

>> New Zealand's Environmental Reporting Series



Our land 2018

DATA TO 2017

AT A GLANCE

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Our land at a glance

This is the first report focused solely on land in the environmental reporting series begun in 2015.

Our land 2018 reports on the state of the soil, and the state of indigenous biodiversity and ecosystems. The aim is to provide an overview of condition, and changes over time, to support decision-making at all levels of society.

This page presents a snapshot of the top-level findings. It is followed by an executive summary.

- **Land is fundamental to human life, and central to the environmental system we depend on.** The decisions we make and the actions we take affect not just the land, but also water, oceans, air and atmosphere, and the life they support.
- **There have been significant shifts in land use in the past two decades.** These include:
 - expansion in urban areas (a 10 percent increase between 1996 and 2012), and accompanying loss of some of our most versatile land
 - reduction in the area of land in agricultural production (7 percent decrease between 2002 and 2012)
 - increase in the proportion of farmland used for dairy (42 percent increase in area between 2002 and 2016), and a decrease in the area in sheep and beef (20 percent reduction between 2002 and 2016)
 - continued intensification of farming, including a shift in the past 15 years to higher stocking rates, especially for dairy.
- **The quantity and quality of soil are affected by erosion and intensification of agriculture:**
 - of the 192 million tonnes of soil estimated lost each year, 44 percent comes from exotic grassland
 - while five out of seven indicators of soil quality were largely within target range, two indicators present concern, as more than 48 percent of tested sites were outside target range for those properties
 - one indicator is for phosphorus content in soil, which when too high can have negative impacts on water quality; the second indicator is for macroporosity (which is part of the soil's physical status and when too low is an indicator of compaction), which can have negative impacts on water quality and production
 - sites under more intensive land uses, such as dairy, cropping and horticulture, and dry stock, were more frequently outside target range for these two soil quality indicators.
- **Indigenous biodiversity and ecosystems continue to be under threat:**
 - there was continued loss of indigenous land cover
 - coastal and lowland ecosystems continued to decline in extent
 - nearly 83 percent (285 of 344 taxa) of the land vertebrates classified in the threatened species system were either threatened or at risk of extinction, and the status of 11 species declined
 - predation and plant-eating by pests, as well as disease and weeds, continued to threaten indigenous biodiversity.
- **There is a bright spot for biodiversity – 20 bird species have improved conservation status.** The status improvement for more than half of these bird species was dependent on intensive conservation management.
- **There are significant gaps in the data that limit the analysis in this report.** Filling these gaps would support better decision-making. This is particularly important for our key economic asset – the soil, and the underlying environmental services that biodiversity and ecosystems provide.

Executive summary

What is at stake – why do soil and biodiversity and ecosystems matter?

The biodiversity and ecosystems above and below the ground sustain every aspect of life in Aotearoa New Zealand. They provide our life-support systems and the foundation of our economy and society.

Land underpins the country's top two export earners: primary production and tourism. In 2016, land-based primary production (agriculture, horticulture, and forestry) earned \$35.4 billion (half of the country's total export earnings of \$70.9 billion), while international tourism expenditure in New Zealand was \$14.7 billion. In the same year, land-based primary production's share of total gross domestic product (GDP) was 3.7 percent, while tourism's share was 5.7 percent.

Land ecosystems are central to all human life: they provide air, water, and food for survival, and insulate us from natural forces such as flood and fire. The land is important for other aspects of being human too: it provides a connection to place and history, and a space we play and learn in. It is where we define culture, express spirituality, and anchor memory and identity.

These together make up the 'ecosystem services': benefits that people derive from the natural world. This is a dependency clearly expressed in te ao Māori: a world view "defined by relationships between people, land, water, flora, fauna, and inhabitants of the spiritual world – all bound together in a web of mutual responsibility" (Waitangi Tribunal, 2011). This has a central tenet, that human well-being is directly connected to the state of the land:

Te toto o te tangata he kai, te oranga o te tangata he whenua.

While food provides the blood in our veins, our health is drawn from the land.

Aotearoa New Zealand's biodiversity has particular significance. Many of our indigenous species, particularly our animals, come from old lineages. A large proportion of these indigenous species are endemic – they are internationally distinctive and important to global biodiversity. If these species are lost to the world, they cannot be replaced.

The most recent survey of our land cover shows that just under half of the land area is covered by natural cover types like indigenous forest, tussock grassland, scrub and shrubland, as well as water bodies, and bare ground. The other half is made up of modified land cover types such as exotic forests and grasslands, cropland, and urban areas. What is known about the condition of these areas, and how they have changed over time, is summarised in the next section.

The current state of biodiversity and ecosystems, and the soil

The findings of the *Our land 2018* report show that the state of our biodiversity and ecosystems and our soil resources is continuing to decline.¹

¹ The selection of the report's top findings was based on these criteria: spatial scale of impact to natural systems; magnitude of change; scale of impact on culture, recreation, health, and the economy; and irreversibility or long-lasting effects of change.

Indigenous biodiversity and ecosystems continue to be under threat

- There is continued loss of indigenous land cover. Between 1996 and 2012 there was a net loss of 31,000 hectares of tussock grassland, 24,000 hectares of indigenous shrubland, and around 16,000 hectares of indigenous forests, through clearance, conversion, and development. Although these areas represent a small proportion of each land cover type, the ongoing loss continues to threaten indigenous biodiversity.
- Coastal and lowland ecosystems that were once widespread (including wetlands) continue to decline in extent. Almost two-thirds of New Zealand's rare and 'naturally uncommon' ecosystems are threatened.
- Of the taxa that are assessed in New Zealand's threat classification system, nearly 83 percent (285 of 344 taxa) of indigenous land-based vertebrates are either threatened or at risk of extinction. This affects taonga species.
- The conservation status of seven bird species, three gecko species, and one species of ground wētā is worsening. The conservation status of 20 bird species is improving – more than half of them are dependent on intensive conservation management.
- Except for some offshore islands and fenced sanctuaries, exotic pests are found almost everywhere in New Zealand. Predation and plant-eating by pests, as well as disease and competition from weeds, continue to threaten indigenous biodiversity.



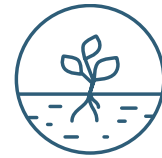
The quantity and quality of soils are affected by erosion and intensifying agriculture

- New Zealand has naturally high rates of erosion, due to a combination of steep terrain, rock and soil types, and climate. Erosion can be accelerated when tree cover is removed. Erosion models comparing soil loss to water with land cover types show 44 percent of the soil that enters our rivers each year comes from pasture (exotic grassland). This is equivalent to 84 million tonnes of soil out of the 192 million tonnes estimated lost each year.
- Soil monitoring programmes in 11 regions across the country between 2014 and 2017² show that results for 83 percent or more of tested sites were within target range for five of the seven indicators (pH, total carbon, total nitrogen, mineralisable nitrogen, bulk density). However, the remaining two indicators give reason for concern.



² These programmes are run by 12 of the 16 regional and unitary councils in New Zealand. In this reporting period only 11 councils provided data for analysis.






- More than 48 percent of tested sites were outside the target range for two indicators of soil quality: phosphorus content (an indicator of soil fertility) and macroporosity (a measure of how many pore spaces there are in the soil, which is an indicator of the soil's physical status).
- Of tested sites, 33 percent had soil phosphorus levels that were too high. Excess phosphorus can travel into waterways through erosion and run-off, where it can trigger growth of unwanted plants and reduce water quality.
- Of tested sites, 44 percent were below the target range for the macroporosity soil indicator (indicating soil compaction). Soil compaction makes soil less productive, and can reduce soil biodiversity and restrict plant growth. As compaction impedes drainage, it can also result in increased greenhouse gas emissions from urine on soils, and an increased amount of phosphorus and eroded soil reaching waterways.
- Sites under more intensive land uses, such as dairy, cropping and horticulture, and dry stock, were more frequently outside the target range for these two soil quality indicators. In particular, 51 percent of tested dairy sites had excess soil phosphorus and 65 percent of tested dairy sites were below the target range for macroporosity. Some horticultural and cropping sites also had high phosphorus levels (37 percent) and low macroporosity levels (39 percent). Drystock sites also had low macroporosity levels (41 percent).



The state of the land is central to the wider environmental system

Changes to the state of the soil or biodiversity and ecosystems have major effects on other parts of the environmental system. This is particularly the case 'downstream' in freshwater and marine environments, but also in air and atmosphere. The connections and interdependencies within indigenous ecosystems are central to the life-giving services they provide, and declines in biodiversity reach across all aspects of the physical environment. The close interrelationship between different environmental 'domains' is illustrated by the wider effects of changes in soil quantity and quality.

Environmental impacts of soil degradation

				
Land	Fresh water	Marine	Atmosphere & climate	Air
Soil quality changes can put added pressure on indigenous plant species and raise opportunities for invasive species.	Water quality and the ecological health of rivers, streams, and lakes can be degraded when eroded sediment, contaminants, and nutrients enter waterways.	A reduction in survival rates of many species and the loss of important marine habitats occurs when eroded sediment reaches estuarine and coastal areas.	Soil is a major carbon sink. Land use change can cause the soil carbon stock to increase or decrease, especially if there is a disturbance of the topsoil as in agriculture and production forestry. When a land use change decreases the soil carbon stock, carbon dioxide, a greenhouse gas, is emitted to the atmosphere. When a land use change increases the soil carbon stock, carbon is removed from the atmosphere.	Dry, bare soil can be eroded by wind, suspending particles in the air and causing respiratory issues, dust nuisance, and loss of fertile soil.
Erosion damages infrastructure such as fencing and roads on farms, and when it occurs, can cause significant impacts to roads, housing, and infrastructure (such as water pipelines).	Compacted soils are often slow draining, which can lead to more sediment and nutrients moving off the land and affecting waterways.		Soil carbon is an indicator of soil organic matter, which is important in supplying and retaining nutrients for plants and farm production and reducing the amount of nutrients leached to water.	
Erosion reduces the amount and quality of soil, leading to reductions in plant and animal productivity.	Sediment that enters waterways can build up in river channels leading to an increased flooding hazard and risk to infrastructure such as bridges.		We have limited understanding of the relationship between erosion and the storage/release of carbon.	
Reductions in soil quality can limit plant growth leading to reductions in animal productivity.			Soils that are wet or compacted are likely to have increased emissions of nitrous oxide, a greenhouse gas.	

What is putting pressure on our land

Human use of land has always had an impact on the environment. What has changed in our lifetime is the extent and intensity of this impact as population increases and technology and society change.






Our land 2018 presents a view of measurable change in the pressures that affect soil and biodiversity and ecosystems. The findings reflect the pressures of human activity in combination with the physical processes of geology and climate. In 2018, the accentuating effects of major earthquakes and climate change have particular relevance.

To gain a view of the overall pressures on land, and on the soil in particular, *Our land 2018* focuses on recent changes in land use (changes in extent, activity type, or intensity), across these major land use types: conservation, forestry, agriculture, and urban. It also reports on three pressures that can have concentrated effect at specific points: mineral extraction, waste, and contamination.

To understand the decline in indigenous biodiversity and ecosystems *Our land 2018* looks at the effects of human activities in terms of habitat loss, habitat degradation, and species loss. The focus is on changes in the extent and distribution of indigenous land cover and ecosystems; and the effects of habitat fragmentation; and pests, weeds, and disease.

These pressures on land can have a compounding effect, as in many wetland areas. Wetland ecosystems continue to decline in extent, after already declining to about 10 percent of their pre-human extent. This habitat loss can result in habitat degradation through fragmentation. Fragmentation can increase the proportion of vulnerable 'edge habitats' and can also result in species isolation, making populations more vulnerable to chance events.

Our human activities, accentuated by recent natural disasters and climate change, are putting pressure on soil and indigenous biodiversity and ecosystems

- While there has been little change in the total exotic grassland area between 2002 and 2012, there was a reduction in the total agricultural land in the same period. The total area recorded in the Agricultural Production Census dropped from approximately 13.4 million hectares in 2002 to about 12.6 million hectares in 2012, a decrease of 7 percent, mainly in pastoral farming land for sheep and beef. 
- Overall, the main shifts in land cover between 1996 and 2012 were from exotic grassland and shrubland to exotic forest, some conversion in the opposite direction, and a 10 percent expansion of urban land. Cropland expanded in area between 1996 and 2002 and more so between 2002 and 2008. 
- Agricultural intensification includes a shift in the past 15 years to higher stocking rates (especially for dairy). 
- At the same time, land under dairy increased to 2.6 million hectares in 2016 (42 percent increase from 2002) and the area under sheep and beef farming decreased to 8.5 million hectares (a 20 percent drop). This shift from sheep and beef farming to dairy farming was most pronounced in Canterbury and Southland.
- Urban expansion is reducing the availability of some of our most versatile productive land. Studies based on changes in land cover indicate that between 1990 and 2008, 29 percent of new urban areas were on some of our most versatile land. Fragmentation can also be a pressure on urban fringes: in 2013, lifestyle blocks occupied 10 percent of New Zealand's most versatile land. This may block future options for agricultural production.
- Change in land cover, historic and recent, is a key pressure on our biodiversity and ecosystems. The remaining indigenous vegetation cover is mostly in hilly and mountainous areas, with only small fragments in lowland and coastal environments. This is not representative of the full range of indigenous ecosystems and habitats.
- Pressures from human activity and exotic invasive species can degrade habitat quality, through modification and fragmentation – making indigenous species more vulnerable to the effects of pests, weeds, and diseases. 
- Predatory animals (particularly rodents, mustelids, and possums) are a major cause of species decline. Browsing animals (including possums, deer, and goats) can damage indigenous forest, and invasive insects and weeds can out-compete indigenous species. Diseases, such as kauri dieback and myrtle rust, also pose a serious threat to biodiversity. 
- Earthquakes, particularly those in Canterbury and Marlborough in the last decade, have had long-lasting impacts across those regions and nationally. The earthquakes have had profound effects on individual and community well-being, landforms, natural systems, and built infrastructure, and have created substantial economic and land management challenges.

- Climate change is already affecting New Zealand’s land systems. We can expect severe effects on land and human systems from long-term changes and increased frequency of intense rainfall events. These effects include challenges to productive systems (shifts in the suitability of land for horticulture and agriculture), pressure on indigenous ecosystems (with exacerbated impacts from pest invasions), increased vulnerability to erosion, sedimentation of waterways, and wildfires, through increased risk of rainfall and drought events.
- Rising sea levels and related storm surges will increase the frequency, severity, and extent of coastal flooding and erosion, while also threatening low-lying infrastructure, cultural sites, and habitats. They may also increase the risk of seawater intrusion to groundwater.



The report has only a partial view of changes in the extent and intensity of other key human activities that put pressure on soil and biodiversity and ecosystems (including tourism, mineral extraction, waste disposal, and contamination of land). These are described, but the lack of national datasets to support reporting of change over time precludes the report reaching specific findings in these areas (see below).

What we need a clearer view of

The Environmental Reporting Act 2015 requires the Ministry for the Environment and Stats NZ to report on the **state** of the environment, the **pressures** affecting its state, and how these **impact** on aspects of environmental and human well-being. The impacts considered include ecological integrity, public health, economy, te ao Māori (the Māori world view), culture, and recreation.

There are significant gaps in data coverage, consistency, and scale that limit the analysis in *Our land 2018*. These gaps also limit the options available to better represent current and future pressures, change over time, and links between state and impact, as well as a more complete range of impacts. The data gaps are outlined in the Data sources and limitations section in the full report.

Find out more

Read the [full report](#). See [Environmental indicators Te taiao Aotearoa: Land](#) on Stats NZ’s website.

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