active management programmes, compared with 42 in 2011/12 (Table 18).

Table 18 Number of threatened species and ecosystems under active management programmes by the Department of Conservation

Significant output measures	2008/09 actual	2009/10 actual	2010/11 actual	2011/12 actual	2012/13 actual	2013/14 target
Threatened species: improved security	237	241	242	238	212	208
Threatened species: managed for persistence	0	0	0	42	111	100
Ecosystems: managed for ecological integrity	0	0	0	0	151	190

Targeted conservation efforts have helped to save the following species from extinction: kākāpō; takahē (*Porphyrio hochstetteri*); black robin (*Petroica traversi*); Chatham Island tāiko (*Pterodroma magentae*), Chatham Island oystercatcher (*Haematopus chathamensis*); parea (*Hemiphaga chathamensis*); Forbes' parakeet (*Cyanoramphus forbesi*); rowi; New Zealand fairy tern (*Sternula nereis davisae*); orange-fronted parakeet (*Cyanoramphus malherbi*); North Island kōkako (*Callaeas cinereus*); and brown teal (*Anas chlorotis*).

Not all planned actions have been successful or were able to be implemented, and not all goals in recovery plans were able to be reached. Examples include some lizard species, for which threats could be managed on islands (through eradication of introduced predators) but not in mainland ecosystems. Examples of improved outcomes for threatened species include the confirmation and successful management of key agents of decline, such as rats for Archey's frogs, and the translocation of populations

to increase their distribution and establish new populations in predator-managed habitats. Similar positive outcomes were achieved for some mudfish and galaxiid fish species, where national planning and implementation has led to increased understanding, landowner and other stakeholder engagement, restoration of key habitats, and protection of significant populations.

Case study on species conservation: kākāpō

The kākāpō is the world's largest parrot, the only flightless parrot, and the only parrot that has a lek breeding system. It is confined to New Zealand, and its flightlessness, ground nesting, and infrequent breeding have made it particularly vulnerable to hunting and introduced stoats, rats, and cats. Research and management is focused on overcoming the kākāpō's low fertility, which is a consequence of inbreeding and very low genetic diversity. Matings between kākāpō are planned and manipulated to maximise the genetic diversity of offspring, which has included the development of artificial insemination techniques. This year, the population decreased by less than 1% to 124 birds, as shown in Fig. 10.

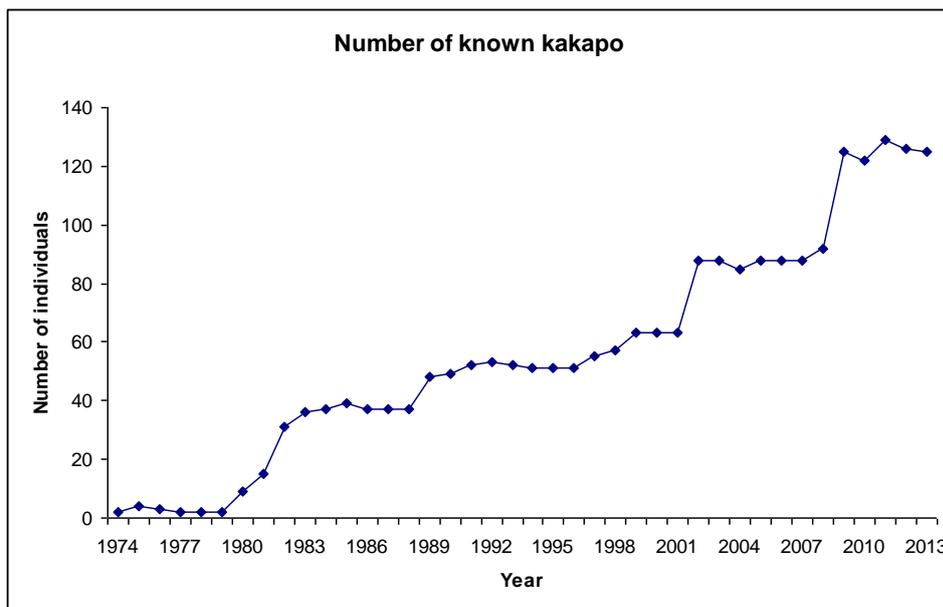


Figure 10 Number of kākāpō, 1974–2013 (Department of Conservation Biodiversity Indicators 2013)

Case study: Operation Ark

Operation Ark is a flagship multi-species protection programme that was undertaken from 2004 to 2010. It was launched in response to devastating rat and stoat plagues in South Island beech forests, which caused the rapid decline of four key bird species (blue duck or whio—*Hymenolaimus malacorhynchos*, yellowhead or mohua—*Mohoua ochrocephala*, and two parakeets or kākāriki karaka—*Cyanoramphus auriceps* and *C. malherbi*). The primary purpose of Operation Ark was to ensure the long-term survival and sustainability of key native species on the mainland. The results after 6 years were as follows:

- Blue duck: Populations were sustained at three sites, with the most marked increases occurring where there was egg removal, captive rearing, and re-introductions of young birds.
- Orange-fronted parakeets: Populations were stabilised and protected offshore island populations were established.
- Yellowheads: Populations were stabilised or increased at all sites and re-introductions to other areas were undertaken.

In addition, populations of long-tailed and short-tailed bats or pekapeka (*Chalinolobus tuberculatus* and *Mystacina robusta*, respectively) have now stabilised or are increasing, following the decline they experienced whilst they were unprotected from rats and stoats.

The findings from Operation Ark have provided valuable input into the management of species at other mainland sites around the country. These findings include:

- Rat trapping was found to be ineffective in protecting threatened species in plague situations;
- Aerially broadcast 1080 poison and variable-toxin bait stations were shown to reduce rat numbers sufficiently to protect bird and bat populations;

- Stoa trapping lines along river valley floors and in networks were successful at keeping stoa numbers down and enabling protected species recovery;
- Breeding and translocation of blue duck was tested successfully at a number of sites; and
- The relationship between climate, beech seed, and rat and stoa plagues is now much better understood.



Target 13

By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.

Conservation of the diversity of New Zealand's genetic resources is included as an objective in the New Zealand Biodiversity Strategy (DOC & MfE 2000)—specifically the development of a collaborative management strategy and identification of risks in the management of introduced and indigenous species.

There are two primary elements of New Zealand's intellectual property rights system that are of relevance to plant genetic resources: plant variety rights (PVR) under the Plant Variety Rights Act 1987; and patents under the Patents Act 1953. Patents can protect new products or processes derived from genetic research on plants through the grant of a proprietary right that lasts for a period of 20 years. PVR can provide proprietary protection for new varieties of plants. Plant variety protection lasts for up to 20 years in the case of non-woody plants, or 23 years in the case of woody plants. PVRs are particularly important in plant genetic research because they provide incentives to breeders and, therefore, encourage investments and effort into plant breeding in New Zealand, and they provide access to overseas-bred varieties that would not be released in New Zealand by their breeders without PVR protection. The grant of PVR provides plant breeders with the exclusive right to sell seed or reproductive material of their new varieties.

To date, there has been relatively little focus on the implementation of overarching strategies for safeguarding genetic diversity or minimising genetic erosion in New Zealand. In recent years, the conservation of genetic diversity, particularly in socio-economically important species, has relied mainly on market forces and private sector initiatives. However, better collaboration between public and private sectors is likely needed for a more comprehensive approach to the conservation of genetic diversity. The Rare Breeds Conservation Society of New Zealand was formed to conserve, record, and promote these breeds, with the particular aim of maintaining genetic diversity within the number of rare livestock breeds currently found in New Zealand. They list the conservation priority of rare and minority breeds in New Zealand, including those that originated in New Zealand (www.rarebreeds.co.nz/).

The majority of New Zealand's primary production economy—farming, horticulture, and forestry industries—are highly dependent on a relatively narrow range of introduced species, and the fishing industry is an important genetic resource that is based mainly on indigenous species. Maintaining the genetic diversity and the productivity of these species is important for both market development and flexibility. Equally important is minimising the biological risk through vulnerability to diseases, pests, or climatic events.

New Zealand is not a centre of origin for mainstream agricultural animal species, and the genetic diversity of important introduced species is managed by the private sector through a market-based approach. This includes collections of exotic species as a means of conserving genetic resources. Some of these collections are partially government funded and maintained by Crown Research Institutes, while others are held by voluntary groups such as botanic gardens, zoological parks, seed banking networks, and rare breed organisations.

Due to the importance of pastoral agriculture to the New Zealand economy, forage plants are New Zealand's single most important plant genetic resource in economic terms, and are likely to remain so for the foreseeable future. New Zealand also grows considerable quantities of pasture and lawn herbage seeds mainly for export. New Zealand's most important *ex situ* pastoral plant genetic resource collections are:

- The Margot Forde Germplasm Collection, at AgResearch Palmerston North, established in the 1930s, which holds over 85,000 accessions of species, including ryegrasses (*Lolium* spp.), fescues (*Festuca* spp.), cocksfoot (*Dactylis* spp.), bromes (*Bromus* spp.), white clover (*Trifolium repens*), red clover (*Trifolium pratense*), lucerne (*Medicago sativa*), *Lotus* spp. legumes, soil conservation plants, and other grassland plants.
- Plant & Food Research's national collection of poplar (*Populus* spp.) and willow (*Salix* spp.) species held at various locations throughout New Zealand.

New Zealand's most important *ex situ* crop collections are:

- Crop Germplasm Resources Unit, housed at Plant & Food Research, which has collections of wheat, barley, oats, maize, peas, onions, potato, and sweet potato (kumara), and other vegetables, along with other minor crops such as essential oilseeds.
- Plant & Food Research unit, which conserves and researches hops.

Radiata pine (*Pinus radiata*) is the dominant species in New Zealand's production forests, and it is therefore important for the industry to maintain the genetic diversity of this species. This is achieved by basing the seed production population on a larger, more genetically diverse breeding population, and by using a number of clones in each year's planting to avoid reductions in genetic diversity associated with clonal forestry. Forest research organisations and industry cooperatives established a radiata pine breeding strategy in 1987, and subsequent work has continued to be focused on genetic improvement and maintenance of long-term genetic variability.

There is less known about the genetic variation of indigenous forest species, some of which appear to have low genetic variability. As noted previously, due to the nature of small and isolated populations among threatened indigenous species, these are likely at high risk of loss of genetic diversity. In 2005, Landcare Research started an 8-year government-funded programme that aimed to develop a framework for identifying and conserving genetic diversity in threatened indigenous tree species.

Living *ex situ* collections of some indigenous plant species and varieties are maintained at a variety of sites around the country. These include:

- Botanic gardens in most major cities and some other localities, notably Auckland, Wellington (including the Otari Open Air Native Plant Museum), Christchurch, Timaru, and Dunedin;
- Research collections (e.g. those of Landcare Research at Lincoln and Havelock North, and of the universities); and
- Several private arboreta (e.g. Hackfalls Arboretum near Gisborne and that of A.P. and H. Druce, near Wellington).

The flax (*Phormium* spp.) collection is one of two significant *ex situ* living collections held by Landcare Research. It was developed from the Rene Orchiston base collection of 50 Māori weaving cultivars. These cultivars were collected from around the country, and are propagated vegetatively because of the high genetic variation in plants grown from seed. Flaxes have strong significance to Māori and were traditionally used to make many woven items and for medicinal and spiritual uses. The flax collection also includes plants from 80 wild-sourced populations. This collection, and its associated research programme, is an example of a focus on within-species variation in native plants. Current research is on genetic diversity at a species and population level.

A second living collection comprises 600 cabbage trees (*Cordyline australis*) planted at three sites (Invermay, Lincoln, and Auckland) to determine the genetic differences between wild populations. Seed was sourced from populations in 28 localities and seedlings were planted out in 1995, along with seedlings of two other native *Cordyline* species. Growth characteristics will be related to traditional Māori uses of tī kōuka (Harris et al. 2006). The collection has also been a major resource for research investigating the causal agent of cabbage tree decline—an insect-vectored phytoplasma.

In addition, Landcare Research has several collections of plant species that are maintained for research purposes. The *ex situ* storage of indigenous plant seeds is undertaken at the Margot Forde Germplasm Centre in a collaborative project between the Centre, the New Zealand Plant Conservation Network (NZPCN), and Landcare Research.

Separate from the above but related in context, Landcare Research also houses the living collection of fungi- and plant-associated bacteria, including about 9,000 strains of fungi that are deep-frozen in liquid nitrogen. The ICMP culture collection contains live cultures of both native and introduced fungi, including invasive plant pathogens. ICMP could potentially become a vehicle for *ex situ* fungal conservation if required.

The New Zealand Seed Bank group, comprised of AgResearch, Landcare Research, the Department of Conservation, and the NZPCN, has established the New Zealand Indigenous Flora Seed Bank project to collect and conserve seeds of New Zealand's flora. In 2013, a Memorandum of Understanding was signed with Kew Gardens on the future of indigenous seed-banking in New Zealand (NZPCN 2013).

Strategic Goal D: Enhance the benefits to all from biodiversity and ecosystem services



Target 14

By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.

The understanding of ecosystem services in New Zealand will be substantially advanced with the launch of 'Ecosystem Services in New Zealand', edited by Landcare Research's Principal Scientist Dr John Dymond, in early 2014. This book provides the first thorough overview of the conditions and trends of ecosystem services in New Zealand, and will help to guide the actions that need to be taken to achieve this target in New Zealand.

As with other areas of environmental management, the Resource Management Act (RMA) 1991 is the key legislation governing the management of New Zealand's freshwater resources. Under the RMA, regional and unitary councils are responsible for making decisions on the allocation and use of water within their boundaries, and for managing water quality. Central government can guide and direct regional councils under the RMA using tools such as national policy statements and national environmental standards.

Under the RMA, the National Policy Statement for Freshwater Management 2011 requires councils to set freshwater objectives and limits in their regional plans. 'Freshwater objectives' are the intended environmental outcomes for a water body that will provide for the values the community considers important, while 'limits' refer to the total amount of water that can be taken out of a freshwater body, or of contaminants that can be discharged into it, without jeopardising the desired outcomes. Currently, the National Policy Statement requires councils to:

- a. Maintain or improve the overall quality of fresh water within a region; and
- b. Safeguard the life-supporting capacity of fresh water, ecosystem processes, and indigenous species, including their associated ecosystems (ecosystem health).

In March 2013, the Government announced proposals to improve the way in which fresh water in New Zealand is managed. One of the key proposals is the introduction of a National Objectives Framework, which would require national minimum environmental states in rivers and lakes for ecosystem health and human contact. Some of these proposals will require amendments to the National Policy Statement for Freshwater Management. For more information see www.mfe.govt.nz/issues/water/.

The National Environmental Standard for Sources of Human Drinking Water came into effect in June 2008, and is intended to reduce the risk of contaminating drinking water sources such as rivers and groundwater. It does this by requiring regional councils to consider the effects of activities on drinking water sources in their decision-making. The standard requires regional councils to ensure that effects on drinking water sources are considered in their decision making processes. Specifically, councils are required to:

- Decline discharge or water permits that are likely to result in community drinking water becoming unsafe for human consumption following existing treatment;
- Be satisfied that permitted activities in regional plans will not result in community drinking water supplies being unsafe for human consumption following existing treatment; and
- Place conditions on relevant resource consents requiring notification of drinking water suppliers if significant unintended events occur (e.g. spills) that may adversely affect sources of human drinking water.



Target 15

By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, through conservation and restoration, including restoration of at least 15 per cent of degraded ecosystems, thereby contributing to climate change mitigation and adaptation, and to combating desertification.

As a part of a suite of initiatives to combat climate change, three carbon forestry schemes have been designed to encourage the establishment of new forests (both indigenous and exotic) and the retention of existing areas of forest. These schemes are the NZ Emissions Trading Scheme; the Permanent Forest Sink Initiative; and the Afforestation Grant Scheme. The first two carbon forestry schemes provide the opportunity for landowners to earn revenue from the carbon sequestered by their forest, while the third provides a grant for forest establishment (www.mpi.govt.nz/forestry/funding-programmes/permanent-forest-sink-initiative.aspx). The conversion of forests to other land uses is disincentivised via a carbon charge for exotic forests (though the conversion of exotic to native species incurs no charge) and controls on the clearance of natural forests.

A robust measure of progress towards the 15% target is not available. However, the fact that one-third of New Zealand's land mass is protected for conservation purposes provides a good platform for resilience and efforts to protect these areas will maintain or enhance the carbon stocks in these areas, even though this may not be the primary aim. In addition to government-sponsored protection and restoration efforts, there is a rapidly growing movement on the part of community groups that is aimed at the minimisation of threats, including introduced weeds, feral browsers and predators, and the restoration of degraded ecosystems. These activities take place on the mainland as well as offshore, where there has been a significant growth in the number and area of islands that are free of pest mammals.

A significant amount of the effort towards restoring degraded ecosystems in New Zealand comes from the control and management of introduced browsing mammals. The purpose of possum control, besides reducing the transmission of bovine tuberculosis to cattle, is to mitigate the significant effects they have on indigenous biodiversity. Possums are also considered to compromise the actual and potential carbon store, particularly in indigenous forests.

To monitor the carbon stocks in its ecosystems, New Zealand has also established an initiative called LUCAS (Land Use and Carbon Analysis System), which uses ground-truthed inventory data and geospatial technologies to estimate greenhouse gas emissions and removals attributable to the land use, land-use change, and forestry sector in New Zealand. New Zealand's international commitments for carbon stocks have focused on forests, and forests contain significant amounts of carbon per hectare, so this has been a focus of the programme.

Other policies designed to reduce the impacts of land use on the environment also have positive carbon benefits. For example, two programmes intended to reduce erosion and water sedimentation (the Sustainable Land Management Hill Country Erosion Programme and East Coast Forestry Project) both promote carbon sequestration in the established forests.

Recent research by Landcare Research estimates that the current carbon stock in above- and below-ground vegetation, litter, coarse woody debris, and soil carbon is 2,396 Mt (or 8,785 Mt CO₂e), across the c. 8 million hectares of New Zealand that is covered in indigenous vegetation (Mason et al. 2012). The results suggest that an additional c. 190 Mt of carbon (or 698 Mt CO₂e) could be stored, largely through succession from grassland or shrublands to forest over periods ranging from a few decades to over 300 years. The greatest carbon gains will occur in favourable 'non forest' areas, largely through the exclusion of domestic stock and the control of wild animals. Feral animal control within existing forests may also sustain or enhance existing carbon stocks over large areas of habitat, but the effect is highly variable and very difficult to quantify. In two contrasting lowland study forests, there has been a demonstrable co-benefit between carbon accumulation and biodiversity gain (Carswell et al. 2013), illustrating the potential for a 'win-win' from restoration of indigenous forest, particularly on fertile lowland sites that are otherwise marginal for agriculture.



Target 16

By 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization is in force and operational, consistent with national legislation.

While we have not signed the Nagoya Protocol, New Zealand has an interest in the Protocol as both a user and a provider of genetic resources.

New Zealand does not currently have a domestic access and benefit-sharing or bio-discovery policy framework in place. However, discrete pieces of legislation (e.g. Wildlife Act 1953) provide some coverage in some situations.

It is essential for New Zealand that any domestic or international regime maintains the Crown’s ability to fulfil its obligations under the Treaty of Waitangi. Government officials are progressing inter-agency discussions to examine whether or not New Zealand is in a position to ratify the Protocol to inform a recommendation to Ministers.

Strategic Goal E: Enhance implementation through participatory planning, knowledge management and capacity building



Target 17

By 2015 each Party has developed, adopted as a policy instrument, and has commenced implementing an effective, participatory and updated national biodiversity strategy and action plan.

The New Zealand Biodiversity Strategy 2000–2020 (NZBS; DOC & MfE 2000) is currently under review in order to bring its goals into line with the Aichi Biodiversity Targets. The refresh will incorporate:

- New information on the status and trends of biodiversity;
- New issues, including the impacts of climate change on biodiversity and the importance of ecosystem services to prosperity;
- Progress against NZBS outcomes, objectives, targets, and actions to date; and
- Key recommendations from the 2005 review of the NZBS, including a more effective monitoring framework.

(Refer to responses to Part II for more details.)

Implementation of some aspects of the Aichi Biodiversity Targets is occurring in parallel or is already encompassed by the existing goals of the current NZBS.



Target 18

By 2020, the traditional knowledge, innovations and practices of indigenous and local communities relevant for the conservation and sustainable use of biodiversity, and their customary use of biological resources, are respected, subject to national legislation and relevant international obligations, and fully integrated and reflected in the implementation of the Convention with the full and effective participation of indigenous and local communities, at all relevant levels.

Legislation

New Zealand has national legislation in place that recognises tangata whenua (indigenous communities) and their Mātauranga Māori (the traditional knowledge base that underpins Māori culture and identity).

New Zealand's key environmental management legislation recognises the importance of the traditional knowledge, innovations, and practices of Māori in the sustainable use and management of biodiversity. The Resource Management Act 1991 requires anyone exercising authority under the Act to recognise and provide for the relationship of Māori and their culture with their ancestral lands, waters, sites, wāhi tapu, and other taonga (section 6(e)) and also recognises kaitiakitanga (defined as guardianship by the tangata whenua), and provides for the delegation or sharing of powers under the Act (e.g. sections 33, 36B, and 188). The Resource Management Amendment Act 2005 was intended to further improve the effectiveness of Māori participation in the management of natural resources and to encourage collaborative projects, such as the partnerships that councils have developed with Ngāti Whātua. Such agreements can be between a range of parties, including local authorities, other public authorities, iwi (tribal) authorities, and groups that represent hapū (clans or descent groups), and further work may be required to implement the agreements effectively.

The Fisheries Act 1983 supports traditional harvesting in the marine environment and the management of areas by iwi. Mātaitai reserves (areas reserved for traditional, non-commercial harvest that are under management of Māori authorities), taiāpure (fishing areas that are managed by local tribes), and the placing of rāhui (bans) on areas to restrict harvest or for other cultural reasons (e.g. to reduce local drownings or environment impacts such as oil spills, etc.) are also in place. For more information see the Customary Fishing Regulations (www.fish.govt.nz/en-nz/Māori/default.htm).

Treaty of Waitangi

The Waitangi Tribunal has made a number of recommendations to the Government in its report on the WAI 262 Treaty of Waitangi claim—'Ko Aotearoa Tēnei: This is New Zealand' (www.waitangi-tribunal.govt.nz/reports/downloadpdf.asp?reportid={BF981901-5B55-441C-A93E-8E84B67B76E9}.pdf). This report focuses on the protection of Māori culture and identity, with a particular focus on Mātāuranga Māori and associated taonga (treasured possessions), including flora and fauna. The New Zealand Government is considering its formal response to the Waitangi Tribunal's recommendations in the WAI 262 report.

The Crown and various Māori iwi are progressively working through Treaty of Waitangi settlements to further recognise and provide for specific iwi values in legislation. Two examples of this are the co-management provision of the Ngai Tahu Claims Settlement Act 1998 and the Waikato-Tainui Raupatu Claims (Waikato River) Settlement Act 2010. The negotiations are providing Māori with increased opportunities for involvement and decision-making over important natural and biological resources through both the return of land to Māori ownership, and co-management and relationship agreements between Māori and the Crown, leading to increased roles in environmental management (www.waitangi-tribunal.govt.nz/).

Arrangements to enable iwi and hapū to participate in the management of specific habitats and species are evolving. A range of mechanisms exist, including formal advisory input into management plans via advisory committees and statutory co-governance arrangements, which have tended to emerge almost exclusively from Treaty settlements. The number of these management arrangements is fluid, as the gathering pace of Treaty settlements is increasing the variety and number of protocols and arrangements. Examples of these management arrangements include:

- Ngāti Toa: Strategic Advisory Group over Kapiti Island.
- Ngāti Pahauwera: Regional Planning Committee with Council.
- Te Tau Ihu settlements: Eight iwi are established in an iwi-led River and Freshwater Advisory Committee.
- Ngāti Porou: Commitment to co-author a section/place of the Conservation Management Strategy.
- Tamaki Makaurau Collective: Tupuna Maunga o Tamaki Makaurau Authority, with 50% iwi and 50% Auckland Council representation, the Authority will be responsible for 13 volcanic cone reserves around Auckland.

Co-governance arrangements also exist but are comparatively rare. As part of the settlement with Tūhoe, Te Urewera National Park will have a new legal identity established, and have its governance and management arrangements set out in its own Act of Parliament.

Business engagement

Māori control up to 37% of New Zealand's domestic fishing quota. Māori own two of the top five fisheries companies—Aotearoa Fisheries Limited and Ngāi Tahu Fisheries Settlement Limited—as well as a 50% shareholding in the third largest company, Sealord Limited. Māori also control a

considerable stake of New Zealand's aquaculture industry. Māori currently own at least 14% of the land underlying plantation forests, and Māori forestry ownership will continue to increase through further afforestation of suitable Māori-owned land and through ongoing Treaty settlements. For example, in 2008 the Crown returned 176,000 hectares of Crown forest licence land worth \$196 million to seven central North Island iwi.

Funds

The Waikato-Tainui Raupatu Settlement Act 2010 created the Waikato River Authority. The purpose of this Authority is to fund rehabilitation initiatives in its role as trustee for the Waikato River Clean-up Trust. The Trust is responsible for administering a Clean-up Fund of \$220 million over 30 years. Biodiversity protection and restoration is a specific priority for the Waikato River Clean-up Trust, and most of the projects administered by the Trust involve an element of pest control, habitat restoration, nutrient load reduction, and/or water quality improvement. It is therefore anticipated that the bulk of the \$12 million has, or will have, positive biodiversity outcomes. \$6 million was made available for projects in 2010/11, and a further \$6 million will be available for 2012/13. Biodiversity protection is a specific priority in the Waipa River catchment and above the Karapiro Dam to the Huka Falls.

The Waikato River Authority also supports projects specifically identified as Mātauranga Māori. In the 2011/12 funding round, the Authority spent \$279,280 on four projects based on preserving Mātauranga Māori.

An important initiative to support the conservation and sustainable use of biodiversity on Māori-owned land in ways that enable the retention of tino rangatiratanga (ownership and control) is through the Nga Whenua Rahui fund. As at 30 June 2012 there were:

- 198 sites and 166,395 hectares under legal protection via Nga Whenua Rahui;
- Sign off of six kawenata/agreements covering 2,220 hectares; and
- 19 applications covering 2,414 hectares at an advanced stage.

Collaborative interagency work on pest control is also undertaken. For example, feral goat operations were carried out at nine sites covering 31,776 hectares, possum operations were carried out at three sites covering 11,781 hectares using ground-control methods, and multi-species pest control programmes (targeting mustelids, rodents, and possums) were undertaken at three sites totalling 3,358 hectares.

Education

A significant concern for some Māori is the increasingly rapid loss of traditional knowledge both of individuals who retain knowledge, and of communities who still hold remnant understandings that relate back to earlier times when people had traditional lifestyles in which they were more immersed in the natural world. For example, the majority of species that were traditionally used for rongoa (medicine) are found in the regenerating fringe of the bush, where their primary role is often to heal the landscape and prepare the way for more permanent species to follow. However, they are often very palatable and, because of where they grow, are often supplanted by more vigorous exotic species. As a result, many of these species are becoming increasingly difficult to find. Consequently, many traditional healers are unable to access the plants they need for their rongoa and so, in many cases, the range of species used by healers is diminishing because fewer and fewer species are now available. If the plants, or access to the plants, is lost, then the mātauranga relating to those plants will also be lost. Uses can be recorded, but the knowledge and experience involved in preparing and administering the rongoa are less likely to be maintained. Māori knowledge of harore (fungi) was documented by Fuller et al. (2004), who showed that Māori today recognise 13 species, eight of which are used as food, and the remainder for medicine, fire-carrying, and as an environmental indicator. Unfortunately, many of the 183 collated Māori fungal names can no longer be linked to distinct species or to traditional uses of these fungi. As with plants, this knowledge resided with past elders and is now lost.

The understanding of the connections between Mātauranga Māori, western science, and resource and environmental management has expanded significantly in recent years. General education about Mātauranga Māori is now available in the secondary and tertiary education system. Massey University offers a Postgraduate Diploma in Māori Resource and Environmental Management, Victoria University of Wellington offers a major in Māori Resource Management as part of its Bachelor of Arts in Environmental Studies programme, and Lincoln University includes a paper on Mana Kaitiaki

(Māori Resource Management) as part of its Master of Environmental Policy, as well as papers in Māori Resource Management and Te Kaitiakitaka (Māori Environmental Management).

The Mataranga Kura Taiao Fund was set up to 'preserve, protect and promote the use of traditional Māori knowledge and practices in biodiversity management'. In 2011/12, the Fund spent \$552,000 on 59 projects. One example is the WaiMāori Stream Care Programme, which aims to research and develop community awareness of freshwater protection, and to involve tikanga Māori and ensure that traditional methods of mahinga kai are retained.

Biodiversity research has been made more accessible to Māori by partial translation of some Landcare Research scientific publications, such as the bilingual popular summary for most of the 70-volume invertebrates series 'Fauna of New Zealand / Ko te Aitanga Pepeke o Aotearoa', and the bilingual preface and abstract for the five-volume series 'The Fungi of New Zealand / Ngāa Harore o Aotearoa'. In addition, some biodiversity websites are bilingual, including the very popular illustrated site 'What is this bug? He aha tēnei pepeke?'

(www.landcareresearch.co.nz/resources/identification/animals/bug-id-Māori/te-akaaka).

Specific tools have been developed that recognise and value biodiversity and ecosystems that are of importance to iwi. Some examples include:

- GIS databases recording nohanga (traditional food gathering sites), with wāhi tapu (sacred) sites restricted to protect their cultural significance and to ensure that access is retained by iwi only;
- A Cultural Health Index for Streams and Waterways (www.mfe.govt.nz/publications/water/cultural-health-index-jun03/cultural-health-index-jun03.pdf);
- Māori methods and indicators for marine protection (www.doc.govt.nz/Documents/science-and-technical/sap238.pdf); and
- Māori indicators for wetland health (www.kaikoura.govt.nz/docs/Council%20Documents/otherdocs/trk_appendix_2.pdf).

Overseas support

The New Zealand Aid Programme's 'Environmental and Social Impacts Operational Policy' (www.aid.govt.nz/sites/default/files/Environmental%20and%20Social%20Impacts%20Operational%20Policy_0.pdf) and associated guidelines aim to ensure that New Zealand supports development activities that conserve and strengthen the environment, and that environmental risks are managed and mitigated. The guidelines specifically identify 'local customary practice' as an area to be considered for potential adverse impacts. Furthermore, it ensures that activities, where appropriate, 'seek to conserve and strengthen the environment and communities through: enhancing the quality and conservation value of critical habitats', amongst other things.



Target 19

By 2020, knowledge, the science base and technologies relating to biodiversity, its values, functioning, status and trends, and the consequences of its loss, are improved, widely shared and transferred, and applied.

The 2010 International Year of Biodiversity was used as an opportunity to promote biodiversity and ecosystem services in New Zealand. There is cross-agency discussion about the provision of a whole-of-government biodiversity information portal or Clearing House Mechanism. New Zealand is a member and significant contributor of data to the Global Biodiversity Information Facility, though our GBIF National Node is not yet established.

New Zealand Inventory of Biodiversity: In 2012, New Zealand became the first country to catalogue all known living and fossil species, from 530 million years ago to today. The three-volume 1,758-page work 'New Zealand Inventory of Biodiversity' offers a first full review of the country's entire known species of animals, plants, fungi, and microorganisms—more than 56,200 living and 14,700 fossil species covering all environments. The inventory, which was led and edited by Dennis Gordon of NIWA, was an international effort involving 237 specialists from 19 countries, and took over a decade to complete.

Biological collections: The scientific evidence base for biodiversity (and biosecurity) research is secured by a range of curated biological collections. Many of these are designated by central government as Nationally Significant, and funded in part by separate ‘backbone funding’ acknowledging their scientific and cultural relevance nationally and internationally. Principal holders of these nationally significant biological collections are NIWA and Landcare Research. In addition, the Museum of New Zealand Te Papa Tongarewa and regional museums also hold invaluable collections of specimens of diverse organism groups.

Yet-to-be-recorded biodiversity: Specialists associated with the biological collections are active in documenting the unrecorded biodiversity of New Zealand. For certain groups, including invertebrates and fungi, less than 50% of the expected diversity has been recorded. In addition to the 56,200 living species recorded in the recent New Zealand Inventory of Biodiversity, estimates of unrecorded living species range from 62,000 to 66,000 (Gordon 2009–2012).

New Zealand Organisms Register: Greatly improved access to biodiversity information is being achieved through a nationwide initiative that links and regularly updates national biodiversity databases covering different organism groups. The New Zealand Organisms Register (NZOR; www.nzor.org.nz/Home) was initiated by Landcare Research in 2006, and has been developed with support from the Terrestrial and Freshwater Biodiversity Information Systems Programme (TFBIS) and a consortium including data providers (Crown Research Institutes and museums) and government agencies (e.g. Department of Conservation, Ministry for Primary Industries). Organism names are principal identifiers and provide the fundamental vocabulary by which we discover, index, manage, and share information relating to biodiversity. Access to an authoritative list of names and their relationships to species (taxa) is key to supporting information management and sharing across the conservation, biodiversity, and biosecurity sectors.

New Zealand is progressively implementing a national system to monitor and report on biodiversity as part of an ongoing programme to develop a nationally-consistent and cohesive approach to managing biodiversity across all of the country’s land and waters. This system was designed by the Department of Conservation and Landcare Research

(www.landcareresearch.co.nz/publications/researchpubs/report_extract_inventory_monitoring.pdf). It applies a systematic approach that is based on three different layers of information that operate at different scales with varying levels of detail and coverage: Tier 1—Broad-scale monitoring for a national context; Tier 2—Nationally-consistent monitoring of managed places and species on land, freshwater, and in the ocean to report on management effectiveness; Tier 3—Intensive, targeted monitoring for research and evaluation (www.doc.govt.nz/documents/science-and-technical/drds338entire.pdf).

The Biodiversity Monitoring and Reporting System will provide consistent and comprehensive information about biodiversity across public conservation lands and, with the participation of New Zealand’s other biodiversity managers, has the ability to deliver the full New Zealand picture. It will:

- Provide a foundation of sound data to better inform effective management planning and policy development.
- Improve understanding and reporting on the health of New Zealand’s biodiversity and trends in ecological integrity.
- Reduce reliance on anecdotal evidence and expert advice by delivering factual evidence to inform decisions and report on progress towards outcomes.
- Improve comparability between projects and allow assessment of interventions.
- Help to further identify what work should be focused on.
- Help New Zealand to meet national and international reporting requirements.

Access to new, regularly updated, and more easily shared biodiversity data will result in better decisions and outcomes that support the healthy environment New Zealand needs for its economic and social wellbeing.

New Zealand’s Parliamentary Commissioner for the Environment (PCE) has powers to investigate environmental issues, processes, and public agencies, and to provide independent advice on any matters that may have an impact on the quality of the environment to Parliament and a wider public audience. Current priorities are climate change, electricity, water management, biodiversity, transport fuel, mining, and environmental agencies and processes. The PCE office recently released a report explaining the science of water quality to help people better understand, discuss, and debate the issues around freshwater quality—a very high profile issue in New Zealand (see www.pce.parliament.nz/assets/Uploads/PCE-Water-Quality-in-New-Zealand.pdf). The report seeks to

explain why different types of pollutants cause various effects and, in doing so, provides an understanding of how interventions might improve or protect water quality.

New Zealand has eight universities: University of Auckland, Auckland University of Technology, University of Waikato, Massey University, Victoria University of Wellington, University of Canterbury, Lincoln University, and University of Otago. Each university has significant teaching and research capability, as well as international standing in biodiversity and related sciences.

In addition, Centres of Research Excellence are based across these institutions; these are inter-institutional research networks, within which researchers work together on commonly agreed work programmes. Research centres with a biodiversity science base include:

- Joint Graduate School in Plant & Food Science, Centre for Biodiversity and Biosecurity and Ngā Pae o te Māramatanga—New Zealand's Centre of Indigenous Research Excellence – University of Auckland
- Institute for Applied Ecology New Zealand - Auckland University of Technology
- Waterways Centre for Freshwater Management – University of Canterbury
- Isaac Centre for Nature Conservation and Centre for Wildlife Management and Conservation - Lincoln University
- Centre for Study of Agriculture, Food and Environment – University of Otago
- Centre for Biodiversity and Restoration Ecology – Victoria University of Wellington
- Lake Ecosystem Restoration New Zealand and Centre for Biodiversity and Ecology Research – University of Waikato
- Ecological Economics Research New Zealand and Allan Wilson Centre for Molecular Ecology and Evolution -Massey University

There are seven Crown Research Institutes that are owned by the New Zealand Government and which undertake science relevant to New Zealand and transfer that knowledge into society. These are autonomous companies and employ more than 4,000 people throughout New Zealand. Many are involved in biodiversity research. For example, Landcare Research's Biodiversity and Conservation team works on a range of projects aimed at protecting terrestrial biodiversity in New Zealand, and mitigating the impacts of invasive species on the natural environment and productive sector. Their core skills and capability fall into three key areas: biodiversity management, invasive species management, and molecular biology

Following engagement with the science sector and the public through The Great NZ Science Project, ten National Science Challenges were launched in 2013 to take a more strategic approach to government investments in science, which brought scientists together from different institutions and across disciplines to achieve a common goal through collaboration. \$73.5 million will be spent over 4 years to fund these challenges. The challenges with a biodiversity aspect are:

- New Zealand's biological heritage—protecting and managing our biodiversity, improving our biosecurity, and enhancing our resilience to harmful organisms
- Our land and water—research to enhance primary sector production and productivity, while maintaining and improving our land and water quality for future generations
- Life in a changing ocean—understanding how we can exploit our marine resources within environmental and biological constraints
- The deep south—understanding the role of the Antarctic and the Southern Ocean in determining our climate and our future environment
- Science for technological innovation—enhancing the capacity of New Zealand to use physical and engineering sciences for economic growth
- Resilience to nature's challenges—research into enhancing our resilience to natural disasters

New technologies are being developed to effectively control predators and to protect New Zealand's biodiversity by collaborations between government agencies, universities, Crown Research Institutes, and private companies. For example, a targeted stoat toxin, PAPP (paraaminopropiophenone), is being developed with pesticide manufacturer Connovation. This is a red blood cell toxicant that kills humanely and selectively, and which does not persist in carcasses, eliminating the risk of secondary poisoning. Research continues into toxins that target the gut of possums to minimise risks to other species, and into other alternative toxins, including encapsulated cyanide, cholecalciferol, diphacinone, and zinc phosphide. Scientists are developing vaccines to block fertility in possums and disrupt stoat breeding cycles, with current research investigating mechanisms for vaccine delivery. Goodnature has developed a range of innovative self-setting traps targeting stoats, rats, and

possums, whereby a small gas cartridge triggers and then resets the trap up to 12 times, delivering a more efficient trap.

Early this year, New Zealand Birds Online, a digital encyclopaedia of New Zealand birds, was launched to provide information, images, and sound files for all New Zealand bird species, including fossils. It was developed by The Museum of New Zealand Te Papa Tongarewa, Birds New Zealand (the Ornithological Society of New Zealand), and the Department of Conservation.

	<p>Target 20 By 2020, at the latest, the mobilization of financial resources for effectively implementing the Strategic Plan for Biodiversity 2011-2020 from all sources, and in accordance with the consolidated and agreed process in the Strategy for Resource Mobilization, should increase substantially from the current levels. This target will be subject to changes contingent to resource needs assessments to be developed and reported by Parties.</p>
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Public funds

The annual 'Vote Conservation' and 'Vote Environment' appropriations provide the best approximation of the amount of central government funding that has been spent on implementing the Strategic Plan for Biodiversity 2011–2020 (Table 19). However, they also cover more than biodiversity, only describe public funding at the central government level, and do not include private resources. Other Votes that support the implementation of the policies discussed within this document include 'Vote Primary industries', which supports the implementation of the forestry components of the NZETS and the grants schemes in Target 15, and 'Vote Science and Innovation', which supports the National Science Challenge.

The Vote Conservation appropriation covers both natural and historic resources, as well as recreation facilities. It includes items such as:

- Working with communities to protect natural and historic resources;
- Services to control weed and animal pests on lands administered by the Department of Conservation in relation to regional pest management strategies;
- The protection and conservation management of historic heritage;
- Management of natural heritage, including the maintenance, restoration, and protection of ecosystems, habitats, and species;
- Recreational facilities and services, and the management of business concessions;
- Policy advice, services to the Minister of Conservation and statutory bodies, and provision of statutory planning;
- Identification and implementation of protection for natural and historic places, management services of natural and historic places, and funding for projects for the New Zealand Biodiversity funds; and
- Capital expenditure.

The Vote Environment appropriation is also broader than just biodiversity and includes items such as:

- Managing environmental obligations and programmes;
- Grants to third parties for domestic environmental management and education programmes, and contributions to international institutions;
- Improving the quality, flow, and availability of fresh water;
- Improving the resource management framework;
- Improving resource management, including management of the Exclusive Economic Zone;
- Improving the relationship with Māori;
- Reducing harm from natural, chemical, and biological hazards, and from waste;
- Third party investigations, management, and remediation services relating to contaminated sites;
- The development of a national carbon accounting system;
- Policy advice in relation to the domestic and international climate change programmes, and contributions to international programmes;
- The administration, implementation, and operation of the Emissions Trading Scheme, including the impairment of debt—note: a total of around \$171 million is for the allocation of New Zealand emission units to the New Zealand economy;

- The development and purchase of new software; and
- Ministerial servicing.

Table 19 Annual 'Vote Conservation' and 'Vote Environment' appropriations (source: www.treasury.govt.nz/budget/votehistory/envir/, downloaded November 2013)

Appropriation	2013/14 (\$000)	2012/13 (\$000)	2011/12 (\$000)	2010/11 (\$000)	2009/10 (\$000)
Vote Conservation Appropriation	\$444,013	\$446,139	\$437,800	\$404,684	\$399,392
Vote Environment Appropriation	\$315,671	\$480,095	\$105,436	\$122,660	\$109,976

Over the 2010/11 and 2011/12 financial years, the New Zealand Aid Programme contributed approximately NZ\$10 million to support biodiversity-related development assistance where addressing biodiversity was the principal outcome of the activity. Contributions towards these activities were primarily delivered through bilateral programmes and contestable funds such as the 'Partnership Fund' (with a focus in the Pacific). The Aid Programme has, for example, contributed to a Turtle Conservation project in several Pacific islands and to National Trust Ecotourism Projects in Fiji. The Aid Programme also supported a number of activities where biodiversity was a significant, but not the principal, component of the activity; for example, in relation to fisheries, ocean science, biosecurity, quarantine, and invasive species. Support was also provided to the 'Pacific Invasives Initiative' to assist capability building in several Pacific island countries. Beyond the Pacific, the Aid Programme delivered activities such as the Watershed Protection Programme in Aceh, Indonesia.

Other sources of funding

The New Zealand Government is aiming to mobilise financial resources for biodiversity from beyond public funds. To that end, in 2012/13, there was substantial growth in the number of commercial partnerships and engagement in conservation. Revenue from commercial partnerships increased by 59% from 2011/12, enabling a wide range of conservation work to be undertaken. The Department of Conservation's current major commercial partners are Air New Zealand, Dulux, Fonterra, Genesis Energy, Kathmandu, Mitre 10, and New Zealand Aluminium Smelters. The partnership with Air New Zealand supports new conservation programmes around the National Parks Great Walks network and provides transport during translocations of threatened species around the country. Individual conservation projects are also supported in partnership arrangements. For example, the Whio Recovery Programme is run in partnership with Genesis Energy and is showing impressive results—in 2012/13, more than 6,000 predator traps were set in whio breeding areas, with 312 ducklings fledging safely, which is up from 212 in 2011/12.

Community conservation groups (e.g. the Yellow-Eyed Penguin Trust) have also developed significant partnerships with commercial companies.

11. What has been the contribution of actions to implement the Convention towards the achievement of the relevant 2015 MDGs in New Zealand?

Target 7A: Integrate the principles of sustainable development into country policies and programs; reverse loss of environmental resources	
Proportion of land area covered by forest	In 2012, forests covered approximately 10.51 million hectares, or about 37.7%, of New Zealand's land area. Of this, about 6.3 million hectares are tall indigenous forest. Approximately 2.1 million hectares are planted forests of non-native species. Over 99.5% of timber harvest volume comes from commercial planted forests. Most of the indigenous forest area is contained within Crown conservation land, which is managed by the Department of Conservation for biodiversity conservation, natural heritage, and recreation purposes.
CO ₂ emissions, total, per capita and per \$1 GDP (PPP)	Emissions total in 2010, as per the inventory report published at the UNFCCC: PPP—573.8433 tonnes per million USD.

	Per capita—16.2758 tonnes per capita.
Consumption of ozone-depleting substances	2012: 342.78 Ozone depleting potential (ODP) tonnes of methyl bromide for quarantine or pre-shipment (QPS) fumigation purposes. 9.47 ODP tonnes of HCFCs.
Proportion of fish stocks within safe biological limits	Refer to data provided in Target 6.
Proportion of total water resources used	New Zealand's total freshwater resource has an estimated volume of 327,605 million cubic meters (Mm ³), comprising 497,885 Mm ³ of surface water and 614,720 Mm ³ of groundwater. A total of 27,000 Mm ³ /year was allocated for consumptive use in 2010 (Aqualinc 2010). It is estimated that approximately 65% of this allocated volume is utilised (ibid.). This represents 17,550 Mm ³ /year or 1.6% of the total water resource.
Target 7B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss	
Proportion of terrestrial and marine areas protected	Refer to data provided in Target 11.
Proportion of species threatened with extinction	Refer to data provided in Table 1.
Target 8D: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term	
<p>New Zealand contributes to debt relief initiatives through International Financial Institutions such as the World Bank, Asian Development Bank, and African Development Bank. This includes the provision of financial contributions to the Highly Indebted Poor Country (HIPC) Initiative (1996) and the Multilateral Debt Relief Initiative (MDRI) (2006).</p> <p>The New Zealand Aid Programme's focus on sustainable economic development recognises the importance of ensuring that the policies and activities we support take into account the interests of future generations, including the common vision that was agreed on at the 2012 UN Rio+20 Conference on Sustainable Economic Development.</p> <p>The New Zealand Aid Programme's approach is to integrate 'environment' as a cross-cutting issue across all activities in the Programme. We believe that this is the most effective way to manage environmental risks and to maximise opportunities, and we therefore look to design projects and programmes that benefit the environment (including tackling biodiversity loss).</p>	
Net ODA, total and to LDCs, as percentage of OECD/DAC donors' GNI	Net ODA in 2012 was \$US455.4 million or 0.28% of New Zealand's GNI. ODA to Least Developed Countries (LDCs) totalled \$US119.7 million.
Proportion of total sector-allocable ODA of OECD/DAC donors to basic social services (basic education, primary health care, nutrition, safe water, and sanitation)	16% of sector-allocable ODA in 2012 was directly targeted to basic social services (US\$40.2 million).
Proportion of bilateral ODA of OECD/DAC donors that is untied	93% of bilateral aid in 2011 was untied.

ODA received in small island developing States as proportion of their GNIs

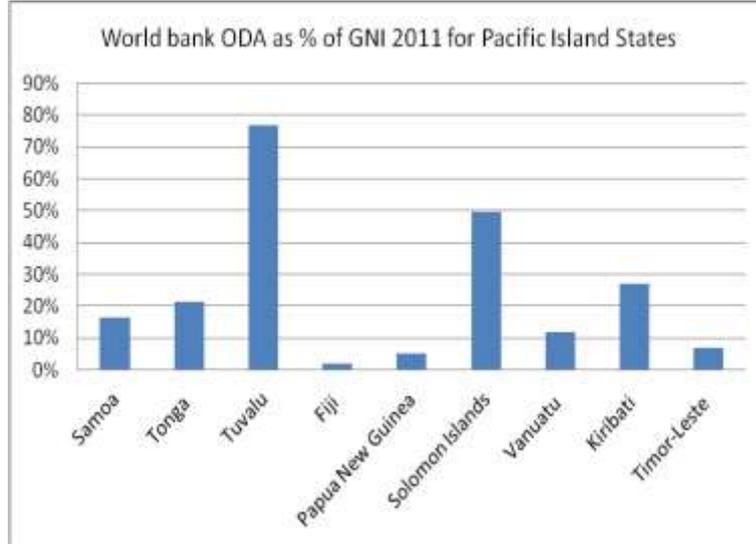


Figure 11 ODA received for Pacific Island States as a proportion of their GNIs

Proportion of total developed country imports (by value and excluding arms) from developing countries and from LDCs, admitted free of duty

New Zealand has one of the lowest tariff profiles in the world. New Zealand's simple average Most Favoured Nation (MFN) tariff rate across all goods is 2.1%, whereas the world average is 9.45%. Similarly, New Zealand has very few behind the border barriers to trade. The support paid by the New Zealand Government to domestic agriculture producers is the lowest in the OECD.

LDCs have duty and quota-free access to New Zealand markets. Table 20 provides an overview of the proportion of NZ duty free imports from LDCs and developing countries for the year ending June 2013. Most tariffs have been aggregated up. Trade less than NZ\$ 1 million has been ignored, thereby underestimating the value of tariffs.

A significant amount of New Zealand trade with developing countries is within trade agreements. China, Malaysia, Thailand, Indonesia, the Philippines, Viet Nam, and Chile are classified as 'developing countries' and collectively account for about 27.5% of New Zealand's imports by value. The duties they face exporting to New Zealand are lower than MFN rates, under the New Zealand China Free Trade Agreement (FTA); the Australian, ASEAN, New Zealand FTA; and the Trans-Pacific Strategic Economic Partnership.

Table 20 Proportion of NZ duty free imports from LDCs and developing countries, year to June 2013

	Value imports NZ\$ million	Value tariffs NZ\$ million	Share duty free %
Developing ASEAN (not LDC)*	7,745.28	15.01	99.81
China	7,375.57	53.22	99.28
Chile	54.56	10.68	99.98
Other developing countries	1,735.02	62.10	96.42
Total developing countries	16,910.43	141.01	99.17
Total LDCs	555	0	100.00
Totals	17,465.43	153.32	99.12

* Indonesia, Thailand, Malaysia, the Philippines, and Viet Nam. Brunei is also excluded as it is neither an LDC nor a developing country.

LDCs and Developing Countries are based on the OECD 2012 / 2013 Development Assistance Committee (DAC) list of ODA recipients. MFN rates specified in the New Zealand Customs Working Tariff Document and trade values from Global Trade Atlas, years to June 2013.

Average tariffs imposed by

Table 21 New Zealand tariffs on agriculture, textiles, and clothing

developed countries on agricultural products, and textiles and clothing from developing countries		Value imports NZ\$ million	Value tariffs NZ\$ million	Estimated applied tariff %
	Agriculture			
	Developing ASEAN (not LDC)	173.49	0	0
	China	69.26	0	0
	Chile	12.28	0	0
	Other developing countries	197.14	0.97	0.49
	LDCs	8.43	0	0
	Textiles			
	Developing ASEAN (not LDC)	36.26	0.83	2.29
	China	112.77	0.90	0.80
	Chile	0.18	0.005	2.78
	Other developing countries	55.93	1.80	3.22
	LDCs	2.74	0	0
	Clothing			
	Developing ASEAN (not LDC)	111.53	4.65	4.17
	China	1,341.13	50.02	3.73
	Chile	0.07	0.003	4.29
	Other developing countries	132.60	10.44	7.87
	LDCs	55.98	0	0
	Total developing countries	2,242.64	76.79	3.36
	Total LDCs	67.15	0	0
	Totals	2,309.79	76.79	3.25
	These are estimated by dividing total applicable tariffs by total trade within each group of HS codes			
Agricultural support estimate for OECD countries as percentage of their GDP	The OECD Producer Support Estimate (PSE) indicates the annual value of payments made by a country to support domestic agricultural production. It is reported as a ratio of gross farm receipts. New Zealand's 2011 PSE was 0.79%, which is the lowest level of any OECD country (the OECD average 2011 PSE was 18.83%). As a share of GDP, New Zealand's 2011 PSE was 0.08% (approximately 168 million of 204,578 million).			
Proportion of ODA provided to help build trade capacity	22% of total ODA in 2012 was provided in sectors contributing to trade capacity (US\$98.3 million).			

12. What lessons have been learned from the implementation of the Convention in New Zealand?

The New Zealand Biodiversity Strategy (NZBS; DOC & MfE 2000) was adopted in 2000 and was intended to guide activities for CBD implementation over a 20-year timeframe. However, with the adoption in 2010 of the Strategic Plan for Biodiversity and the 2020 Aichi Biodiversity Targets, the Government has needed to initiate a process to refresh the NZBS to include these recent elements.

Implementation of the CBD needs to go far beyond what is included in the NZBS, however. By mainstreaming biodiversity into other policies and sectors, implementation can be progressed through other instruments on multiple fronts. Many of the instruments through which the CBD is implemented have been around for decades (e.g. the Resource Management Act 1991, Biosecurity Act 1993). However, new tools have needed to be developed that advance New Zealand's progress toward the

Aichi Biodiversity Targets, such as the Living Standards Framework developed by Treasury and establishment of the government-wide Natural Resource Sector group.

While managing biodiversity is a big challenge, New Zealand has made some large advances in the management of indigenous ecosystems, particularly in ridding conservation islands of introduced pests, but has also seen declines in other areas.

In the past 4 years, a surge of activity has been commenced to understand and map ecosystem services provided by our biological heritage, with a view to promoting better environmental, social, and economic outcomes. Just one example that will advance the understanding of ecosystem services is the recent launch of 'Ecosystem Services in New Zealand', edited by Landcare Research's Principal Scientist Dr John Dymond (Dymond 2014).

Biodiversity management in New Zealand and implementation of the Convention can only be successful if a collaborative approach is taken and government agencies, iwi, Crown Research Institutes, academia, and others all work together to achieved the desired outcomes.

Appendix I—Information concerning the reporting Party and preparation of the Fifth National Report

Summary of the participatory process followed in preparing the report, including information on stakeholders involved and material used as a basis for the report

This report was drafted by subject experts from central and local government across the Natural Resource Sector. Material was also provided by key experts from business/industry, non-government organisations, as well as the public.

The first step in the reporting process was to obtain data and initial responses to the key questions across the main topic areas by engaging with subject matter experts from central government, including the Department of Conservation, Ministry for Primary Industries, Ministry for the Environment, Te Puni Kokiri, Treasury, and Ministry of Foreign Affairs and Trade.

This was followed by targeted consultation with Māori, i.e. seeking input from iwi. Considerable interest was shown, though substantial input was hindered by the limited timeframe available for consultation.

Input from Crown Research Institute scientists, local government biodiversity advisors, and citizen scientists at non-governmental organisations was also incorporated into the report.

The final report was submitted to the Minister of Conservation for approval.

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Appendix II—Additional Resources

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