Food and Agriculture Organization of the United Nations

Global Forest Resources Assessment 2020

Report

New Zealand

Rome, 2020

FAO has been monitoring the world's forests at 5 to 10 year intervals since 1946. The Global Forest Resources Assessments (FRA) are now produced every five years in an attempt to provide a consistent approach to describing the world's forests and how they are changing. The FRA is a country-driven process and the assessments are based on reports prepared by officially nominated National Correspondents. If a report is not available, the FRA Secretariat prepares a desk study using earlier reports, existing information and/or remote sensing based analysis.

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Introduction

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Introductory text

Historical context

When people first arrived in New Zealand (c. 750 years ago) forests covered over 80% of the landscape – all but the tops of the mountains and the most poorly drained of the lowlands. Today, only about a third of this native forest remains, concentrated mainly in mountainous and hilly areas.

During the first century of European settlement the clearance of native forests was so rapid that in 1918 the New Zealand Government placed restrictions on exports of indigenous timber, and in 1925 introduced financial incentives to create exotic plantations to reduce the pressure on native forests. Mass plantings of radiata pine in the 1920s and 1930s, and again in the 1960s, created a plantation forestry industry that is able to supply New Zealand's domestic timber needs and earn substantial export revenue.

In 1986–87 the Government's forest assets were split between the Department of Conservation (to manage protected native forests) and the New Zealand Forestry Corporation (to manage plantation forestry operations). This ring-fenced most of New Zealand's native forests for conservation and restricted the commercial harvesting of indigenous timber. Most of the corporation's forests have since been sold to commercial interests. There have been fluctuations in the area of exotic plantations over the past two decades, driven mainly by a shift to more profitable agricultural land uses such as dairying, and the introduction of the New Zealand Emissions Trading Scheme. In 2018 the Government announced a goal to double current rates of tree planting to deliver one billion trees by 2028. This will be achieved through a range of regulatory and non-regulatory tools and incentives that encourage new afforestation.

In recent years there have also been changes in the status of forest land managed for conservation. This includes a shift to a new kind of management regime between the Department of Conservation (DOC) and indigenous tribal groups (iwi). Joint land management for conservation purposes has been explored since 2005. A ground-breaking agreement in 2014 transferred 213,000 hectares of largely forested land in the former Te Urewera National Park, to a joint DOC-iwi governing board.

Biodiversity

New Zealand’s indigenous forests are characterised by a high degree of endemism. The large number of animal and plant species which have been deliberately or inadvertently introduced since European settlement continue to modify New Zealand forest ecosystems. While the major biodiversity losses associated with early human settlement have been stemmed, indigenous biodiversity has continued to decline over the last century. New technologies for reducing or eradicating mammalian pests are creating opportunities to reintroduce endangered flora and fauna to areas they formally occupied. The government has recently committed to ridding the country of key mammalian pest species (rats, mustelids and Australian brushtail possums) by 2050, and there are ongoing investigations into ways to combat other pest species.

Pests and diseases

Historically, very few insect pests have caused problems in New Zealand pine plantations. The most important diseases affecting pines are needle cast (*Cyclaneusma*), needle blight (*Dothistroma*), root rot (*Armillaria*) and fluke canker (*Neonectria*). Eucalypt plantations are more affected with at least 50 percent damaged by insect pests (mainly *Paropsis* beetle) and leaf spot fungi. Indigenous forests have seen a significant increase in detections of kauri dieback (*Phytophora agathidicida*) over the last few years. This disease has the potential to severely affect large areas of native forest in the upper North Island. The recent arrival of myrtle rust (*Austropuccinia psidii*) is also a cause for concern as Myrtaceous species are prominent in some native forest ecosystems and form the basis of the lucrative manuka honey industry.

A large area of New Zealand hill country is affected by the uncontrolled spread of introduced conifers. In 2007 the area affected was estimated at c. 805,000 hectares in the South Island, and 300,000 hectares in the North Island. Recent estimates indicate that the area affected is now c. 1.7 million hectares and is increasing at c. 5 percent per annum. Wilding conifers invade native ecosystems and cause habitat loss for indigenous plant and animal species. They threaten iconic tourist landscapes, reduce water yields, and increase the risk of wild fires. A National Wilding Conifer Control Programme established in 2016 aims to minimise the negative impacts of wilding conifers and ensure their management and control is timely and cost-effective.

Soil and water

Much of the indigenous forest on New Zealand’s mountain and hill country has historically been referred to as “protection forest”. This reflects the naturally unstable nature of the terrain, and the important role that forests play in soil and water conservation. These forests are considered to have a strong slope-stabilising influence during low intensity storms, but are less effective at providing stability when natural erosion processes combine with high-intensity storm events. Some planted

forests have been established for soil and water conservation purposes, although in most cases this is not the primary management objective.

New Zealand has legislative mechanisms, through the Resource Management Act 1991 and the Forests Act 1949, that address activities that may have adverse effects on soil and water resources. All commercial forest management must meet the requirements of these Acts. About 25 percent of indigenous forests and 16 percent of planted forests are on land with a moderate to high risk of soil erosion.

Biomass and carbon

As part of its commitment to the United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol, New Zealand has developed a Land Use and Carbon Analysis System (LUCAS) which reports carbon pools and fluxes across all forests annually from 1990. Forest carbon (and therefore biomass) stocks have increased steadily since 1990.

Productive capacity

The standing volume (growing stock) of exotic planted forests has increased steadily over recent decades and is projected to reach 780 million cubic metres by 2020. Recent estimates suggest that the standing volume of naturally regenerating indigenous forests has declined slightly over this period. Planted forest estimates are updated annually in the National Exotic Forest Description (NEFD). There is no consolidated assessment of indigenous plantation area or standing volume. New Zealand's forest estate supports a number of smaller industries that are unrelated to timber production. These are described in the following section.

Socio-economic benefits

The New Zealand forest industry makes a significant contribution to the country's Gross Domestic Product through forestry and logging, and wood and wood products. Forests are also important to the country's tourism and recreation industry. Nature-based tourism activities are among the principal attractions for overseas visitors, and an increasing number of communities now rely on the employment generated by this sector. A number of small to medium-scale industries also rely upon the forest estate. These include bee keeping which produces several mono-floral honeys based on tree species, game hunting and possum trapping, and sphagnum harvesting. While most are not important at a national scale, they make a significant contribution to the economic activity of some local communities. The extent of these activities is often difficult to quantify.

Research and development

New Zealand has a long history of high-quality forest research by Crown Research Institutes and universities. Research and technologies to sustain plantation forest management are extensive and continue to be developed. For the indigenous conservation estate research is focused on biodiversity and management of threats from introduced pests.

Central government is the principal source of research and development funding. There are numerous research consortiums, research providers and industry arrangements. Most government agencies are organised by functional groupings rather than around a specific sector or industry. This makes it difficult to quantify the value of the forest component of government expenditure.

Employment

The forestry sector is a significant employer in its own right and creates downstream opportunities for further processing and support services. The wide geographical spread of the forest estate means employment opportunities exist throughout much of the country. The number of forestry jobs has declined over the last decade due to a combination of increasing productivity, restructuring within the sector and changes in market and foreign exchange conditions. Government intentions for a substantial increase in forestry plantings over the next few years may well reverse this trend. Safety in forestry, particularly associated with harvesting, has become a more prominent issue in recent years and the industry has been taking steps to improve its safety record.

Recreation and tourism

Fostering the recreational use of New Zealand's conservation lands is one the key roles performed by the Department of Conservation. The Department manages nearly 80 percent of New Zealand's indigenous forests and provides recreational opportunities for all ability and fitness levels. Private interests have an opportunity to provide recreational activities within the conservation estate through a formal concession system. New Zealand's larger plantation companies also provide opportunities for public access, allowing people to undertake activities ranging from hunting and horse trekking to hiking and mountain biking. Access is normally via a permit system, which allows forestry operations to continue in conjunction with recreational activities.

Legal, institutional and economic framework

New Zealand has a well-established and robust legal framework supporting the sustainable management of resources, including forests. It includes the Resource Management Act (RMA) 1991, Conservation Act 1987, Forests Act 1949, and Biosecurity Act 1993. The Treaty of Waitangi, which was signed in 1840, recognises the rights of Māori and their partnership with the Crown. Sustainable resource use in New Zealand seeks to balance the adverse effects of an activity on the environment against the requirement for the sustainable use of the resource. The legislative and economic frameworks mean that investment decisions are largely market driven.

The New Zealand Government is open to foreign investment, and regulations are liberal by international standards. The Overseas Investment Act 2005 regulates overseas acquisitions in New Zealand land and significant business interests. The Act was amended in 2018 to provide for a simplified screening pathway for investment in forestry land, or bare land for conversion to forestry. It also introduced a new screening requirement for overseas investment in forestry rights and other profits a prendre which provide an interest in the land. The property transfer system provides a high level of certainty for land owners and prospective purchasers. This has been a significant factor in New Zealand attracting forestry investment over the past 25 years, both for new plantings and the acquisition of existing land and forest assets. New Zealand has a very low incidence of corruption. Enforcement of forest laws continues to be a high priority for government agencies.

Information to support public participation in forest-related decision making is available for the commercial plantation sector and the conservation estate. A range of legislatively based and semi-formal mechanisms provide for public input to decision-making processes on resource management. Dispute resolution processes exist in some situations.

Summary

The forestry and timber processing industries are important components of regional economic activity, but there are relatively few communities where the sector is the major employer. In most regions forestry occurs in conjunction with pastoral production and other forms of economic activity, such as tourism and primary sector (e.g. dairy) processing. New Zealand's forestry and timber processing communities have seen significant change over recent decades, with

- the corporatisation and sale of the Crown's commercial forests and processing assets
- commercial pressures driving productivity and performance improvements, and rationalisation of businesses
- the replacement of labour with capital and technology
- fluctuating log and timber prices, which have seen corresponding fluctuations in harvesting activity and log exports.

Conservation forestry also faces several challenges, namely the need to

- balance the pressure from extractive industries to access resources on conservation land against the biodiversity losses that tend to accompany these activities,
- balance the increasing revenues being received from tourism-related activities against the risk that increasing visitor numbers will degrade the environment, and
- find new ways of reducing pest and weed species to protect and enhance the endemic flora and fauna that are a key selling point for New Zealand's image.

Information sources

Ministry for the Environment and Stats NZ 2018. New Zealand's Environmental Reporting Series: Our land 2018. Available from www.mfe.govt.nz and www.stats.govt.nz.

Ministry for Primary Industries 2015. Sustainable management of New Zealand's Forests. New Zealand's third country report on the Montreal Process criteria and indicators. Available from www.mpi.govt.nz.

New Zealand Forest Owners Association website. www.nzfoa.org.nz. (Accessed August 2018)

1 Forest extent, characteristics and changes

1a Extent of forest and other wooded land

National data

Data sources

1990	**References**	Ministry for the Environment 2018. New Zealand's Greenhouse Gas Inventory 1990-2016. Available from: http://www.mfe.govt.nz/publications/climate-change/new-zealands-greenhouse-gas-inventory-1990%E2%80%932016 Land Cover Database (LCDB) version 4.1 Available from: https://www.landcareresearch.co.nz/resources/data/lris LUCAS NZ Land Use Map 1990 2008 2012 (v018) Available from: https://data.mfe.govt.nz/layer/52375-lucas-nz-land-use-map-1990-2008-2012-v018/ Wiser SK, Hurst JM, Wright EF, Allen RB. 2011. New Zealand's forest and shrubland communities: a quantitative classification based on a nationally representative plot network. Applied Vegetation Science 14:506–523. Subdivision of the natural forest area into tall forest and regenerating forest
	Methods used	Full-cover forest/vegetation maps
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Classifications and definitions

1990	National class	Definition
	Planted forest	Forests planted in exotic tree species predominantly grown for wood and wood fibre and at least 1 ha in extent. In New Zealand approximately 90% of the area is planted in Pinus radiata. The area reported is the gross stocked forest area which generally includes mappable gaps such as roads, landings, and areas within forest boundaries that are not planted in exotic forest. Harvested areas awaiting replanting are included. All forests in this class will meet or exceed 30% canopy cover and 5 metres in height at maturity.
	Naturally regenerating forest	Includes Natural forest – tall forest and Natural forest – regenerating forest
	Natural forest - tall forest	

		Areas of natural forest at least 1 ha in extent that are dominated by tall indigenous forest canopy species. All forests in this class exceed 30% canopy cover and 5 metres in height.
	Natural forest - regenerating forest	Areas of natural forest at least 1 ha in extent that will meet or exceed the forest thresholds (≥ 30% canopy cover and 5 metres height) at maturity.
	Shrubland	Areas of naturally regenerating woody vegetation at least 1 ha in extent that are not expected to meet or exceed the forest thresholds at maturity. Woody vegetation in this class meets 'Other Wooded Land' thresholds.

	National class	**Definition**
2000	Planted forest	Forests planted in exotic tree species predominantly grown for wood and wood fibre and at least 1 ha in extent. In New Zealand approximately 90% of the area is planted in Pinus radiata. The area reported is the gross stocked forest area which generally includes mappable gaps such as roads, landings, and areas within forest boundaries that are not planted in exotic forest. Harvested areas awaiting replanting are included. All forests in this class will meet or exceed 30% canopy cover and 5 metres in height at maturity.
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2015	Planted forest	Forests planted in exotic tree species predominantly grown for wood and wood fibre and at least 1 ha in extent. In New Zealand approximately 90% of the area is planted in Pinus radiata. The area reported is the gross stocked forest area which generally includes mappable gaps such as roads, landings, and areas within forest boundaries that are not planted in exotic forest. Harvested areas awaiting replanting are included. All forests in this class will meet or exceed 30% canopy cover and 5 metres in height at maturity.
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Original data and reclassification

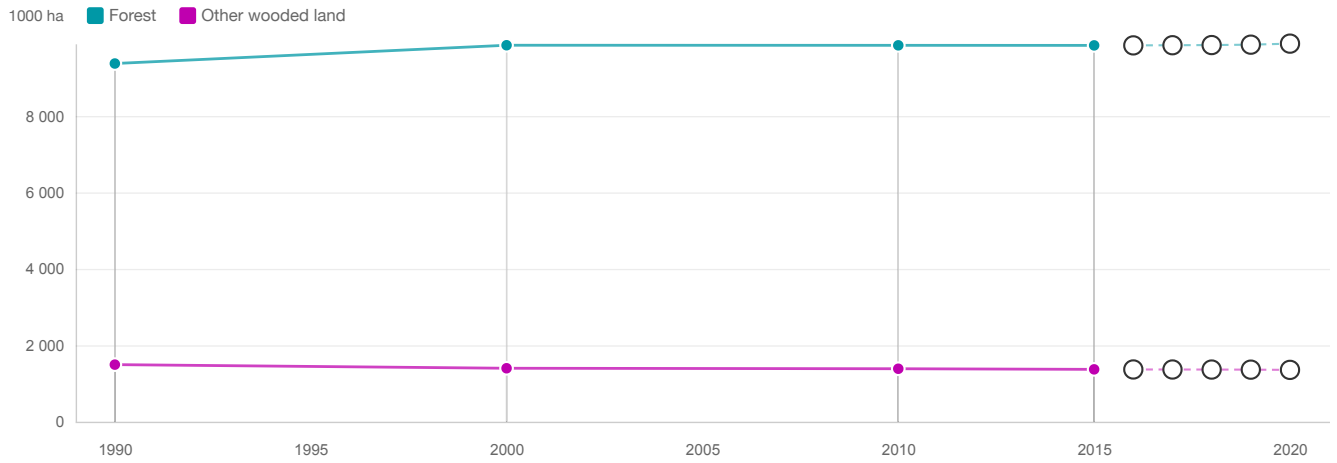
1990	**Classifications and definitions**		**FRA classes**		
	Class	**Area (1000 ha)**	**Forest**	**Other wooded land**	**Other land**
	Planted forest	1 531.12	100.00 %	%	**%**
	Naturally regenerating forest		100.00 %	%	**%**
	Natural forest - tall forest	6 593.22	100.00 %	%	**%**
	Natural forest - regenerating forest	1 247.93	100.00 %	%	**%**
	Shrubland	1 494.19	%	100.00 %	**%**
	Total	**10 866.46**	**9 372.27**	**1 494.19**	**0.00**

	Classifications and definitions		FRA classes		
	Class	**Area (1000 ha)**	**Forest**	**Other wooded land**	**Other land**
2000	Planted forest	2 025.12	100.00 %	0.00 %	**0.00 %**
	Naturally regenerating forest		100.00 %	0.00 %	**0.00 %**
	Natural forest - tall forest	6 586.10	100.00 %	0.00 %	**0.00 %**
	Natural forest - regenerating forest	1 239.22	100.00 %	%	**%**
	Shrubland	1 399.22	%	100.00 %	**%**
	Total	**11 249.66**	**9 850.44**	**1 399.22**	**0.00**

	Classifications and definitions		FRA classes		
	Class	**Area (1000 ha)**	**Forest**	**Other wooded land**	**Other land**
2010	Planted forest	2 024.32	100.00 %	0.00 %	**0.00 %**
	Naturally regenerating forest		100.00 %	0.00 %	**0.00 %**
	Natural forest - tall forest	6 579.25	100.00 %	0.00 %	**0.00 %**
	Natural forest - regenerating forest	1 244.55	100.00 %	%	**%**
	Shrubland	1 386.48	%	100.00 %	**%**
	Total	**11 234.60**	**9 848.12**	**1 386.48**	**0.00**

2015	Classifications and definitions		FRA classes		
	Class	**Area (1000 ha)**	**Forest**	**Other wooded land**	**Other land**
	Planted forest	2 025.10	100.00 %	0.00 %	**0.00 %**
	Naturally regenerating forest		100.00 %	0.00 %	**0.00 %**
	Natural forest - tall forest	6 577.49	100.00 %	0.00 %	**0.00 %**
	Natural forest - regenerating forest	1 244.02	100.00 %	0.00 %	**0.00 %**
	Shrubland	1 370.39	0.00 %	100.00 %	**0.00 %**

	Total	**11 217.00**	**9 846.61**	**1 370.39**	**0.00**


1000 ha
Forest
Other wooded land
8 000
6 000
4 000
2 000
0
1990
1995
2000
2005
2010
2015
2020

FRA categories	Area (1000 ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Forest (a)	9 372.27	9 850.44	9 848.12	9 846.61	9 846.75	9 850.85	9 855.15	9 865.52	9 892.59
Other wooded land (a)	1 494.19	1 399.22	1 386.48	1 370.39	1 367.47	1 366.57	1 365.22	1 362.66	1 356.70
Other land (c-a-b)	**15 464.54**	**15 081.34**	**15 096.40**	**15 114.00**	**15 116.78**	**15 113.58**	**15 110.63**	**15 102.82**	**15 081.71**
Total land area (c)	**26 331.00**	**26 331.00**	**26 331.00**	**26 331.00**	**26 331.00**	**26 331.00**	**26 331.00**	**26 331.00**	**26 331.00**

The FAOSTAT land area figure for the year 2015 is used for all reference years

Climatic domain	% of forest area 2015	Override value
Boreal	**0.00**	12.63
Temperate	**52.00**	66.28
Sub-tropical	**48.00**	16.89
Tropical	**0.00**	4.20

Comments

Land Use Maps (LUM)

The LUCAS NZ Land Use Map (LUM) is composed of New Zealand-wide land use classifications (12) nominally at 1 January 1990, 1 January 2008 and 31 December 2012 (known as "1990", "2008" and "2012"). These date boundaries were dictated by the First Commitment Period of the Kyoto Protocol. The layer can therefore be used to create either a 1990, 2008 or 2012 land use map depending on what field is symbolised.

Land Cover Data Base (LCDB)

The New Zealand Land Cover Database (LCDB) is a multi-temporal, thematic classification of New Zealand's land cover. It contains 33 mainland classes. Geographic features are described by a polygon boundary, a land cover code, and a land cover name at each of four nominal time steps; summer 1996/97, summer 2001/02, summer 2008/09, and summer 2012/13. The data set is designed to complement in theme, scale and accuracy, Land Information New Zealand’s 1:50,000 topographic database.

Extrapolation to 2020

Estimates for 2017-2020 were prepared by Ministry for Primary Industries staff and the LUCAS team at the Ministry for the Environment. These take into account the New Zealand government’s new goal to plant one billion trees in the next 10 years – between 2018 and 2027.

Difference with data used for FRA 2015

The New Zealand Ministry for the Environment has revised the time series data for forest area since FRA 2015.

1b Forest characteristics

National Data

Data sources + type of data source eg NFI, etc

References to sources of information	Additional comments
Ministry for the Environment 2018. New Zealand's Greenhouse Gas Inventory 1990-2016.	Available from: http://www.mfe.govt.nz/publications/climate-change/new-zealands-greenhouse-gas-inventory-1990%E2%80%932016
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National classification and definitions

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Shrubland	Areas of naturally regenerating woody vegetation at least 1 ha in extent that are not expected to meet or exceed the forest thresholds at maturity. Woody vegetation in this class meets 'Other Wooded Land' thresholds.

Original data

Forest area estimates in the FRA 2020 report were obtained from the LUCAS NZ Land Use Map (LUM) used to calculate carbon estimates for the national greenhouse gas inventory (Ministry for the Environment 2018). This partitions forest land into planted forest and natural forest. The latter includes all naturally regenerating woody communities that meet the forest land criteria. While most natural forests are indigenous, a small proportion is dominated by self-seeding exotic conifer (pine, fir) and/or broadleaved (poplar, willow) species. Subdivision of the natural forest area into tall forest and regenerating forest was achieved using the Wiser et al. 2011 plot classifications.

National Class	Forest area (1000 ha)				
	1990	2000	2010	2015	2016
Planted forest	1539.93	2036.77	2035.96	2036.75	2037.51
Naturally regenerating forest	7886.27	7870.33	7868.81	7866.50	7865.89
Total forest	9426.20	9907.10	9904.77	9903.25	9903.40

Analysis and processing of national data

Estimation and forecasting

Forest area estimates were adjusted to accommodate the difference in area between the land use maps (LUM) (26 925 “000” ha) and the official country area for New Zealand, as reported by Land Information New Zealand (LINZ). LINZ is the government agency responsible for measuring and providing official land area information in New Zealand. This coincides with the New Zealand country data in FAOSTAT (26 771 “000” ha).

Forecast estimates for 2017-2020 were prepared by Ministry for Primary Industries staff and the LUCAS team at the Ministry for the Environment. These take into account the New Zealand government’s new goal to plant one billion trees in the next 10 years – between 2018 and 2027.

National Class	Forest area (1000 ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Planted forest	1531.12	2025.12	2024.32	2025.10	2025.86	2047.63	2052.61	2062.00	2084.48
Naturally regenerating forest	7841.16	7825.32	7823.80	7821.51	7820.90	7803.22	7802.54	7803.52	7808.10
Total forest	9372.28	9850.44	9848.12	9846.61	9846.76	9850.85	9855.15	9865.52	9892.58

Reclassification into FRA 2020 categories

FRA 2020 categories	Forest	Other wooded land	Other land
	%	%	%
Planted forest	100	0	0
Naturally regenerating forest	100	0	0


1000 ha
Naturally regenerating forest
Plantation forest
Other planted forest
6 000
4 000
2 000
0
1990
1995
2000
2005
2010
2015
2020

FRA categories	Forest area (1000 ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Naturally regenerating forest (a)	7 841.16	7 825.32	7 823.80	7 821.51	7 820.90	7 803.22	7 802.54	7 803.52	7 808.10
Planted forest (b)	**1 531.12**	**2 025.12**	**2 024.32**	**2 025.10**	**2 025.86**	**2 047.63**	**2 052.61**	**2 062.00**	**2 084.48**
Plantation forest	1 531.12	2 025.12	2 024.32	2 025.10	2 025.86	2 047.63	2 052.61	2 062.00	2 084.48
…of which introduced species	1 531.12	2 025.12	2 024.32	2 025.10	2 025.86	2 047.63	2 052.61	2 062.00	2 084.48
Other planted forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total (a+b)	**9 372.28**	**9 850.44**	**9 848.12**	**9 846.61**	**9 846.76**	**9 850.85**	**9 855.15**	**9 865.52**	**9 892.58**
Total forest area	**9 372.27**	**9 850.44**	**9 848.12**	**9 846.61**	**9 846.75**	**9 850.85**	**9 855.15**	**9 865.52**	**9 892.59**

Comments

Land Use Maps (LUM)

The LUCAS NZ Land Use Map (LUM) is composed of New Zealand-wide land use classifications (12) nominally at 1 January 1990, 1 January 2008 and 31 December 2012 (known as "1990", "2008" and "2012"). These date boundaries were dictated by the First Commitment Period of the Kyoto Protocol. The layer can therefore be used to create either a 1990, 2008 or 2012 land use map depending on what field is symbolised.

Land Cover Data Base (LCDB)

The New Zealand Land Cover Database (LCDB) is a multi-temporal, thematic classification of New Zealand's land cover. It contains 33 mainland classes. Geographic features are described by a polygon boundary, a land cover code, and a land cover name at each of four nominal time steps; summer 1996/97, summer 2001/02, summer 2008/09, and summer 2012/13. The data set is designed to complement in theme, scale and accuracy, Land Information New Zealand’s 1:50,000 topographic database.

1c Primary forest and special forest categories

National Data

Data sources + type of data source eg NFI, etc

References to sources of information	Additional comments
Ministry for the Environment 2018. New Zealand's Greenhouse Gas Inventory 1990-2016.	Available from: http://www.mfe.govt.nz/publications/climate-change/new-zealands-greenhouse-gas-inventory-1990%E2%80%932016
Land Cover Database (LCDB) version 4.1	Available from: https://www.landcareresearch.co.nz/resources/data/lris
LUCAS NZ Land Use Map 1990 2008 2012 (v018)	Available from: https://data.mfe.govt.nz/layer/52375-lucas-nz-land-use-map-1990-2008-2012-v018/
National Exotic Forest Description (NEFD) – annual publication now produced by the Ministry for Primary Industries.	Available from: http://www.mpi.govt.nz/
Department of Conservation (2006, 2008, 2013, 2018). Land administered by the Department of Conservation.	GIS database layer – Area estimates for IUCN categories
Department of Conservation 2005. The application in New Zealand of the IUCN system of management categories for protected natural areas. 16 p.	Report prepared by the New Zealand Department of Conservation for the New Zealand Committee of IUCN and the New Zealand Conservation Authority.
Lovelock, C.E. et al. 2007.Mangrove growth in New Zealand estuaries: the role of nutrient enrichment at sites with contrasting rates of sedimentation. Oecologia 153: 633-641	

National classification and definitions

National Class	Definition
Planted forest	Forests planted in exotic tree species predominantly grown for wood and wood fibre and at least 1 ha in extent. In New Zealand approximately 90% of the area is planted in *Pinus radiata*. The area reported is the gross stocked forest area which generally includes mappable gaps such as roads, landings, and areas within forest boundaries that are not planted in exotic forest. Harvested areas awaiting replanting are included. All forests in this class will meet or exceed 30% canopy cover and 5 metres in height at maturity.
Naturally regenerating forest	Includes Natural forest – tall forest and Natural forest – regenerating forest
Natural forest – tall forest	Areas of natural forest at least 1 ha in extent that are dominated by tall indigenous forest canopy species. All forests in this class exceed 30% canopy cover and 5 metres in height.
Natural forest – regenerating forest	Areas of natural forest at least 1 ha in extent that will meet or exceed the forest thresholds (≥ 30% canopy cover and 5 metres height) at maturity.
Mangroves	Area of forest or shrubland with mangroves as the dominant or sole canopy cover.
Primary forest	Indigenous forest within protected areas that have as a main management objective to protect and preserve representative indigenous forest ecosystems (National Parks, Nature Reserves, and Scientific Reserves (IUCN categories Ia, Ib, II). Includes LCDB classes indigenous forest and broadleaved hardwood forest.
Nature reserve, scientific reserve	IUCN Category Ia – Strict Nature Reserve: protected area managed mainly for science.
Wilderness area	IUCN Category Ib – Wilderness Area: protected area managed mainly for wilderness protection.
National Park	IUCN Category II – National Park: protected area managed mainly for ecosystem protection and recreation

Original data

Bamboos - Not part of naturally regenerating forests in New Zealand. They are used for shelterbelts in northern New Zealand, but not at a scale that would require it to be reported here.

Mangroves - Data on the extent of mangrove forest and shrubland communities are available from the New Zealand Land Cover Data Base (LCDB) for the years 1996, 2001, 2008 and 2012.

National class	Area (000 ha)			
	1996	2001	2008	2012
Mangroves	28	28	28	28

Temporarily unstocked and/or recently regenerated forest – Forest land that doesn't currently meet the 10% tree cover threshold.

Planted forest

Data on the temporarily unstocked area in planted forests were obtained from the National Exotic Forest Description (NEFD). These estimates are for harvested areas that are currently awaiting replanting.

National Class	Forest area (1000 ha)				
	1990	2000	2010	2015	2016
Planted forest	24	39	55	54	50

Naturally regenerating forests

There are no national-scale data for the recently regenerated area in naturally regenerating forests.

Primary forest – Natural forest – tall forest areas within IUCN categories Ia, Ib and II are used to report Primary Forest. The extent of forest within each category was determined from the Land Cover Data Base (LCBD) maps. The estimates are based on GIS analysis of Department of Conservation land in 2006, 2008, 2013 and 2018. Comparable data are not available for earlier years.

National class	(Forest area (000 ha)			
	2006	2008	2013	2018
IUCN Category Ia	160	160	158	156
IUCN Category Ib	37	37	36	36
IUCN Category II	1947	1947	1966	1780
Total	2144	2144	2160	1972

Rubber wood

Not present in New Zealand

Analysis and processing of national data

Estimation and forecasting

Estimates for each of the reporting years were interpolated/extrapolated from the original data.

Mangroves

National class		Area (000 ha)			
	1990	2000	2010	2015	2020

Mangrove	28	28	28	28	28

Temporarily unstocked and/or recently regenerated forest

The NEFD data were scaled by 12.7% to enable them to be reported on a gross stocked area basis. The scaling factor was provided by the Land Use and Carbon Analysis System (LUCAS) team at the New Zealand Ministry for the Environment.

National Class	Forest area (1000 ha)				
	1990	2000	2010	2015	2020
Planted forest	27	45	62	61	51
Naturally regenerating forests	n.a.	n.a.	n.a.	n.a.	n.a.

Primary forest

National class	(Forest area (000 ha)				
	1990	2000	2010	2015	2020
IUCN Category Ia	166	162	159	157	155
IUCN Category Ib	39	38	37	36	36
IUCN Category II	1898	1927	1956	1780	1780
Total	2103	2127	2152	1973	1971

Reclassification into FRA 2020 categories

FRA 2020 categories	Forest	OWL	OL
	%	%	%
Mangroves	20	80	0
Temporarily unstocked and/or recently regenerated forests	100	0	0
Primary forest	100	0	0

FRA categories	Area (1000 ha)				
	1990	2000	2010	2015	2020
Primary forest	2 103.00	2 127.00	2 152.00	1 973.00	1 971.00
Temporarily unstocked and/or recently regenerated	27.00	45.00	62.00	61.00	51.00
Bamboos	0.00	0.00	0.00	0.00	0.00
Mangroves	28.00	28.00	28.00	28.00	28.00
Rubber wood	0.00	0.00	0.00	0.00	0.00

Comments

Mangroves

In New Zealand mangroves are found around the coasts of the northern half of the North Island. There is one species (*Avicennia marina*) which forms a shrub or small tree to 8m. Most mangrove communities however do not attain forest status. Whether this is the result of environmental constraints or human activity is not clear. Mangrove spread is by natural regeneration and has been attributed to increased sedimentation and nutrient availability in coastal and estuarine areas (Lovelock et al. 2007). Most mangrove areas are mapped by the LCDB as being off-shore (i.e. outside the land area).

Primary Forest

Natural forest – tall forest areas within IUCN categories Ia, Ib and II are used to report Primary Forest. These data are only available for publically-owned forests managed by the Department of Conservation. The increases reported between 1990 and 2010 are the result of areas of tall forest being added to the Conservation Estate. The reduction in primary forest between 2010 and 2015 is the result of the transfer of Te Urewera National Park to the Tūhoe iwi (tribe) as part of a Treaty of Waitangi settlement agreed between the government and the iwi. The former National Park is now managed by a board consisting of Department of Conservation and iwi representatives. Further information on the process can be obtained from https://www.govt.nz/dmsdocument/2707.pdf

1d Annual forest expansion, deforestation and net change

National Data

Data sources + type of data source eg NFI, etc

Land Cover Database (LCDB) version 4.1 Available from: https://www.landcareresearch.co.nz/resources/data/lris

LUCAS NZ Land Use Map 1990 2008 2012 (v018) Available from: https://data.mfe.govt.nz/layer/52375-lucas-nz-land-use-map-1990-2008-2012-v018/

National Exotic Forest Description (NEFD) – annual publication now produced by the Ministry for Primary Industries. Provides a detailed description of New Zealand's production forests. Available from: http://www.mpi.govt.nz/

Ministry for the Environment 2018. New Zealand's Greenhouse Gas Inventory 1990-2016. Available from: http://www.mfe.govt.nz/publications/climate-change/new-zealands-greenhouse-gas-inventory-1990%E2%80%932016

National classification and definitions

Planted forest	Forests planted in exotic tree species predominantly grown for wood and wood fibre and at least 1 ha in extent. In New Zealand approximately 90% of the area is planted in *Pinus radiata*. The area reported is the gross stocked forest area which generally includes mappable gaps such as roads, landings, and areas within forest boundaries that are not planted in exotic forest. Harvested areas awaiting replanting are included. All forests in this class will meet or exceed 30% canopy cover and 5 metres in height at maturity.
Naturally regenerating forest	Includes Natural forest – tall forest and Natural forest – regenerating forest
Natural forest – tall forest	Areas of natural forest at least 1 ha in extent that are dominated by tall indigenous forest canopy species. All forests in this class exceed 30% canopy cover and 5 metres in height.
Natural forest – regenerating forest	Areas of natural forest at least 1 ha in extent that will meet or exceed the forest thresholds (≥ 30% canopy cover and 5 metres height) at maturity.
Afforestation (new plantings)	Planting of trees for the primary purpose of producing wood or wood fibre on land that has not previously been used for growing planted production forests. Estimates based on data supplied by forest owners.
Deforestation	The conversion of forest land to a non-forest (usually agricultural) land use.

Original data

Planted forest

Estimates of forest expansion (afforestation) in planted forests are based on data from the National Exotic Forest Description (NEFD). Projections for 2018 and 2019 were obtained from the Ministry for Primary Industries.

National class	**Area (1000 ha)**										**Average (10-years)**
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	
Afforestation - new plantings (000 ha)	16	15	50	62	98	74	84	64	51	40	55

National class	**Area (1000 ha)**										**Average (10-years)**
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	
Afforestation - new plantings (000 ha)	34	30	22	20	11	6	3	2	2	4	13

National class	**Area (1000 ha)**					**Average (5-years)**
	2010	**2011**	**2012**	**2013**	**2014**	
Afforestation - new plantings (000 ha)	6	12	12	4	3	7

National class	**Area (1000 ha)**	**Average (5-years)**

	2015	2016	2017	2018	2019	
Afforestation - new plantings (000 ha)	3	2	4	13	30	10

Naturally regenerating forests

Estimates of forest expansion (natural expansion) in naturally regenerating forests are based on data from the New Zealand Greenhouse Gas inventory. Projections for 2018 and 2019 were obtained from the Ministry for the Environment.

National class	Area (1000 ha)										Average (10-years)
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	
Natural expansion (000 ha)	0.84	0.84	1.05	1.05	1.05	1.26	1.26	1.47	2.11	2.11	1.30

National class	Area (1000 ha)										Average (10-years)
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
Natural expansion (000 ha)	2.74	2.74	2.74	3.37	3.79	4.00	4.00	4.21	0.34	0.24	2.82

National class	Area (1000 ha)					Average (5-years)
	2010	2011	2012	2013	2014	
Natural expansion (000 ha)	0.30	0.29	0.33	0.27	0.35	0.31

National class	Area (1000 ha)					Average (5-years)
	2015	2016	2017	2018	2019	
Natural expansion (000 ha)	0.35	0.37	0.10	7.24	11.55	3.92

Analysis and processing of national data

Estimation and forecasting

Planted forests

The NEFD data were scaled by 12.7% to enable them to be reported on a gross stocked area basis. The scaling factor was provided by the Land Use and Carbon Analysis System (LUCAS) team at the New Zealand Ministry for the Environment.

National class	Area (1000 ha)										Average (10-years)
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	
Afforestation - new plantings (000 ha)	18	17	56	70	110	83	95	72	57	45	62

National class	Area (1000 ha)										Average (10-years)
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
Afforestation - new plantings (000 ha)	38	34	25	23	12	7	3	2	2	5	15

National class	Area (1000 ha)					Average (5-years)
	2010	2011	2012	2013	2014	
Afforestation - new plantings (000 ha)	7	14	13	5	3	8

National class	Area (1000 ha)					Average (5-years)

	2015	2016	2017	2018	2019	
Afforestation - new plantings (000 ha)	3	2	5	15	34	12

Naturally regenerating forests

Forest area estimates were adjusted to accommodate the difference in area between the land use maps (LUM) (26 925 “000” ha) and the official country area for New Zealand, as reported by Land Information New Zealand (LINZ). LINZ is the government agency responsible for measuring and providing official land area information in New Zealand. This coincides with the New Zealand country data in FAOSTAT (26 771 “000” ha).

National class	Area (1000 ha)										Average (10-years)
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	
Natural expansion (000 ha)	0.84	0.84	1.05	1.05	1.05	1.26	1.26	1.47	2.09	2.09	1.30

National class	Area (1000 ha)										Average (10-years)
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
Natural expansion (000 ha)	2.72	2.72	2.72	3.35	3.77	3.98	3.98	4.19	0.33	0.24	2.80

National class	Area (1000 ha)					Average (5-years)
	2010	2011	2012	2013	2014	
Natural expansion (000 ha)	0.29	0.28	0.33	0.27	0.35	0.30

National class	Area (1000 ha)					Average (5-years)
	2015	2016	2017	2018	2019	
Natural expansion (000 ha)	0.35	0.37	0.10	7.20	11.48	3.90

Reclassification into FRA 2020 categories

National class	Forest	OWL	OL
	%	%	%
Planted forest	100	0	0
Naturally regenerating forests	100	0	0
Other land	0	0	100

FRA categories	Area (1000 ha/year)			
	1990-2000	2000-2010	2010-2015	2015-2020
Forest expansion (a)	63.30	17.80	8.31	15.78
…of which afforestation	62.00	15.00	8.00	12.00
…of which natural expansion	1.30	2.80	0.31	3.90
Deforestation (b)	15.48	18.03	8.61	6.58
Forest area net change (a-b)	**47.82**	**-0.23**	**-0.30**	**9.20**

Comments

1e Annual reforestation

National Data

Data sources + type of data source eg NFI, etc

National Exotic Forest Description (NEFD) – annual publication now produced by the Ministry for Primary Industries. Available from: http://www.mpi.govt.nz/

National classification and definitions

Planted forest	Forests planted in exotic tree species predominantly grown for wood and wood fibre and at least 1 ha in extent. In New Zealand approximately 90% of the area is planted in *Pinus radiata*. The area reported is the gross stocked forest area which generally includes mappable gaps such as roads, landings, and areas within forest boundaries that are not planted in exotic forest. Harvested areas awaiting replanting are included. All forests in this class will meet or exceed 30% canopy cover and 5 metres in height at maturity.
Naturally regenerating forest	Includes Natural forest – tall forest and Natural forest – regenerating forest
Natural forest – tall forest	Areas of natural forest at least 1 ha in extent that are dominated by tall indigenous forest canopy species. All forests in this class exceed 30% canopy cover and 5 metres in height.
Natural forest – regenerating forest	Areas of natural forest at least 1 ha in extent that will meet or exceed the forest thresholds (≥ 30% canopy cover and 5 metres height) at maturity.
Reforestation (restocking)	Replanting of a planted production forest area that has been clear felled. Estimates based on data supplied by forest owners.

Original data

Planted forest

Net stocked estimates of reforestation in planted forests were obtained from the National Exotic Forest Description (NEFD). Projections for 2018 and 2019 were obtained from the Ministry for Primary Industries.

National class	**Area (1000 ha)**										**Average (10-years)**
	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	
Reforestation - restocking (000 ha)	22	22	21	25	25	25	28	30	30	30	26

National class	**Area (1000 ha)**										**Average (10-years)**
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	
Reforestation - restocking (000 ha)	36	36	40	38	40	32	34	35	31	33	39

National class	**Area (1000 ha)**					**Average (5-years)**
	2010	**2011**	**2012**	**2013**	**2014**	
Reforestation - restocking (000 ha)	35	44	45	41	41	41

National class	**Area (1000 ha)**					**Average (5-years)**
	2015	**2016**	**2017**	**2018**	**2019**	
Reforestation - restocking (000 ha)	40	41	45	47	47	44

Naturally regenerating forests

There are no national-scale data for reforestation in indigenous (naturally regenerating) forests. Reforestation in these forests is assumed to be nil.

Analysis and processing of national data

Estimation and forecasting

The NEFD data were scaled by 12.7% to enable them to be reported on a gross stocked basis. The scaling factor was provided by the Land Use and Carbon Analysis System (LUCAS) team at the New Zealand Ministry for the Environment.

Reforestation estimates for 2018-2019 were provided by the Ministry for Primary Industries.

Planted forest

National class	Area (1000 ha)										Average (10-years)
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	
Reforestation - restocking (000 ha)	26	25	24	28	28	28	32	34	34	34	29

National class	Area (1000 ha)										Average (10-years)
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
Reforestation - restocking (000 ha)	41	41	45	43	45	36	38	39	35	37	40

National class	Area (1000 ha)					Average (5-years)
	2010	2011	2012	2013	2014	
Reforestation - restocking (000 ha)	39	50	51	46	46	46

National class	Area (1000 ha)					Average (5-years)
	2015	2016	2017	2018	2019	
Reforestation - restocking (000 ha)	45	46	51	53	53	50

Reclassification into FRA 2020 categories

National class	Forest	OWL	OL
	%	%	%
Planted forest	100	0	0
Naturally regenerating forests	100	0	0
Other land	0	0	100

FRA categories	Area (1000 ha/year)			
	1990-2000	2000-2010	2010-2015	2015-2020
Reforestation	29.00	40.00	46.00	50.00

Comments

1f Other land with tree cover

National Data

Data sources + type of data source eg NFI, etc

Wardle, P. 1991. The vegetation of New Zealand. Cambridge University Press, Cambridge, UK. New Zealand indigenous species of palm.

Statistics New Zealand database (accessed May 2018). Tree orchard data

National classification and definitions

Tree orchards. Areas of planted woody vegetation at least 1 ha in extent grown for the production of fruits, nuts and olives. Tree orchards typically exceed 30% canopy cover, but rarely achieve 5 m height at maturity.

Original data

Palms - New Zealand has one indigenous species of palm, nikau (*Rhopalostylis sapida*), which is found in lowland coastal forests not subject to regular winter frosts. There are no palm species grown for commercial purposes.

Tree orchards - fruits, nuts, olives

Data for 2007, 2009, 2014 and 2017 were sourced from Statistics New Zealand. Data are not available for other years. The main crops grown are apples, avocados, citrus and olives. The data do not include kiwifruit which is a vine.

National class	(Area (1000 ha)			
	2007	2009	2014	2017
Tree orchards	22.34	21.68	20.08	20.25

Agroforestry

There are no national-scale data for this category

Trees in urban settings

There are no national-scale data for this category

Analysis and processing of national data

Estimation and forecasting

Tree orchards

Estimates for each of the reporting years were obtained by linear interpolation/extrapolation.

National class	(Area (1000 ha)				
	1990	2000	2010	2015	2020
Fruit, nut and olive orchards	26.04	23.76	21.49	20.36	19.22

Reclassification into FRA 2020 categories

FRA 2020 categories	Forest	OWL	OL
	%	%	%
Tree orchards	0	100	0

FRA categories	Area (1000 ha)				
	1990	2000	2010	2015	2020
Palms (a)	0.00	0.00	0.00	0.00	0.00
Tree orchards (b)	26.04	23.76	21.49	20.36	19.22
Agroforestry (c)					
Trees in urban settings (d)					
Other (specify in comments) (e)					
Total (a+b+c+d+e)	**26.04**	**23.76**	**21.49**	**20.36**	**19.22**
Other land area	**15 464.54**	**15 081.34**	**15 096.40**	**15 114.00**	**15 081.71**

Comments

2 Forest growing stock, biomass and carbon

2a Growing stock

National Data

Data sources + type of data source eg NFI, etc

Beets P.N., Kimberley, M.O., Goulding C.J., Garrett L.G., Oliver, G.R., Paul, T.S.H. 2009. Natural forest plot data analysis: carbon stock analyses and remeasurement strategy. Client Report No. 11455 prepared by the New Zealand Forest Research Institute Ltd (Scion) for the New Zealand Ministry for the Environment. 132 p. Standing volume estimates for tall indigenous forests, regenerating forests and shrublands.

Murphy G., Cown D. 2015. Within-tree, between-tree, and geospatial variation in estimated *Pinus radiata* bark volume and weight in New Zealand. New Zealand Journal of Forestry Science 454:18. DOI 10.1186/s40490-015-0048-5. Radiata pine bark accounts for 12-13% of the over-bark volume.

Ministry for the Environment 2018. New Zealand's Greenhouse Gas Inventory 1990-2016. Available from: http://www.mfe.govt.nz/publications/climate-change/new-zealands-greenhouse-gas-inventory-1990%E2%80%932016

Holdaway R.J., Easdale T.A., Mason N.W.H., Carswell F.E. 2014. LUCAS Natural Forest Carbon Analysis. Prepared by Landcare Research NZ Ltd for the New Zealand Ministry for the Environment. 48 p. Subdivision of LUCAS naturally regenerating forest plots into tall indigenous and regenerating forest classes.

National classification and definitions

National Class	Definition
Planted forest	Forests planted in exotic tree species predominantly grown for wood and wood fibre and at least 1 ha in extent. In New Zealand approximately 90% of the area is planted in *Pinus radiata*. The area reported is the gross stocked forest area which generally includes mappable gaps such as roads, landings, and areas within forest boundaries that are not planted in exotic forest. Harvested areas awaiting replanting are included. All forests in this class will meet or exceed 30% canopy cover and 5 metres in height at maturity.
Naturally regenerating forest	Includes Natural forest – tall forest and Natural forest – regenerating forest
Natural forest – tall forest	Areas of natural forest at least 1 ha in extent that are dominated by tall indigenous forest canopy species. All forests in this class exceed 30% canopy cover and 5 metres in height.
Natural forest – regenerating forest	Areas of natural forest at least 1 ha in extent that will meet or exceed the forest thresholds (≥ 30% canopy cover and 5 metres height) at maturity.
Shrubland	Areas of naturally regenerating woody vegetation at least 1 ha in extent that are not expected to meet or exceed the forest thresholds at maturity. Woody vegetation in this class meets 'Other Wooded Land' thresholds.
Standing volume (= Growing stock)	The total volume of wood contained in stems of all age classes (in cubic metres). For planted forests this includes all trees. For naturally regenerating forests all stems ≥ 2.5 cm diameter are included. New Zealand is unable to report growing stock for stems ≥ 10 cm diameter. For planted forests, the standing volume is measured under bark.

Original data

Data on the standing volume (= growing stock) were obtained from the Land Use and Carbon Analysis System (LUCAS) used for the national greenhouse gas inventory (MfE 2018). This reports carbon stocks and fluxes annually from 1990. The standing volume estimates are a bi-product of the carbon analysis.

1. Planted forest

Growing stock estimates are reported under bark for planted forests.

National class	Volume (million cubic metres)				
	1990	2000	2010	2015	2016
Planted forest (under bark)	274.86	424.16	585.10	647.86	659.09

1. Naturally regenerating forest, shrubland

Growing stock estimates (over bark) were obtained from the LUCAS natural forest and shrubland dataset (Beets et al. 2009). Subdivision of the naturally regenerating forest plots into tall forest and regenerating forest follows Holdaway et al. (2014). Average stem volumes were 486.5, 138.52 and 35.93 m^3/ha for tall forest, regenerating forest and shrubland respectively. Average stem volume (m^3/ha) was multiplied by forest/shrubland area (Question 1) to obtain the national estimate.

National class	Volume (million cubic metres)				
	1990	2000	2010	2015	2016
Natural forest – tall forest (over bark)	3207.76	3204.35	3200.95	3199.97	3199.97
Natural forest - regenerating forest (over bark)	172.87	171.63	172.46	172.32	172.32
Shrubland (over bark)	53.68	50.27	49.81	49.24	49.13

Analysis and processing of national data

Estimation and forecasting

Estimates for 2017-2020 were prepared by Ministry for Primary Industries staff and the LUCAS team at the Ministry for the Environment.

1. Planted forest

A multiplying factor of 1.14 was used to the convert the original (under bark) figures to an over bark estimate (Murphy & Cown 2015).

National class	Volume (million cubic metres)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Planted forest (over bark)	313.34	483.54	667.01	738.56	751.36	762.94	773.56	780.87	781.24

2. Tall indigenous forest, regenerating forest, shrubland

Growing stock estimates (over bark)

National class	Volume (million cubic metres)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Natural forest – tall forest (over bark)	3207.89	3204.43	3201.09	3200.24	3200.02	3199.92	3199.76	3199.60	3199.44
Natural forest - regenerating forest (over bark)	172.75	169.49	166.67	166.38	166.31	163.87	163.83	163.78	163.73
Shrubland (over bark)	53.68	50.28	49.82	49.25	49.14	49.10	49.05	48.96	48.74

Reclassification into FRA 2020 categories

FRA 2020 categories	Forest	OWL	OL
	%	%	%
Planted forest	100	0	0
Natural forest - tall forest	100	0	0
Natural forest - regenerating forest	100	0	0
Shrubland	0	100	0

FRA categories	Growing stock m³/ha (over bark)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Naturally regenerating forest	431.14	431.15	430.45	430.43	430.43	431.08	431.09	431.01	430.73
Planted forest	204.65	238.77	329.50	364.71	370.88	372.60	376.87	378.70	374.79
…of which plantation forest	204.65	238.77	329.50	364.71	370.88	372.60	376.87	378.70	374.79
…of which other planted forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forest	394.14	391.60	409.70	416.91	418.18	418.92	419.80	420.07	418.94
Other wooded land	35.93	35.93	35.93	35.93	35.93	35.93	35.93	35.93	35.93

FRA categories	Total growing stock (million m³ over bark)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Naturally regenerating forest	3 380.64	3 373.91	3 367.77	3 366.62	3 366.33	3 363.79	3 363.59	3 363.38	3 363.17
Planted forest	313.34	483.54	667.01	738.57	751.36	762.94	773.56	780.87	781.24
…of which plantation forest	313.34	483.54	667.01	738.57	751.36	762.94	773.56	780.87	781.24
…of which other planted forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forest	3 693.97	3 857.45	4 034.78	4 105.19	4 117.69	4 126.73	4 137.15	4 144.25	4 144.41
Other wooded land	53.68	50.27	49.81	49.24	49.13	49.10	49.05	48.96	48.74

Comments

In New Zealand all planted forest is plantation forest.

We recognise that there is a discrepancy between the growing stock and the biomass/carbon estimates for Natural forest – regenerating forest. The former declines over the reporting period while the latter increases. At the present time we don't have a way of addressing this discrepancy. The addition of growing stock estimates to the LUCAS inventory would probably be the best way to resolve this issue.

2b Growing stock composition

National Data

Data sources + type of data source eg NFI, etc

Goulding C.J. 2005. Measurement of trees. In: Colley M. (ed). Forestry Handbook. New Zealand Institute of Forestry. Conversion of merchantable volume to total standing volume.

Beets P.N., Kimberley, M.O., Goulding C.J., Garrett L.G., Oliver, G.R., Paul, T.S.H. 2009. Natural forest plot data analysis: carbon stock analyses and remeasurement strategy. Client Report No. 11455 prepared by the New Zealand Forest Research Institute Ltd (Scion) for the New Zealand Ministry for the Environment. 132 p. Standing volume estimates for native tree species.

Murphy G., Cown D. 2015. Within-tree, between-tree, and geospatial variation in estimated *Pinus radiata* bark volume and weight in New Zealand. New Zealand Journal of Forestry Science 454:18. DOI 10.1186/s40490-015-0048-5. For radiata pine, bark accounts for 12-13% of the over-bark volume.

Ministry for the Environment 2018. New Zealand's Greenhouse Gas Inventory 1990-2016. Available from: http://www.mfe.govt.nz/publications/climate-change/new-zealands-greenhouse-gas-inventory-1990%E2%80%932016

National Exotic Forest Description (NEFD) database, Ministry of Primary Industries (accessed June 2018). Standing volume estimates for introduced tree species.

National classification and definitions

National Class	Definition
Planted forest	Forests planted in exotic tree species predominantly grown for wood and wood fibre and at least 1 ha in extent. In New Zealand approximately 90% of the area is planted in *Pinus radiata*. The area reported is the gross stocked forest area which generally includes mappable gaps such as roads, landings, and areas within forest boundaries that are not planted in exotic forest. Harvested areas awaiting replanting are included. All forests in this class will meet or exceed 30% canopy cover and 5 metres in height at maturity.
Naturally regenerating forest	Includes Natural forest – tall forest and Natural forest – regenerating forest
Natural forest – tall forest	Areas of natural forest at least 1 ha in extent that are dominated by tall indigenous forest canopy species. All forests in this class exceed 30% canopy cover and 5 metres in height.
Natural forest – regenerating forest	Areas of natural forest at least 1 ha in extent that will meet or exceed the forest thresholds (≥ 30% canopy cover and 5 metres height) at maturity.
Standing volume (= Growing stock)	The total volume of wood contained in stems of all age classes (in cubic metres). For planted forests this includes all trees. For naturally regenerating forests all stems ≥ 2.5 cm diameter are included. New Zealand is unable to report growing stock for stems ≥ 10 cm diameter. For planted forests, the standing volume is measured under bark.

Original data

Estimates of the standing volume (= growing stock) of native tree species were obtained from Beets et al. 2009. This report analyses data from the LUCAS (Land Use and Carbon Analysis System) plot network which was established to provide carbon estimates for New Zealand's naturally regenerating forests (MfE 2018). Average per hectare values for the 10 most common native tree species were multiplied by the area of naturally regenerating forests.

Estimates of the standing volume (= growing stock) for the most common introduced tree species were obtained from the National Exotic Forest Description (NEFD) database maintained by the Ministry for Primary Industries. The NEFD reports merchantable volume. This was scaled by a factor of 1.18 to obtain an estimate of total standing volume (Goulding 2005).

1. Growing stock estimates reported under bark for planted forests.

FRA 2020 categories	Scientific name	Common name	Growing stock in forest (million m3 over bark)				
			1990	2000	2010	2015	2016
Introduced tree species							
#1	*Pinus radiata*	radiata pine	228.21	390.73	549.68	610.43	620.92
#2	*Pseudotsuga menziesii*	Douglas fir	23.17	16.82	17.10	19.12	19.76

#3		other exotic softwoods	18.88	9.00	8.84	9.13	9.32
#4		exotic hardwoods	4.60	7.60	9.47	9.18	9.08
Remaining introduced tree species			0	0	0	0	0
TOTAL volume of introduced tree species			274.86	424.16	585.10	647.86	659.09

2. Growing stock estimates are reported over bark for naturally regenerating forests.

FRA 2020 categories	Scientific name	Common name	Growing stock in forest (million m^3 over bark)				
			1990	2000	2010	2015	2016
Native tree species							
#1	*Lophozonia menziesii*	silver beech	567.80	565.57	563.61	563.33	563.26
#2	*Fuscospora fusca*	red beech	459.68	457.88	456.29	456.06	456.00
#3	*Weinmannia racemosa*	kamahi	326.94	325.66	324.53	324.37	324.33
#4	*Fuscospora cliffortioides*	mountain beech	223.45	222.57	221.80	221.69	221.66
#5	*Dacrydium cupressinum*	rimu	156.34	155.72	155.18	155.11	155.09
#6	*Beilschmiedia tawa*	tawa	139.71	139.17	138.68	138.62	138.60
#7	*Metrosideros umbellata*	southern rata	96.12	95.75	95.41	95.37	95.35
#8	*Fuscospora truncata*	hard beech	93.14	92.78	92.46	92.41	92.40
#9	*Fuscospora solandri*	black beech	68.21	67.94	67.71	67.67	67.67
#10	*Prumnopitys ferruginea*	miro	50.18	49.98	49.81	49.78	49.78
Remaining native tree species			1199.07	1200.89	1202.29	1202.22	1202.20
TOTAL volume of native tree species			3380.64	3373.91	3367.77	3366.62	3366.33

Analysis and processing of national data

Estimation and forecasting

Estimates for 2020 assume that the proportion of species/species groups remained constant between 2016 and 2020.

1. Planted forest

A multiplying factor of 1.14 was used to the convert the original (under bark) figures to an over bark estimate (Murphy & Cown 2015).

FRA 2020 categories	Scientific name	Common name	Growing stock in forest (million m3 over bark)					
			1990	2000	2010	2015	2016	2020
Introduced tree species								
#1	*Pinus radiata*	radiata pine	260.16	445.43	626.64	695.89	707.85	736.00
#2	*Pseudotsuga menziesii*	Douglas fir	26.42	19.18	19.49	21.80	22.53	23.42
#3		other exotic softwoods	21.52	10.26	10.08	10.41	10.63	10.76

#4		exotic hardwoods	5.29	8.67	10.80	10.46	10.35	11.05
Remaining introduced tree species			0.00	0.00	0.00	0.00	0.00	0.00
TOTAL volume of introduced tree species			313.39	483.54	667.01	738.56	751.36	781.24

Naturally regenerating forest

FRA 2020 categories	Scientific name	Common name		Growing stock in forest (million m^3 over bark)				
			1990	2000	2010	2015	2016	2020
Native tree species								
#1	*Lophozonia menziesii*	silver beech	567.80	565.57	563.61	563.33	563.26	563.06
#2	*Fuscospora fusca*	red beech	459.68	457.88	456.29	456.06	456.00	455.85
#3	*Weinmannia racemosa*	kamahi	326.94	325.66	324.53	324.37	324.33	324.22
#4	*Fuscospora cliffortioides*	mountain beech	223.45	222.57	221.80	221.69	221.66	221.59
#5	*Dacrydium cupressinum*	rimu	156.34	155.72	155.18	155.11	155.09	155.03
#6	*Beilschmiedia tawa*	tawa	139.71	139.17	138.68	138.62	138.60	138.55
#7	*Metrosideros umbellata*	southern rata	96.12	95.75	95.41	95.37	95.35	95.32
#8	*Fuscospora truncata*	hard beech	93.14	92.78	92.46	92.41	92.40	92.37
#9	*Fuscospora solandri*	black beech	68.21	67.94	67.71	67.67	67.67	67.64
#10	*Prumnopitys ferruginea*	miro	50.18	49.98	49.81	49.78	49.78	49.76
Remaining native tree species			1199.07	1200.89	1202.29	1202.22	1202.20	1199.78
TOTAL volume of native tree species			3380.64	3373.91	3367.77	3366.62	3366.33	3363.17

Reclassification into FRA 2020 categories

FRA 2020 categories	Forest	OWL	OL
	%	%	%
Introduced tree species	100	0	0
Native tree species	100	0	0

FRA categories	Scientific name	Common name	Growing stock in forest (million m³ over bark)				
			1990	2000	2010	2015	2020
Native tree species							
#1 Ranked in terms of volume	Lophozonia menziesii	silver beech	567.80	565.57	563.61	563.33	563.06
#2 Ranked in terms of volume	Fuscospora fusca	red beech	459.68	457.88	456.29	456.06	455.85
#3 Ranked in terms of volume	Weinmannia racemosa	kamahi	326.94	325.66	324.53	324.37	324.33
#4 Ranked in terms of volume	Fuscospora cliffortioides	mountain beech	223.45	222.57	221.80	221.69	221.59
#5 Ranked in terms of volume	Dacrydium cupressinum	rimu	156.34	155.72	155.18	155.11	155.03
#6 Ranked in terms of volume	Beilschmiedia tawa	tawa	139.71	139.17	138.68	138.62	138.55
#7 Ranked in terms of volume	Metrosideros umbellata	southern rata	96.12	95.75	95.41	95.37	95.32
#8 Ranked in terms of volume	Fuscospora truncata	hard beech	93.14	92.78	92.46	92.41	92.37
#9 Ranked in terms of volume	Fuscospora solandri	black beech	68.21	67.94	67.71	67.67	67.64
#10 Ranked in terms of volume	Prumnopitys ferruginea	miro	50.18	49.98	49.81	49.78	49.76
Remaining native tree species			1 199.07	1 200.89	1 202.29	1 202.22	1 199.78
Total volume of native tree species			**3 380.64**	**3 373.91**	**3 367.77**	**3 366.63**	**3 363.28**
Introduced tree species							
#1 Ranked in terms of volume	Pinus radiata	radiata pine	260.16	445.43	626.64	695.89	736.00

FRA categories	Scientific name	Common name	Growing stock in forest (million m³ over bark)				
			1990	2000	2010	2015	2020
Native tree species							
#2 Ranked in terms of volume	Pseudotsuga menziesii	Douglas fir	26.42	19.18	19.49	21.80	23.42
#3 Ranked in terms of volume		other exotic softwoods	21.52	10.26	10.08	10.41	10.76
#4 Ranked in terms of volume		exotic hardwoods	5.29	8.67	10.80	10.46	11.05
#5 Ranked in terms of volume							
Remaining introduced tree species			0.00	0.00	0.00	0.00	0.00
Total volume of introduced tree species			**313.39**	**483.54**	**667.01**	**738.56**	**781.23**
Total growing stock			**3 694.03**	**3 857.45**	**4 034.78**	**4 105.19**	**4 144.51**

Comments

Other exotic softwoods can be partitioned into ‘Cypress species’ and ‘Other exotic softwoods’ from 2010. Exotic hardwoods can be partitioned into ‘Eucalyptus species’ and ‘Other exotic hardwoods’ from 2010.

2c Biomass stock

National Data

Data sources + type of data source eg NFI, etc

Ministry for the Environment 2018. New Zealand's Greenhouse Gas Inventory 1990-2016. Available from: http://www.mfe.govt.nz/publications/climate-change/new-zealands-greenhouse-gas-inventory-1990%E2%80%932016

National classification and definitions

National Class	Definition
Planted forest	Forests planted in exotic tree species predominantly grown for wood and wood fibre and at least 1 ha in extent. In New Zealand approximately 90% of the area is planted in *Pinus radiata*. The area reported is the gross stocked forest area which generally includes mappable gaps such as roads, landings, and areas within forest boundaries that are not planted in exotic forest. Harvested areas awaiting replanting are included. All forests in this class will meet or exceed 30% canopy cover and 5 metres in height at maturity.
Naturally regenerating forest	Includes Natural forest – tall forest and Natural forest – regenerating forest
Natural forest – tall forest	Areas of natural forest at least 1 ha in extent that are dominated by tall indigenous forest canopy species. All forests in this class exceed 30% canopy cover and 5 metres in height.
Natural forest – regenerating forest	Areas of natural forest at least 1 ha in extent that will meet or exceed the forest thresholds (≥ 30% canopy cover and 5 metres height) at maturity.
Above ground live (AGL) biomass	Live biomass of trees, tree ferns and shrubs.
Below ground (BG) biomass	Based on existing studies, this is assumed to be 20% AGL for planted forests, and 25% AGL for tall indigenous and regenerating forests.
Dead wood (DW)	Dead standing stems and logs with a diameter ≥ 10 cm.

Original data

Data on biomass stock were obtained from the Land Use and Carbon Analysis System (LUCAS) used for the national greenhouse gas inventory (MfE 2018). This reports carbon stocks and fluxes annually from 1990. The biomass estimates are a bi-product of the carbon analysis. Estimates for 2017-2020 were prepared by Ministry for Primary Industries staff and the LUCAS team at the Ministry for the Environment.

National class	**Forest Biomass (million metric tonnes oven-dry weight)**								
	1990	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Planted forest									
Above-ground biomass	188.42	287.538	373.33	401.22	406.34	408.49	412.56	415.31	415.15
Below-ground biomass	41.12	62.39	80.77	86.86	88.02	88.35	89.31	90.00	90.08
Dead wood	35.58	54.22	67.57	76.08	77.538	77.36	79.17	81.29	84.31

National class	**Forest Biomass (million metric tonnes oven-dry weight)**								
	1990	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Natural forest - tall forest									
Above-ground biomass	2338.94	2336.41	2333.98	2333.36	2333.20	2333.09	2332.97	2332.86	2332.74

Below-ground biomass	584.74	584.10	583.50	583.34	583.30	583.27	583.24	583.21	583.19
Dead wood	322.14	321.79	321.46	321.37	321.35	321.34	321.32	321.30	321.29

National class	Forest Biomass (million metric tonnes oven-dry weight)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Natural forest - regenerating forest									
Above-ground biomass	94.00	118.26	141.90	154.44	156.93	159.44	161.95	164.47	166.98
Below-ground biomass	23.51	29.56	35.48	38.59	39.20	39.81	40.43	41.04	41.66
Dead wood	13.42	14.91	16.36	17.18	17.34	17.50	17.67	17.83	18.00

National class	Forest Biomass (million metric tonnes oven-dry weight)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Total forest									
Above-ground biomass	2621.36	2742.20	2849.22	2889.01	2896.47	2901.02	2907.48	2912.64	2914.87
Below-ground biomass	649.36	676.05	699.75	708.79	710.51	711.44	712.98	714.26	714.92
Dead wood	371.14	390.93	405.39	414.63	416.22	416.20	418.15	420.42	423.59

Analysis and processing of national data

Estimation and forecasting

Biomass stock per hectare was obtained by dividing total biomass by forest area (Question 1).

National class	Forest Biomass (tonnes/ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Planted forest									
Above-ground biomass	122.99	140.89	180.73	194.01	196.38	198.97	198.46	198.73	196.05
Below-ground biomass	26.84	30.57	39.10	42.00	42.54	42.60	42.96	43.07	42.54
Dead wood	23.23	26.57	32.71	36.79	37.47	37.30	38.08	38.90	39.81

National class	Forest Biomass (tonnes/ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Natural forest - tall forest									
Above-ground biomass	354.75	354.75	354.75	354.75	354.75	354.75	354.75	354.75	354.75
Below-ground biomass	88.69	88.69	88.69	88.69	88.69	88.69	88.69	88.69	88.69
Dead wood	48.86	48.86	48.86	48.86	48.86	48.86	48.86	48.86	48.86

National class	Forest Biomass (tonnes/ha)								

	1990	2000	2010	2015	2016	2017	2018	2019	2020
Natural forest - regenerating forest									
Above-ground biomass	75.37	96.65	117.93	128.58	130.71	132.84	134.97	137.10	139.24
Below-ground biomass	18.85	24.16	29.49	32.12	32.65	33.17	33.69	34.22	34.74
Dead wood	10.76	12.18	13.60	14.30	14.44	14.58	14.72	14.87	15.01

National class	Forest Biomass (tonnes/ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Total forest									
Above-ground biomass	279.69	278.38	289.32	293.40	294.15	294.49	295.02	295.23	294.65
Below-ground biomass	69.28	68.63	71.05	71.98	72.16	72.22	72.35	72.40	72.27
Dead wood	39.60	39.69	41.16	42.11	42.27	42.25	42.43	42.62	42.82

Reclassification into FRA 2020 categories

FRA 2020 categories	Forest	OWL	OL
	%	%	%
Planted forest	100	0	0
Natural forest - tall forest	100	0	0
Natural forest - regenerating forest	100	0	0

FRA categories	Forest biomass (tonnes/ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Above-ground biomass	279.69	278.38	289.32	293.40	294.15	294.49	295.02	295.23	294.65
Below-ground biomass	69.28	68.63	71.05	71.98	72.16	72.22	72.35	72.40	72.27
Dead wood	39.60	39.69	41.16	42.11	42.27	42.25	42.43	42.62	42.82

Comments

We recognise that there is a discrepancy between the growing stock and the biomass/carbon estimates for Natural forest – regenerating forest. The former declines over the reporting period while the latter increases. At the present time we don’t have a way of addressing this discrepancy. The addition of growing stock estimates to the LUCAS inventory would probably be the best way to resolve this issue.

2d Carbon stock

National Data

Data sources + type of data source eg NFI, etc

Ministry for the Environment 2018. New Zealand's Greenhouse Gas Inventory 1990-2016. Available from: http://www.mfe.govt.nz/publications/climate-change/new-zealands-greenhouse-gas-inventory-1990%E2%80%932016

National classification and definitions

National Class	Definition
Planted forest	Forests planted in exotic tree species predominantly grown for wood and wood fibre and at least 1 ha in extent. In New Zealand approximately 90% of the area is planted in *Pinus radiata*. The area reported is the gross stocked forest area which generally includes mappable gaps such as roads, landings, and areas within forest boundaries that are not planted in exotic forest. Harvested areas awaiting replanting are included. All forests in this class will meet or exceed 30% canopy cover and 5 metres in height at maturity.
Naturally regenerating forest	Includes Natural forest – tall forest and Natural forest – regenerating forest
Natural forest – tall forest	Areas of natural forest at least 1 ha in extent that are dominated by tall indigenous forest canopy species. All forests in this class exceed 30% canopy cover and 5 metres in height.
Natural forest – regenerating forest	Areas of natural forest at least 1 ha in extent that will meet or exceed the forest thresholds (≥ 30% canopy cover and 5 metres height) at maturity.
Above ground live (AGL) biomass	Live biomass of trees, tree ferns and shrubs.
Below ground (BG) biomass	Based on existing studies, this is assumed to be 20% AGL for planted forests, and 25% AGL for tall indigenous and regenerating forests.
Dead wood (DW)	Dead standing stems and logs with a diameter ≥ 10 cm.
Litter (L)	Fallen branches (≤ 10 cm diameter), twigs, dead leaves, and the fermented humic horizons.
Biomass carbon	Woody biomass is assumed to be 50% carbon.
Soil carbon	Organic carbon in mineral and organic soils (including peat) to a soil depth of 30 cm.

Original data

Carbon data were obtained from the Land Use and Carbon Analysis System (LUCAS) used for the national greenhouse gas inventory (MfE 2018). This reports carbon stocks and fluxes annually from 1990. Estimates for 2017-2020 were prepared by Ministry for Primary Industries staff and the LUCAS team at the Ministry for the Environment.

National class	**Forest Carbon (million metric tonnes)**								
	1990	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Planted forest									
Carbon in above-ground biomass	94.21	143.77	186.67	200.61	203.17	204.24	206.28	207.66	207.58
Carbon in below-ground biomass	20.56	31.20	40.39	43.43	44.01	44.18	44.66	45.00	45.04
Carbon in dead wood	17.79	27.11	33.78	38.04	38.76	38.68	39.58	40.64	42.16

Carbon in litter	9.00	12.50	14.70	13.97	13.82	13.77	13.70	13.66	13.62
Soil carbon	152.76	202.13	201.35	200.44	200.43	201.01	201.43	202.54	205.47

National class	Forest Carbon (million metric tonnes)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Natural forest - tall forest forest									
Carbon in above-ground biomass	1169.47	1168.21	1166.99	1166.68	1166.60	1166.54	1166.49	1166.43	1166.37
Carbon in below-ground biomass	292.37	292.05	291.75	291.67	291.65	291.64	291.62	291.61	291.59
Carbon in dead wood	161.07	1601.90	160.73	160.69	160.68	160.67	160.66	160.65	160.64
Carbon in litter	86.14	86.05	85.96	856.93	85.936	85.92	85.92	85.91	85.91
Soil carbon	622.66	621.95	621.27	621.10	621.06	621.03	620.99	620.96	620.93

National class	Forest Carbon (million metric tonnes)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Natural forest - regenerating forest									
Carbon in above-ground biomass	47.00	59.13	70.95	77.22	78.46	79.72	80.98	82.23	83.49
Carbon in below-ground biomass	11.75	14.78	17.74	19.29	19.60	19.91	20.21	20.52	20.83
Carbon in dead wood	6.71	7.46	8.18	8.59	8.67	8.75	8.83	8.92	9.00
Carbon in litter	8.25	8.10	7.96	7.95	7.95	7.94	7.94	7.94	7.94
Soil carbon	118.10	115.63	113.59	113.37	113.32	113.29	113.25	113.22	113.19

National class	Forest Carbon (million metric tonnes)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Total forest									
Carbon in above-ground biomass	1310.68	1371.10	1424.61	1444.51	1448.23	1450.51	1453.74	1456.32	1457.43
Carbon in below-ground biomass	324.68	338.03	349.88	354.39	355.26	355.72	356.49	357.13	357.46
Carbon in dead wood	185.576	195.46	202.69	207.31	208.11	208.10	209.08	210.21	211.80
Carbon in litter	103.39	106.64	108.62	107.85	107.69	107.64	107.56	107.51	107.47
Soil carbon	893.52	939.70	936.21	934.91	934.81	935.32	935.68	936.72	939.59

Analysis and processing of national data

Estimation and forecasting

Carbon stock per hectare was obtained by dividing total carbon stock by forest area (Question 1).

National class	Forest Carbon (tonnes/ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020

Planted forest									
Carbon in above-ground biomass	61.50	70.45	90.37	97.01	98.19	99.48	99.23	99.36	98.02
Carbon in below-ground biomass	13.42	15.29	19.55	21.00	21.27	21.30	21.48	22.53	22.27
Carbon in dead wood	11.61	13.28	16.36	18.39	18.73	18.65	19.04	19.45	19.91
Carbon in litter	5.88	6.12	7.12	6.75	6.68	6.64	6.59	6.53	6.43
Soil carbon	99.72	99.04	97.48	96.93	96.87	96.92	96.90	96.91	97.03

National class	Forest Carbon (tonnes/ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Natural forest - tall forest									
Carbon in above-ground biomass	177.37	177.37	177.37	177.37	177.37	177.37	177.37	177.37	177.37
Carbon in below-ground biomass	44.34	44.34	44.34	44.34	44.34	44.34	44.34	44.34	44.34
Carbon in dead wood	24.43	24.43	24.43	24.43	24.43	24.43	24.43	24.43	24.43
Carbon in litter	13.06	13.06	13.06	13.06	13.06	13.06	13.06	13.06	13.06
Soil carbon	94.44	94.43	94.43	94.43	94.43	94.43	94.43	94.43	94.43

National class	Forest Carbon (tonnes/ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Natural forest - regenerating forest									
Carbon in above-ground biomass	37.69	48.33	58.97	64.29	65.35	66.42	67.49	68.55	69.62
Carbon in below-ground biomass	9.42	12.08	14.74	16.06	16.32	16.58	16.85	17.11	17.37
Carbon in dead wood	5.38	6.09	6.80	7.15	7.22	7.29	7.36	7.43	7.50
Carbon in litter	6.62	6.62	6.62	6.62	6.62	6.62	6.62	6.62	6.62
Soil carbon	94.70	94.50	94.40	94.39	94.39	94.39	94.39	94.38	94.38

National class	Forest Carbon (tonnes/ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Total forest									
Carbon in above-ground biomass	139.85	139.19	144.66	146.70	147.07	147.25	147.51	147.62	147.33
Carbon in below-ground biomass	34.64	34.32	35.53	35.99	36.08	36.11	36.17	36.20	36.13
Carbon in dead wood	19.80	19.84	20.58	21.05	21.13	21.13	21.21	21.31	21.41
Carbon in litter	11.03	10.83	11.03	10.95	10.94	10.93	10.91	10.90	10.86
Soil carbon	95.34	95.40	95.06	94.95	94.94	94.95	94.94	94.95	94.98

Reclassification into FRA 2020 categories

FRA 2020 categories	Forest	OWL	OL

	%	%	%
Planted forest	100	0	0
Natural forest - tall forest	100	0	0
Natural forest - regenerating forest	100	0	0

FRA categories	Forest carbon (tonnes/ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Carbon in above-ground biomass	139.85	139.19	144.66	146.70	147.07	147.25	147.51	147.62	147.33
Carbon in below-ground biomass	34.64	34.32	35.53	35.99	36.08	36.11	36.17	36.20	36.13
Carbon in dead wood	19.80	19.84	20.58	21.05	21.13	21.13	21.21	21.31	21.41
Carbon in litter	11.03	10.83	11.03	10.95	10.94	10.93	10.91	10.90	10.86
Soil carbon	95.34	95.40	95.06	94.95	94.94	94.95	94.94	94.95	94.98

Soil depth (cm) used for soil carbon estimates	30.00

Comments

Woody biomass is assumed to be 50% carbon

We recognise that there is a discrepancy between the growing stock and the biomass/carbon estimates for Natural forest – regenerating forest. The former declines over the reporting period while the latter increases. At the present time we don’t have a way of addressing this discrepancy. The addition of growing stock estimates to the LUCAS inventory would probably be the best way to resolve this issue.

3 Forest designation and management

3a Designated management objective

National Data

Data sources + type of data source eg NFI, etc

References to sources of information	Additional comments
Ministry for the Environment 2018. New Zealand's Greenhouse Gas Inventory 1990-2016.	Available from: http://www.mfe.govt.nz/publications/climate-change/new-zealands-greenhouse-gas-inventory-1990%E2%80%932016
Griffiths AD 2002. Indigenous forestry on private land: present trends and future potential. Ministry of Agriculture and Forestry Technical Paper No. 01/6.	Trends in the sustainable management of privately-owned indigenous forests for timber production.
Indigenous Forestry Unit, Ministry for Primary Industries: Sustainable Forest Management plans and permits database (accessed June 2018).	Indigenous forest area for timber production
Ministry for Primary Industries: East Coast Forestry Project database (accessed June 2018)	Forest areas established for erosion control
Ministry for the Environment LUCAS NZ Land Use Map 1990 2008 2012 (v018)	Available from: https://data.mfe.govt.nz/layer/52375-lucas-nz-land-use-map-1990-2008-2012-v018/
Department of Conservation (2006). Land administered by the Department of Conservation.	GIS database layer – Area estimates for IUCN categories
Land Cover Database (LCDB) version 4.1	Available from: https://www.landcareresearch.co.nz/resources/data/lris
Queen Elizabeth II Trust. Database of land protected by QEII covenants (accessed June 2018)	Forest areas protected for the conservation of biodiversity
Nga Whenua Rahui database (accessed June 2018)	Forest areas protected for the conservation of biodiversity
National Exotic Forest Description (NEFD) – annual publication now produced by the Ministry for Primary Industries.	Planted forests with recreational access
Ministry for Primary Industries: Afforestation Grants Scheme, Emissions Trading Scheme and Permanent Forest Sink Initiative databases (accessed June 2018)	Forest area for carbon sequestration

National classification and definitions

National Class	Definition
Planted forest	Forests planted in exotic tree species predominantly grown for wood and wood fibre and at least 1 ha in extent. In New Zealand approximately 90% of the area is planted in *Pinus radiata*. The area reported is the gross stocked forest area which generally includes mappable gaps such as roads, landings, and areas within forest boundaries that are not planted in exotic forest. Harvested areas awaiting replanting are included. All forests in this class will meet or exceed 30% canopy cover and 5 metres in height at maturity.
Naturally regenerating forest	Includes Natural forest – tall forest and Natural forest – regenerating forest
Natural forest – tall forest	Areas of natural forest at least 1 ha in extent that are dominated by tall indigenous forest canopy species. All forests in this class exceed 30% canopy cover and 5 metres in height.
Natural forest – regenerating forest	Areas of natural forest at least 1 ha in extent that will meet or exceed the forest thresholds (≥ 30% canopy cover and 5 metres height) at maturity.

Original data

Production

1. Planted forest

The primary function of planted forests is timber production. Planted forest areas reported in Table 1b were used for this table.

Planted forest for timber production	Forest area (1000 ha)				
	1990	2000	2010	2015	2016
Planted forest	1532	2041	2066	2068	2069

2. Naturally regenerating forests

Naturally regenerating forests used for timber production are managed under the Forest Act 1949 (Part 3A, amended 1993) which specifies provisions and procedures for the sustainable management of indigenous forests (Griffiths 2002). The Indigenous Forestry team of the Ministry for Primary Industries (MPI) administers the Indigenous Forestry provisions of the Forest Act, approving plans and permits and monitoring and enforcing compliance. Data on naturally regenerating forests used for timber production were sourced from the Sustainable Forest Management Plans and Permits database maintained by MPI (accessed June 2018).

Naturally regenerating forest for timber production	Forest area (1000 ha)						
	1990	2000	2010	2015	2016	2017	2018
State owned indigenous forest for timber production	164	12	12	12	12	12	12
Privately owned indigenous forest for timber production	124	34	81	82	77	74	69
Total	288	46	93	94	89	86	81

Protection of soil and water

There are no forests that have been established exclusively for the protection of soil and water. There are two cases where forests have been planted for protective purposes as well as timber production.

1. Planted forests established for erosion control/reducing flooding risk (East Coast North Island Forestry Project) but which will be harvested at maturity and replanted. Area estimates were sourced from the Ministry for Primary Industries database used to determine subsidy payments to land owners who are part of the scheme.

East Coast Forestry project	Forest area (1000 ha)									
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Area established per annum	0.00	0.00	0.00	1.77	2.77	2.27	4.76	4.25	3.57	3.71
Cumulative area established	0.00	0.00	0.00	1.77	4.54	6.80	11.57	15.82	19.39	23.10

East Coast Forestry project	Forest area (1000 ha)									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Area established per annum	2.45	0.93	2.14	1.11	1.50	0.43	0.64	0.40	0.82	0.74
Cumulative area established	25.55	26.49	28.62	29.73	31.24	31.66	32.30	32.70	33.52	34.26

East Coast Forestry project	Forest area (1000 ha)							
	2010	2011	2012	2013	2014	2015	2016	2017
Area established	0.72	2.39	1.41	2.54	0.45	0.32	0.09	0.20
Cumulative area established	34.98	37.37	38.78	41.33	41.78	42.09	42.19	42.39

2. Planted forests established to stabilise coastal sand dunes, but which will be harvested at maturity and replanted. The area of planted forest established on coastal sand dunes was obtained by intersecting the Land Use Map (1990 - 2008) with the IPCC soils layer used for national reporting of soil carbon. In the absence of evidence to the contrary the area of coastal sand dune forests was assumed to have remained constant since 2008.

Forests planted to stabilise coastal sand dunes	Forest area (1000 ha)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Area established per annum	0.00	0.00	0.50	0.47	0.75	0.56	0.64	0.49	0.39	0.30
Cumulative area established	61.85	61.85	62.35	62.82	63.57	64.14	64.78	65.27	65.66	65.96

Forests planted to stabilise coastal sand dunes	Forest area (1000 ha)								
	2000	2001	2002	2003	2004	2005	2006	2007	2008
Area established per annum	0.25	0.23	0.17	0.15	0.08	0.04	0.02	0.02	0.02
Cumulative area established	66.22	66.44	66.61	66.76	66.84	66.89	66.91	6.92	66.94

Conservation of biodiversity

These are the publically-owned indigenous forests managed by the New Zealand Department of Conservation (DOC), and privately-owned indigenous forests protected by Queen Elizabeth II covenants, or managed under the Nga Whenua Rahui programme.

Forest managed for conservation of biodiversity	Forest area (1000 ha)			
	2006	2008	2013	2018
Department of Conservation	4995	5003	5181	5017

Forest managed for conservation of biodiversity	Forest area (1000 ha)					
	1990	2000	2010	2015	2016	2017
Queen Elizabeth II	13	36	56	68	69	71
Nga Whenua Rahui	0	74	113	118	118	118

Social Services

While the use of forests for recreational purposes is widespread and encouraged in New Zealand, few if any forests are managed primarily for this purpose.

1. Planted forests

New Zealand's large-scale (1000 ha+) commercially owned and managed plantations are typically available to the public for recreational activities. These include hiking, mountain biking, horse riding, hunting and fishing. Public access mostly, but not always, is by permit and may be charged for. Smaller privately managed forestry blocks are generally not available for public recreation.

Estimates of planted forests available for recreational activities were obtained by multiplying the total planted forest area (Table 1b) by the percentage of large-scale (1000 ha+) commercially owned and managed forests.

Planted forest available for recreational use	Forest area (1000 ha)				
	1990	2000	2010	2015	2016
Planted forest	1263	1478	1454	1456	1457

2. Naturally regenerating (Indigenous) forests

Recreational activities are permitted/encouraged in most state-owned indigenous forests managed by the Department of Conservation. The exception is areas that are managed for rare or endangered flora and fauna, or to protect heritage values. These are estimated to total 10,000 ha, and have not changed greatly over recent decades. Two territorial authorities (Wellington Regional Council and Auckland City Council) also manage substantial areas of indigenous forest which are used for public recreation. The forest area managed by these authorities has not changed greatly over recent decades and is assumed to have remained constant since 1990.

Naturally regenerating forests with public access for recreational activities	Forest area (1000 ha)			

	1990	2000	2010	2015
Publically owned indigenous forests managed by the Department of Conservation	4513	4796	5079	4991
Publically owned indigenous forests managed by the Auckland City Council	34	34	34	34
Publically owned indigenous forests managed by the Wellington Regional Council and adjacent local authorities	42	42	42	42

Multiple use

Forests reported under Protection of Soil and Water and Social Services.

Other (specify)

Forest area designated for carbon sequestration

Small areas of New Zealand forests have been managed for carbon sequestration since the early 2000s. Between 2008 and 2012 (the first commitment period for the Kyoto Protocol) the New Zealand government established three schemes to encourage forest owners to manage their forests for carbon sequestration purposes. These are the Afforestation Grants Scheme (AGS), the Permanent Forest Sink Initiative (PFSI), and the Emissions Trading Scheme (ETS).

Data on forest area managed for carbon sequestration before 2008 were sourced from the Landcare Research EBEX21 programme. Data on the New Zealand government carbon sequestration schemes were sourced from the Ministry for Primary Industries. Forests registered with EBEX21 were transferred to the PFSI in 2009.

Forests designated for carbon sequestration	Forest area (1000 ha)									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
EBEX21 programme	0	0	1	1	1	1	2	3	3	0
Afforestation Grants Scheme	0	0	0	0	0	0	0	0	0	3
Permanent Forest Sink Initiative	0	0	0	0	0	0	0	0	0	4
Emissions Trading Scheme	0	0	0	0	0	0	0	0	0	47

Forests designated for carbon sequestration	Forest area (1000 ha)							
	2010	2011	2012	2013	2014	2015	2016	2017
EBEX21 programme	0	0	0	0	0	0	0	0
Afforestation Grants Scheme	6	9	12	12	12	12	14	16
Permanent Forest Sink Initiative	9	15	15	15	15	15	15	15
Emissions Trading Scheme	142	248	370	261	277	301	294	326

Analysis and processing of national data

Estimation and forecasting

Production

Planted forest areas reported in Table 1b were used for this table. Indigenous forest estimates are based on trends in the sustainable forest Management Plans and Permits database maintained by the Indigenous Forestry team, MPI (accessed June 2018).

National class	Forest area (000 ha)				
	1990	2000	2010	2015	2020
Planted forest	1532	2041	2066	2068	2118

State owned indigenous forest for timber production	164	12	12	12	12
Privately owned indigenous forest for timber production	124	34	81	82	61
Total	1820	2087	2159	2162	2191

Protection of soil and water

Estimates for 2020 obtained by extrapolation.

National class	Forest area (000 ha)				
	1990	2000	2010	2015	2020
East Coast Forestry Project	0	26	35	42	43
Forests planted to stabilise coastal sand dunes	62	66	67	67	68
Total	62	92	102	109	111

Conservation of Biodiversity

Estimates for reporting dates obtained by extrapolation/interpolation.

National class	Forest area (000 ha)				
	1990	2000	2010	2015	2020
Forest area managed by the Department of Conservation	4523	4806	5089	5001	5023
Forest area protected by Queen Elizabeth II covenants	13	36	56	68	75
Forest area in the Nga Whenua Rahui programme	0	74	113	118	118
Total	4536	4916	5258	5187	5216

Social Services

Estimates for 2020 obtained by extrapolation.

National class	Forest area (000 ha)				
	1990	2000	2010	2015	2020
Naturally regenerating forests where recreational activities are permitted and/or encouraged					
Planted forests with public access for recreational purposes	1263	1478	1454	1456	1458
Total					

Multiple use

Forests reported under Protection of Soil and Water and Social Services.

Forest area designated for carbon sequestration

Estimates for 2020 obtained by extrapolation

National class	Forest area (000 ha)

	1990	2000	2010	2015	2020
Afforestation Grants Scheme	0	0	6	12	22
Permanent Forest Sink Initiative	0	0	9	15	15
Emissions Trading Scheme	0	0	142	301	357
Total	0	0	157	328	394

Reclassification into FRA 2020 categories

FRA 2020 categories	Forest	Other wooded land	Other land
	%	%	%
Planted forest	100	0	0
Natural forest - tall forest	100	0	0
Natural forest - regenerating forest	100	0	0
Naturally regenerating forest	100	0	0

Primary designated management objective

FRA 2020 categories	Forest area (1000 ha)				
	1990	2000	2010	2015	2020
Production (a)	1 758.00	1 995.00	2 057.00	2 053.00	2 081.00
Protection of soil and water (b)	0.00	0.00	0.00	0.00	0.00
Conservation of biodiversity (c)	4 536.00	4 916.00	5 258.00	5 187.00	5 216.00
Social Services (d)	0.00	0.00	0.00	0.00	0.00
Multiple use (e)	62.00	92.00	102.00	109.00	111.00
Other (specify in comments) (f)	0.00	0.00	0.00	0.00	0.00
None/unknown (g)	**3 016.27**	**2 847.44**	**2 431.12**	**2 497.61**	**2 484.59**
Total forest area	**9 372.27**	**9 850.44**	**9 848.12**	**9 846.61**	**9 892.59**

Total area with designated management objective

FRA 2020 categories	Forest area (1000 ha)				
	1990	2000	2010	2015	2020
Production	1 820.00	2 087.00	2 159.00	2 162.00	2 191.00
Protection of soil and water	62.00	92.00	103.00	109.00	110.00
Conservation of biodiversity	4 536.00	4 916.00	5 258.00	5 187.00	5 216.00
Social Services	5 852.00	6 350.00	6 609.00	6 523.00	6 666.00
Other (specify in comments)	0.00	0.00	157.00	328.00	394.00

Comments

Primary designated management objective

For forests specified as "None/unknown" the primary designated management is unknown.

Total area with designated management objective

Other - Forest area designated for carbon sequestration

3b Forest area within protected areas and forest area with long-term management plans

National Data

Data sources + type of data source eg NFI, etc

Data sources

References to sources of information	Additional comments
Department of Conservation (2005). The application in New Zealand of the IUCN system of management categories for protected natural areas. 16 p.	Report prepared by the New Zealand Department of Conservation for the New Zealand Committee of IUCN and the New Zealand Conservation Authority.
Department of Conservation (2006). Land administered by the Department of Conservation.	GIS database layer – Area estimates for IUCN categories
Department of Conservation policies and plans (accessed May 2018)	Management plans for state-owned indigenous forests managed for the conservation of biodiversity. Available from: https://www.doc.govt.nz/about-us/our-policies-and-plans/statutory-plans/
Queen Elizabeth II Trust. Database of lands protected by QEII covenants (accessed May 2018)	Privately owned indigenous forests legally protected
Nga Whenua Rahui database (accessed May 2018)	Privately owned indigenous forests legally protected
Griffiths, AD (2002). Indigenous forestry on private land: present trends and future potential. Ministry of Agriculture and Forestry Technical Paper No. 01/6	Privately owned indigenous forests for timber production
Indigenous Forestry Unit, Ministry for Primary Industries: Sustainable forest Management plans and permits database (accessed June 2018)	State and privately owned indigenous forests for timber production
New Zealand Forest Accord (1991)	Planted forests for timber production. Available from: https://www.nzfoa.org.nz/
Principles for commercial plantation forest management (1995)	Planted forests for timber production. Available from: https://www.nzfoa.org.nz/

National classification and definitions

National Class	Definition
Planted forest	Forests planted in exotic tree species predominantly grown for wood and wood fibre and at least 1 ha in extent. In New Zealand approximately 90% of the area is planted in *Pinus radiata*. The area reported is the gross stocked forest area which generally includes mappable gaps such as roads, landings, and areas within forest boundaries that are not planted in exotic forest. Harvested areas awaiting replanting are included. All forests in this class will meet or exceed 30% canopy cover and 5 metres in height at maturity.
Naturally regenerating forest	Includes Natural forest – tall forest and Natural forest – regenerating forest
Natural forest – tall forest	Areas of natural forest at least 1 ha in extent that are dominated by tall indigenous forest canopy species. All forests in this class exceed 30% canopy cover and 5 metres in height.
Natural forest – regenerating forest	Areas of natural forest at least 1 ha in extent that will meet or exceed the forest thresholds (≥ 30% canopy cover and 5 metres height) at maturity.
Sanctuary area, Ecological area, Nature reserve, Scientific reserve	IUCN Category Ia – Strict Nature Reserve: protected area managed mainly for science.
Wilderness Area	IUCN Category Ib – Wilderness Area: protected area managed mainly for wilderness protection.
National Park	IUCN Category II – National Park: protected area managed mainly for ecosystem protection and recreation.
Natural Monument	IUCN Category III – Natural Monument: protected area managed mainly for conservation of specific natural features.
Habitat/Species Management Area	IUCN Category IV – Habitat/Species Management Area: protected area managed mainly for conservation through management intervention.

Protected landscape	IUCN Category V – Protected landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation.
Managed Resource Protected Area	IUCN Category VI – Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems.

Original data

Forest area within legally established protected areas

New Zealand protected areas are defined by national legislation. This includes the Reserves Act 1977, National Parks Act 1980 and the Conservation Act 1987.

The IUCN protected area estimates are based on GIS analysis of indigenous forests on conservation land in 2006, 2008, 2013 and 2018

IUCN Categories	Forest area (000 ha)			
	2006	2008	2013	2018
Category Ia	160	160	158	156
Category Ib	37	37	36	36
Category II	1947	1947	1966	1780
Category III	1424	1444	1573	1584
Category IV	19	19	19	10
Total	3587	3607	3752	3566

Forest area with long-term forest management plan

1. Planted forest

Planted forests typically have long-term management plans which are regularly reviewed to take account of market trends and other factors affecting the forest industry. Planted forest areas reported in Table 1b are used here.

Forest with a long-term management plan	Forest area (1000 ha)				
	1990	2000	2010	2015	2016
Planted forest	1532	2041	2066	2068	2069

2. Naturally regenerating forest

State-owned indigenous forests managed for conservation of biodiversity, privately owned indigenous forests with protection covenants, and indigenous forests used for timber production typically have long-term management plans.

State-owned forests managed for conservation of biodiversity	Forest area (000 ha)			
	2006	2008	2013	2018
Department of Conservation	4995	5003	5181	5017

Privately-owned forests managed for conservation of biodiversity	Forest area (000 ha)					
	1990	2000	2010	2015	2016	2017
Queen Elizabeth II covenants	13	36	56	68	69	71
Nga Whenua Rahui programme	0	74	113	118	118	118

Indigenous forest for timber production	Forest area (000 ha)

	1990	2000	2010	2015	2016	2017	2018
State owned indigenous forest for timber production	164	12	12	12	12	12	12
Privately owned indigenous forest for timber production	124	34	81	82	77	74	69

Analysis and processing of national data

Estimation and forecasting

Estimates for reporting dates obtained by extrapolation/interpolation.

Forest area within legally established protected areas	**Forest area (1000 ha)**								
	1990	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Naturally regenerating forest	3180	3426	3672	3566	3566	3566	3566	3566	3566

Forests with a long-term management plan	**Forest area (000 ha)**								
	1990	**2000**	**2010**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Planted forest	1532	2041	2066	2068	2069	2074	2079	2090	2118
State-owned indigenous forests managed by the Department of Conservation	4523	4806	5089	5001	5006	5012	5017	5023	5028
State-owned indigenous forests managed for timber production	164	12	12	12	12	12	12	12	12
Privately owned indigenous forests managed for timber production	124	34	81	82	77	74	69	65	61
Privately owned indigenous forests protected by Queen Elizabeth II covenants	13	36	56	68	69	71	72	74	75
Privately owned indigenous forests in the Nga Whenua Rahui programme	0	74	113	118	118	118	118	118	118

Reclassification into FRA 2020 categories

FRA 2020 categories	**Forest**	**OWL**	**OL**
	%	**%**	**%**
Planted forest	100	0	0
Natural forest - tall forest	100	0	0
Natural forest - regenerating forest	100	0	0

FRA categories	Area (1000 ha)								
	1990	2000	2010	2015	2016	2017	2018	2019	2020
Forest area within protected areas	3 180.00	3 426.00	3 672.00	3 566.00	3 566.00	3 566.00	3 566.00	3 566.00	3 566.00
Forest area with long-term forest management plan	6 356.00	7 003.00	7 417.00	7 349.00	7 351.00	7 361.00	7 367.00	7 382.00	7 412.00
…of which in protected areas	3 180.00	3 426.00	3 672.00	3 566.00	3 566.00	3 566.00	3 566.00	3 566.00	3 566.00

Comments

4 Forest ownership and management rights

4a Forest ownership

National Data

Data sources + type of data source eg NFI, etc

References to sources of information	Additional comments
Ministry of Forestry 1992. National Exotic Forest Description as at 1 April 1991.	Planted forest ownership. Ownership data were not available for 1990. Data from 1991 was used to report 1990.
Ministry of Agriculture and Forestry 2001. National Exotic Forest Description as at 1 April 2000.	Planted forest ownership.
Ministry of Agriculture and Forestry 2011. National Exotic Forest Description as at 1 April 2010.	Planted forest ownership.
Ministry for Primary Industries 2016. National Exotic Forest Description as at 1 April 2015.	Planted forest ownership.
Māori Land Spatial Dataset	Available from: https://www.maorilandcourt.govt.nz/your-maori-land/maori-land-data-service/
Ministry for the Environment 2018. New Zealand's Greenhouse Gas Inventory 1990-2016.	Available from: http://www.mfe.govt.nz/publications/climate-change/new-zealands-greenhouse-gas-inventory-1990%E2%80%932016
LUCAS NZ Land Use Map 1990 2008 2012 (v018)	Available from: https://data.mfe.govt.nz/layer/52375-lucas-nz-land-use-map-1990-2008-2012-v018/
Land Cover Database (LCDB) version 4.1	Available from: https://www.landcareresearch.co.nz/resources/data/lris

National classification and definitions

National Class	Definition
Registered public company	A company in which members of the public can invest, and which is registered on the New Zealand Stock Exchange.
Privately owned	The legal entities included in this category are private companies, partnerships, individuals and trusts, which includes Māori trusts and incorporations.
State owned enterprise	State owned companies or trusts.
Local government	Government at the regional or district/city level.
Central government	Government at the national level.
Planted forest	Forests planted in exotic tree species predominantly grown for wood and wood fibre and at least 1 ha in extent. In New Zealand approximately 90% of the area is planted in *Pinus radiata*. The area reported is the gross stocked forest area which generally includes mappable gaps such as roads, landings, and areas within forest boundaries that are not planted in exotic forest. Harvested areas awaiting replanting are included. All forests in this class will meet or exceed 30% canopy cover and 5 metres in height at maturity.
Naturally regenerating forest	Includes Natural forest – tall forest and Natural forest – regenerating forest
Natural forest – tall forest	Areas of natural forest at least 1 ha in extent that are dominated by tall indigenous forest canopy species. All forests in this class exceed 30% canopy cover and 5 metres in height.
Natural forest – regenerating	Areas of natural forest at least 1 ha in extent that will meet or exceed the forest thresholds (≥ 30% canopy cover and 5 metres height) at maturity.

forest	

Original data

Planted forest

Data on the ownership of planted forests were obtained from National Exotic Forest Description (NEFD) reports. NEFD records ownership data on a net stocked basis that excludes harvested areas awaiting restocking. Ownership is based solely on the ownership of the forest irrespective of the ownership of the land. Forests owned by state-owned enterprises, local and central government are publically owned. All other forests are privately owned. Data on the area of planted forest owned by indigenous/tribal communities (Māori) was obtained by intersecting the newly released Maori land block database "Maori land online" with the Land Cover Database v. 4.1. This information, which is currently only available for 2017, was used to report 2015.

Category of Forest/Ownership	Forest area (000 ha)			
	1990	2000	2010	2015
Planted forest				
State-owned enterprise	311	45	10	11
Local government	58	55	52	43
Central government	49	48	60	14
Registered public company	500	790	31	0
Privately owned	444	876	1684	1771
… of which owned by individuals	n.a.	n.a.	n.a.	n.a.
… of which owned by private business entities and institutions	n.a.	n.a.	n.a.	n.a.
… of which owned by local, tribal and indigenous communities	n.a.	n.a.	n.a.	118
Total	1362	1814	1837	1839

Naturally regenerating forest

Most of New Zealand's naturally regenerating forests are owned by the state and managed by the Department of Conservation.

Data from Tables 1b and 3b are used to report the total area of natural forest – tall forest and the area of state-owned forests. Other indigenous forests are privately owned. Data on the area of indigenous forest owned by indigenous/tribal communities (Māori) was obtained by intersecting the newly released Maori land block database "Maori land online" with the Land Cover Database v. 4.1. This information, which is currently only available for 2017, was used to report 2015.

Category of Forest/Ownership	Forest area (000 ha)			
	1990	2000	2010	2015
Natural forest - tall forest				
State owned	4523	4806	5089	5001
Privately owned	2070	1780	1490	1576
… of which owned by individuals	n.a.	n.a.	n.a.	n.a.
… of which owned by private business entities and institutions	n.a.	n.a.	n.a.	n.a.
… of which owned by local, tribal and indigenous communities	n.a.	n.a.	n.a.	447
Total	6593	6586	6579	6577

Analysis and processing of national data

Estimation and forecasting

Area estimates for both planted and naturally regenerating forests were adjusted on a pro-rata basis to fit the total forest areas reported in Question 1.

Category of Forest/Ownership	Forest area (000 ha)			
	1990	2000	2010	2015
Planted forest				
State owned enterprise	350	50	11	12
Local government	65	61	57	47
Central government	55	54	66	16
Registered public company	562	882	34	0
Privately owned	499	978	1856	1950
… of which owned by individuals	n.a.	n.a.	n.a.	n.a.
… of which owned by private business entities and institutions	n.a.	n.a.	n.a.	n.a.
… of which owned by local, tribal and indigenous communities	n.a.	n.a.	n.a.	118
Subtotal	1531	2025	2024	2025
Naturally regenerating forest				
State owned	5379	5710	6052	5948
Privately owned	2462	2115	1772	1874
… of which owned by individuals	n.a.	n.a.	n.a.	n.a.
… of which owned by private business entities and institutions	n.a.	n.a.	n.a.	n.a.
… of which owned by local, tribal and indigenous communities	n.a.	n.a.	n.a.	447
Subtotal	7841	7825	7824	7822
Total forest area	9372	9850	9848	9847

Reclassification into FRA 2020 categories

FRA 2020 categories	Forest	OWL	OL
	%	%	%
Planted forest	100	0	0
Natural forest - tall forest	100	0	0
Naturally regenerating forest	100	0	0

FRA categories	Forest area (1000 ha)			
	1990	2000	2010	2015
Private ownership (a)	3 523.00	3 975.00	3 662.00	3 823.00
…of which owned by individuals				
…of which owned by private business entities and institutions				
…of which owned by local, tribal and indigenous communities				565.00
Public ownership (b)	5 849.00	5 875.00	6 186.00	6 023.00
Unknown/other (specify in comments) (c)	**0.27**	**0.44**	**0.12**	**0.61**
Total forest area	**9 372.27**	**9 850.44**	**9 848.12**	**9 846.61**

Comments

All land in New Zealand is formally owned.

The figures in the unknown/other category are rounding errors.

4b Holder of management rights of public forests

National Data

Data sources + type of data source eg NFI, etc

References to sources of information	Additional comments
Ministry of Forestry 1992. National Exotic Forest Description as at 1 April 1991.	Planted forest ownership. Ownership data were not available for 1990. Data from 1991 was used to report 1990.
Ministry of Agriculture and Forestry 2001. National Exotic Forest Description as at 1 April 2000.	Planted forest ownership.
Ministry of Agriculture and Forestry 2011. National Exotic Forest Description as at 1 April 2010.	Planted forest ownership.
Ministry for Primary Industries 2016. National Exotic Forest Description as at 1 April 2015.	Planted forest ownership.
Ministry of Agriculture and Forestry 2006. GIS analysis of Maori land ownership.	Data and information obtained from the Land Cover Data Base (LCDB) version 2 (2001/02 satellite imagery), and the Maori Land Information database.
Ministry for the Environment 2018. New Zealand's Greenhouse Gas Inventory 1990-2016.	Available from: http://www.mfe.govt.nz/publications/climate-change/new-zealands-greenhouse-gas-inventory-1990%E2%80%932016
LUCAS NZ Land Use Map 1990 2008 2012 (v018)	Available from: https://data.mfe.govt.nz/layer/52375-lucas-nz-land-use-map-1990-2008-2012-v018/

National classification and definitions

National Class	Definition
State owned enterprise	State owned companies or trusts.
Local government	Government at the regional or district/city level.
Central government	Government at the national level.
Planted forest	Forests planted in exotic tree species predominantly grown for wood and wood fibre and at least 1 ha in extent. In New Zealand approximately 90% of the area is planted in *Pinus radiata*. The area reported is the gross stocked forest area which generally includes mappable gaps such as roads, landings, and areas within forest boundaries that are not planted in exotic forest. Harvested areas awaiting replanting are included. All forests in this class will meet or exceed 30% canopy cover and 5 metres in height at maturity.
Naturally regenerating forest	Includes Natural forest – tall forest and Natural forest – regenerating forest
Natural forest – tall forest	Areas of natural forest at least 1 ha in extent that are dominated by tall indigenous forest canopy species. All forests in this class exceed 30% canopy cover and 5 metres in height.
Natural forest – regenerating forest	Areas of natural forest at least 1 ha in extent that will meet or exceed the forest thresholds (≥ 30% canopy cover and 5 metres height) at maturity.

Original data

Data from Table 4a were used to report forests in public ownership.

Public Ownership	**Forest area (000 ha)**			
	1990	**2000**	**2010**	**2015**
Planted forest				

State owned enterprise	350	51	11	12
Local government	65	61	57	47
Central government	55	54	66	16
Naturally regenerating forest				
State owned	5379	5710	6052	5948
Total forest area	5849	5875	6186	6023

Data from Question 3a were used to report private management rights for forests in public ownership (see comments).

Private management rights	**Forest area (000 ha)**			
	1990	**2000**	**2010**	**2015**
Naturally regenerating forest				
Private business entities and institutions	0	12	12	12

Analysis and processing of national data

Estimation and forecasting

Not required

Reclassification into FRA 2020 categories

Reclassification into FRA 2020 categories

FRA 2020 categories	**Forest**	**OWL**	**OL**
	%	**%**	**%**
Planted forest	100	0	0
Naturally regenerating forest	100	0	0

FRA categories	Forest area (1000 ha)			
	1990	2000	2010	2015
Public Administration (a)	5 849.00	5 863.00	6 174.00	6 011.00
Individuals (b)	0.00	0.00	0.00	0.00
Private business entities and institutions (c)	0.00	12.00	12.00	12.00
Local, tribal and indigenous communities (d)	0.00	0.00	0.00	0.00
Unknown/other (specify in comments) (e)	**0.00**	**0.00**	**0.00**	**0.00**
Total public ownership	**5 849.00**	**5 875.00**	**6 186.00**	**6 023.00**

Comments

Before 2000 all forests in public ownership were publically administered. In the early 2000s logging of publically owned indigenous forests by publically owned agencies ceased. The one exception was a 12,000 ha block of indigenous forest in the SW of the South Island, where a concession to harvest timber was granted to a private company in exchange for the protection of an area of privately-owned virgin old-growth forest that abuts Fiordland National Park.

5 Forest disturbances

5a Disturbances

National Data

Data sources + type of data source eg NFI, etc

References to sources of information	Additional comments
Moore JR, Manley BR, Park D, Scarrott CJ 2012. Quantification of wind damage to New Zealand's planted forests. Forestry 86: 173-183.	Wind damage to planted forests
Moore JR 2018. Unpublished dataset on wind damage to planted forests.	Wind damage to planted forests
Platt I, Griffiths A, Wootton M 2014. Assessment of Cyclone Ita wind-blow damage to West Coast indigenous forests. Ministry for Primary Industries Technical paper No. 2014/41. 25p.	Wind damage to indigenous forests. Available from: http://www.mpi.govt.nz/news-resources/publications.aspx
New Zealand Forest Research Institute (Scion) Forest Health database (accessed July 2013)	Insect pest and disease outbreaks in planted forests.
New Zealand Dothistroma Control Committee records (accessed July 2018)	*Dothistroma* outbreaks in pine plantations
Ministry for Primary Industries Kauri dieback database (accessed July 2018)	Extent of indigenous forests affected by kauri dieback.
Bulman LS, Gadgil PD, Kershaw DJ, Ray JW 2004. Assessment and control of Dothistroma needle blight. Forest Research Bulletin No. 229. 48p.	*Dothistroma* outbreaks in pine plantations
Biosecurity New Zealand, Ministry for Primary Industries. Protection and response website (accessed July 2018)	Information on the introduction and spread of myrtle rust, and measures being taken to mitigate the risks posed by the disease. Available from: https://www.mpi.govt.nz/protection-and-response/responding/alerts/myrtle-rust/

National classification and definitions

National Class	Definition
Planted forest	Forests planted in exotic tree species predominantly grown for wood and wood fibre and at least 1 ha in extent. In New Zealand approximately 90% of the area is planted in *Pinus radiata*. The area reported is the gross stocked forest area which generally includes mappable gaps such as roads, landings, and areas within forest boundaries that are not planted in exotic forest. Harvested areas awaiting replanting are included. All forests in this class will meet or exceed 30% canopy cover and 5 metres in height at maturity.
Naturally regenerating forest	Includes Natural forest – tall forest and Natural forest – regenerating forest
Natural forest – tall forest	Areas of natural forest at least 1 ha in extent that are dominated by tall indigenous forest canopy species. All forests in this class exceed 30% canopy cover and 5 metres in height.
Natural forest – regenerating forest	Areas of natural forest at least 1 ha in extent that will meet or exceed the forest thresholds (≥ 30% canopy cover and 5 metres height) at maturity.
Outbreaks of insects	A reduction in forest health caused by increased numbers of harmful insects.
Outbreaks of diseases	A reduction in forest health caused by increased levels of harmful pathogens such as bacteria, fungi, phytoplasma or virus.
Severe weather events	Damage to forested areas resulting from heavy snowfalls, high winds, prolonged drought etc.

Original data

The figures in the tables below are estimates of the extent of damage in years when significant damage was observed. Blank cells indicate that the pest/disease wasn't observed at a damaging level in that year.

Insects

Disturbance type or event	Forest area affected (1000 ha)								
	2000	2001	2002	2003	2004	2005	2006	2007	2008
Bark beetle (Hylastes ater)* – pine plantations	60	40	40	40	40	40	2	2	2
Disturbance type or event	**Forest area affected (1000 ha)**								
	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Bark beetle (Hylastes ater)* – pine plantations	2	2	2	2	2	1	1	1	1

- Bark beetle – estimated annual average for 1990-2000, 2001-2005, 2006-2013 and 2014-2017.

Diseases

Disturbance type or event	Forest area affected (1000 ha)								
	2000	2001	2002	2003	2004	2005	2006	2007	2008
Needle Blight (*Dothistroma septosporum*) – pine plantations			182			121	135		99
Red needle cast (*Phytophthora pluvialis*) – pine plantations[1]									40
Physiological needle blight – pine plantations			30						20
Kauri dieback (*Phytophthora agathidicida*) – kauri forest	1	1	1	1	1	1	1	1	1
Disturbance type or event	**Forest area affected (1000 ha)**								
	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Needle Blight (*Dothistroma septosporum*) – pine plantations								88	127
Red needle cast (*Phytophthora pluvialis*) – pine plantations	40	40	40	40	40	80	45	50	160
Physiological needle blight – pine plantations					35	25	15	35	45
Kauri dieback (*Phytophthora agathidicida*) – kauri forest	1	1	1	1	1	1	2	3	3

- Red needle cast – estimated annual average for 2008-2013.
- Kauri dieback – estimated annual average for 2000-2013.

Severe weather events

Planted forests

Disturbance type or event	Forest area affected (1000 ha)								
	2000	2001	2002	2003	2004	2005	2006	2007	2008
Wind	0.78	0.13	0.06	0.14	3.91	0.04	0.28	0.20	2.59
Disturbance type or event	**Forest area affected (1000 ha)**								

	2009	2010	2011	2012	2013	2014	2015	2016	2017
Wind	0.08	1.16	1.60	1.68	0.25	2.29	0.26	0.04	0.22

Naturally regenerating forests

Disturbance type or event	Forest area affected (1000 ha)								
	2000	2001	2002	2003	2004	2005	2006	2007	2008
Wind									

Disturbance type or event	Forest area affected (1000 ha)								
	2009	2010	2011	2012	2013	2014	2015	2016	2017
Wind						40.8			

Analysis and processing of national data

Estimation and forecasting

Not required

Reclassification into FRA 2020 categories

FRA 2020 categories	Forest	OWL	OL
	%	%	%
Planted forest	100	0	0
Naturally regenerating forest	100	0	0
Natural forest - tall forest	100	0	0
Natural forest - regenerating forest	100	0	0

FRA categories	Area (1000 ha)																	
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Insects (a)	60.00	40.00	40.00	40.00	40.00	40.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00	1.00	1.00
Diseases (b)	1.00	1.00	213.00	1.00	1.00	122.00	136.00	1.00	160.00	41.00	41.00	41.00	41.00	76.00	106.00	62.00	176.00	335.00
Severe weather events (c)	0.78	0.13	0.06	0.14	3.91	0.04	0.28	0.20	2.59	0.08	1.16	1.60	1.68	0.25	43.09	0.26	0.04	0.22
Other (specify in comments) (d)																		
Total (a+b+c+d)	**61.78**	**41.13**	**253.06**	**41.14**	**44.91**	**162.04**	**138.28**	**3.20**	**164.59**	**43.08**	**44.16**	**44.60**	**44.68**	**78.25**	**150.09**	**63.26**	**177.04**	**336.22**
Total forest area	**9 850.44**	–	–	–	–	–	–	–	–	–	**9 848.12**	–	–	–	–	**9 846.61**	**9 846.75**	**9 850.85**

Comments

Insects

1. Planted forests

Hylastes ater is being displaced by another bark beetle, *Hylurgus ligniperda*. Hylurgus causes no damage to living seedlings or trees. Over recent years the numbers of *H. ligniperda* beetles trapped have vastly outnumbered *H. ater*. *Hylastes* beetles are now only damaging small areas of planted forest in the southern South Island, and this damage will subside once *Hylurgus* becomes established. The increasing incidence insect pests has limited Eucalypt plantings and in the North Island the area of Eucalypt plantations is declining.

1. Indigenous forests

No information available

Diseases

1. Planted forests

The Dothistroma needle blight data are the most reliable. They are based on an annual aerial survey of susceptible planted forests. The aerial survey is used to identify the areas for aerial spraying to control the disease. Dothistroma outbreaks are governed by weather and disease cycles tend to occur over 4-5 years. There were reasonably severe outbreaks in 2016 and 2017, other than that disease levels have remained low since 2008.

For other diseases the data are less robust, and estimates of the area affected are based on observations rather than structured surveys. Red needle cast was first discovered in 2008. Outbreaks are localised, and remain confined to the central North Island, East Cape, and Nelson. A severe outbreak was recorded in 2017. There is no apparent trend other than it is highly uncommon for outbreaks to occur in consecutive years. Physiological needle blight is a disease that appears sporadically and in specific areas. It is unlikely to increase in distribution or severity unless climate patterns change markedly. There are no national-scale data on the extent or severity of *Cyclaneusma* needle cast (pine plantations) or Swiss needle cast (*Phaeocryptopus gaeumannii*) in Douglas fir stands. Concern over the impact of Swiss needle cast is limiting the development of Douglas fir plantations in the North Island and upper South Island.

1. Indigenous forests

There is little information on insect pest or fungal disease damage to New Zealand's indigenous forests. The major disease issue currently affecting indigenous forests is kauri dieback (*Phytophthora agacidicida*) which has the potential to damage large areas of kauri forest in the upper North Island. Kauri dieback was first observed in the early 1970s and until recently has been present at low levels in localised areas. A national programme to understand the disease and reduce its spread and impacts has been running since 2009. Surveillance undertaken during this time has seen a significant increase in detections of the disease, including new sites and spread within forest areas known to already be infected.

Myrtle rust (*Austropuccinia psidii*) was first noticed on mainland New Zealand in 2017, and despite early efforts at containment has spread rapidly. It has the potential to seriously affect indigenous forests where *Metrosideros species* (pohutukawa, northern and southern rata) are canopy dominants, and endangered species such as Bartlett's rata (*Metrosideros bartlettii*). Myrtle rust also poses a risk to forestry (*Eucalyptus* species) and horticulture (feijoa, guava), and the lucrative manuka (*Leptospermum scoparium*) honey industry.

Wind damage

There are few quantitative assessments of wind damage to New Zealand indigenous forests. This is because the low level of indigenous timber harvesting means that the damage results in little or no economic loss to the forest industry. Damaging winds are often associated with the remnants of tropical cyclones. Cyclone Ita, which damaged an estimated 40,800ha of forests on the West Coast of the South Island in April 2014, is one of the few recent storms for which the extent of damage to indigenous forests has been quantified (Platt, Griffiths & Wootton 2014).

5b Area affected by fire

National Data

Data sources + type of data source eg NFI, etc

Anderson, S.A., Doherty, J.J., Pearce, H.G. 2008. Wildfires in New Zealand from 1991 to 2007. New Zealand Journal of Forestry 53(3): 19-22.

Wakelin S.J. 2018. Update of wildfire data. Unpublished data prepared by Scion for the New Zealand Ministry for the Environment.

National classification and definitions

Forest. Areas of planted or naturally regenerating woody vegetation at least 1 ha in extent that will meet or exceed the forest thresholds (≥ 30% canopy cover and 5 metres height) at maturity.

Shrubland. Areas of naturally regenerating woody vegetation at least 1 ha in extent that are not expected to meet or exceed the forest thresholds at maturity. Woody vegetation in this class meets or exceeds 'Other Wooded Land' thresholds, and will generally exceed 30% canopy cover and 1 metre height.

Grassland. Areas of cultivated or naturally regenerating herbaceous vegetation, usually dominated by grasses. Includes montane herbfields above timberline, areas with limited vegetation cover and significant bare soil, and linear shelterbelts that are < 1 ha in area or <30 m wide.

Original data

FRA 2020 categories	Area (ha)								
	2000	2001	2002	2003	2004	2005	2006	2007	2008
Grassland	5599	3793	2442	4440	3062	1038	1751	4320	2205
Shrubland	1703	2084	2225	2247	1422	2460	2002	2202	1707
Forest	338	225	332	241	327	373	473	961	690
Total land area affected by fire	7640	6102	5000	6928	4811	3871	4226	7483	4603
FRA 2020 categories	**Area (ha)**								
	2009	2010	2011	2012	2013	2014	2015	2016	2017
Grassland	938	704	364	1641	1317	1302	910	1031	2084
Shrubland	2348	2253	1055	1241	1081	994	976	1872	2133
Forest	1004	740	551	524	424	555	1536	939	498
Total land area affected by fire	4290	3698	1970	3406	2822	2851	3422	3842	4716

Analysis and processing of national data

Estimation and forecasting

Not required

Reclassification into FRA 2020 categories

FRA 2020 categories	Forest	OWL	OL
	%	%	%
Forest	100	0	0
Shrubland	0	100	0
Grassland	0	0	100

FRA categories	Area (1000 ha)																	
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total land area affected by fire	7.64	6.10	5.00	6.93	4.81	3.87	4.23	7.48	4.60	4.29	3.70	1.97	3.41	2.82	2.85	3.42	3.84	4.72
…of which on forest	0.34	0.22	0.33	0.24	0.33	0.37	0.47	0.96	0.69	1.00	0.74	0.55	0.52	0.42	0.56	1.54	0.94	0.50

Comments

5c Degraded forest

Does your country monitor area of degraded forest		No
If "yes"	What is the national definition of "Degraded forest"?	
	Describe the monitoring process and results	

Comments

6 Forest policy and legislation

6a Policies, Legislation and national platform for stakeholder participation in forest policy

National Data

Data sources + type of data source eg NFI, etc

References to sources of information	Additional comments
Ministry for Primary Industries (2015). Sustainable management of New Zealand's forests. New Zealand's third country report on the Montreal Process Criteria and Indicators.	Available from: https://www.montrealprocess.org
Ministry for Primary Industries (2014). National report to the 11th session of the United Nations Forum on Forests. New Zealand Ministry for Primary Industries, Wellington, New Zealand. 21 p.	Available from: http://www.un.org/esa/forests/documents/index.html
Ministry of Agriculture and Forestry (2010). National report to the 9th session of the United Nations Forum on Forests. New Zealand Ministry of Agriculture and Forestry, Wellington, New Zealand. 33p.	Available from: http://www.un.org/esa/forests/documents/index.html
Resource Management Act 1993	Available from: http://legislation.govt.nz
Biosecurity Act 1993	Available from: http://legislation.govt.nz
Conservation Act 1987	Available from: http://legislation.govt.nz
Forests Act 1949	Available from: http://legislation.govt.nz

National classification and definitions

Not applicable

Original data

Not applicable

Indicate the existence of	Boolean (Yes/No)	
	National	Sub-national
Policies supporting SFM	Yes	Yes
Legislations and regulations supporting SFM	Yes	No
Platform that promotes or allows for stakeholder participation in forest policy development	Yes	Yes
Traceability system(s) for wood products	No	No

Comments

New Zealand does not have a national forest policy. It does however have a well-established and robust legal framework supporting the sustainable management of resources, including forests. This includes the Resource Management Act 1991 (RMA), Conservation Act 1987, Forests Act 1949 and Biosecurity Act 1993. The Treaty of Waitangi, which sits alongside this legislation, recognises the rights of Māori and their partnership with the Crown. The RMA is the principal legislation promoting the sustainable management of resources. In 2018 RMA regulations were used to implement a National Environmental Standard for Plantation Forestry. The Forests Act was amended in 1993 to provide for the sustainable management of indigenous forests on private land. At the subnational (e.g. conservancy) level conservation strategies for indigenous forests managed by the Department of Conservation include forest management policies and plans. These are developed under the Conservation Act 1987, and include provision for public consultation.

The development of policy on forestry (or other resource management) issues at the national, regional and/or local levels follows procedures that provide for public/stakeholder participation. At the national level this may be through correspondence or discussion with the Minister responsible for the conservation or forestry portfolios, the government department drafting the policy advice, public submission processes and/or presentations to Parliament's select committees considering the policy (and legislative) issue. Select committees are committees of Parliament. At the regional and local government levels participatory mechanisms include forums, submissions and statutory procedures that provide for submissions, hearings and judicial review of decisions.

In 2018 the Government established Te Uru Rākau/ Forestry New Zealand as a dedicated business unit within the Ministry for Primary Industries to provide a greater leadership and focus for forestry sector, including forest policy and operations.

There are no regulated traceability systems for wood and wood products from exotic forests. However, business practices mean movements of logs can be accounted for in most cases. The Forests Act has controls that require confirmation of the source of wood and wood products from indigenous forests. Chain of Custody certification is available on a voluntary basis through the Forest Stewardship Council (FSC), and the Programme for the Endorsement of Forest Certification (PEFC).

6b Area of permanent forest estate

National Data

Data sources + type of data source eg NFI, etc

References to sources of information	Additional comments
Reserves Act 1977	Available from: http://legislation.govt.nz
National Parks Act 1980	Available from: http://legislation.govt.nz
Conservation Act 1987	Available from: http://legislation.govt.nz
Department of Conservation (2005). The application in New Zealand of the IUCN system of management categories for protected natural areas. 16 p.	Report prepared by the New Zealand Department of Conservation for the New Zealand Committee of IUCN and the New Zealand Conservation Authority.
Department of Conservation (2006, 2008, 2013, 2018). Land administered by the Department of Conservation.	GIS database layer – Area estimates for IUCN categories

National classification and definitions

National Class	Definition
Permanent forest estate	Forest area protected by legislation

Original data

State-owned indigenous forests managed for conservation of biodiversity are reported as permanent forest estate. Forest area estimates reported in Question 3b were used in this table.

FRA 2020 categories	Forest area (1000 ha)					
	Applicable?	1990	2000	2010	2015	2020
Area of permanent forest estate	Yes	3 180.00	3 426.00	3 672.00	3 566.00	3 566.00

Comments

7 Employment, education and NWFP

7a Employment in forestry and logging

National Data

Data sources + type of data source eg NFI, etc

Ministry of Forestry (1993) New Zealand Forestry Statistics. Data for 1990 based on New Zealand Standard Industrial Classification (NZSIC) 1987 codes.

Statistics New Zealand. Data for 2000-2017 based on Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 codes. Available from: https://www.stats.govt.nz

National classification and definitions

Persons engaged/Full-time equivalent	Total number of full-time employees (number of persons working 30 hours or more per week plus half the number of persons working part-time. It includes proprietors who do not pay themselves a salary or wage.
Employee count	Head-count of all salary and wage earners without differentiation of employees and working proprietors.
NZSIC 1987	
1210	Forestry and services to forestry
1220	Logging and other timber felling
1230	Forestry and logging management and consulting
ANZSIC 2006	
A030100	Forestry: Growing standing timber both in native forests, plantations or timber tracts.
A030200	Logging: Felling trees for logs, cutting and shaping trees, or gathering other forest products.
A051000	Forestry support services: Providing services such as reforestation, afforestation, conservation or plantation maintenance on a fee or contract basis, operating nurseries, or providing firefighting services.

Original data

Data on forestry employment in 1990 were sourced from a Ministry of Forestry report. Annual data on forestry employment are available for download from Statistics New Zealand from 2000. Statistics New Zealand is New Zealand's official data agency. The 1990 figures are expressed as a full-time equivalent (FTE) measure of employees and working proprietors using the NZSIC 1987 codes. From 2000 onwards this changes to a count of employees and working proprietors (EC) using the ANZSIC 2006 codes. Data on the gender of employees are not available.

NZSIC 1987 codes	Definition	Persons engaged/ Full-time equivalent
		1990
1210	Forestry and services to forestry	3342
1220	Logging and other timber felling	2280
1230	Forestry and logging management and consulting	259
Total		5881

ANZSIC 2006 codes	Definition	Employee count								
		2000	2001	2002	2003	2004	2005	2006	2007	2008
A030100	Forestry	3957	4026	4026	4068	4158	4038	4020	3981	4101
A030200	Logging	4566	4650	4638	4746	4857	4701	4650	4611	4713
A051000	Forestry support services	591	636	699	726	750	753	717	654	600

Total		9114	9312	9363	9540	9765	9492	9387	9246	9414

ANZSIC 2006 codes	**Definition**	**Employee count**								
		2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
A030100	Forestry	3975	3942	3903	3816	3765	3750	3813	3789	3723
A030200	Logging	4557	4512	4500	4410	4377	4392	4470	4413	4365
A051000	Forestry support services	579	537	534	543	531	513	498	489	492
Total		9111	8991	8937	8769	8673	8655	8781	8691	8580

FRA 2020 categories	Full-time equivalents (1000 FTE)											
	1990			2000			2010			2015		
	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male
Employment in forestry and logging	5.88			9.21			9.01			8.71		
…of which silviculture and other forestry activities	3.34			3.39			3.94			3.78		
…of which logging	2.28			4.61			4.52			4.43		
…of which gathering of non wood forest products												
…of which support services to forestry	0.26			0.61			0.55			0.50		

Comments

Data for 1990 are based on a single year; for 2000 on a 2-year average, and for 2010 and 2015 on a 3-year average.

7b Graduation of students in forest-related education

National Data

Data sources + type of data source eg NFI, etc

References to sources of information	Additional comments
School of Forestry and College of Engineering, University of Canterbury, Christchurch. Records database (accessed June 2018)	
North Tec Tertiary Education Institute, Whangarei. Records database (accessed June 2018)	
Toi-ohomai Institute of Technology, Rotorua. Records database (accessed June 2018)	No data available for 1990
Waikato University, Hamilton. Records database (accessed June 2018)	

National classification and definitions

National Class	Definition
Bachelor of Forestry Science	Four year undergraduate degree.
Bachelor of Engineering (Hons) Forest Engineering	Four year undergraduate degree.
Master of Forestry Science	Two year postgraduate degree
Doctor of Philosophy	Three-four year postgraduate degree
Diploma	One year undergraduate course of study
Graduate/Postgraduate Diploma	One year graduate/postgraduate course of study

Original data

Training Institution	Degree/Diploma	Number of graduated											
		1989	1990	1991	1999	2000	2001	2009	2010	2011	2014	2015	2016
Canterbury University	Bachelor of Forestry Science	27	20	11	44	29	30	19	16	15	21	12	16
	Bachelor of Engineering (Hons) Forest Engineering	0	0	0	9	3	5	8	1	3	6	3	5
	Graduate Diploma in Forestry	0	0	0	0	0	0	0	0	0	2	1	0
	Postgraduate Diploma in Forestry	0	2	3	2	1	3	1	1	1	0	1	1
	Master of Forestry Science	4	6	2	8	3	8	5	3	1	4	2	4
	Doctoral Degree	2	2	2	2	3	6	1	3	6	5	2	4

Training Institution	Degree/Diploma	Number of graduated											
		1989	1990	1991	1999	2000	2001	2009	2010	2011	2014	2015	2016
Waikato University	BSc/BSc Tech. (Forestry major)	0	0	0	7	9	2	0	0	0	0	0	0

Training Institution	Degree/Diploma	Number of graduated											
		1989	1990	1991	1999	2000	2001	2009	2010	2011	2014	2015	2016
Toi-ohomai Institute of Technology	New Zealand Diploma in Forest Management				0	0	0	0	0	0	0	0	1

	Diploma in Forest Management				0	0	0	0	0	0	0	6	9
	Diploma in Forestry Operations				0	0	0	0	0	0	0	5	9
	National Diploma in Forestry (Forest Management)				0	27	0	0	7	0	0	0	0

Training Institution	**Degree/Diploma**	**Number of graduated**											
		1989	**1990**	**1991**	**1999**	**2000**	**2001**	**2009**	**2010**	**2011**	**2014**	**2015**	**2016**
North Tec Tertiary Education Institute	Northland Polytechnic Certificate in Forestry (Forest Industries)	0	0	0	0	0	0	33	10	40	50	54	13
	Northland Polytechnic Certificate in Foundation Forestry Skills	0	0	0	0	0	0	12	16	13	32	36	0
	National Certificate in Forest Operations	0	0	0	0	0	0	0	0	1	73	188	68
	New Zealand Certificate in Forest Harvesting Operations	0	0	0	0	0	0	0	0	0	0	0	21
	New Zealand Certificate in Forest Industry Foundation Skills	0	0	0	0	0	0	0	0	0	0	0	44

FRA 2020 categories	Number of graduated students											
	1990			2000			2010			2015		
	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male
Doctoral degree	2.00			4.00			3.00			4.00		
Master's degree	4.00			6.00			3.00			3.00		
Bachelor's degree	19.00			46.00			21.00			21.00		
Technician certificate / diploma	2.00			11.00			17.00			165.00		
Total	27.00			67.00			44.00			193.00		

Comments

7c Non wood forest products removals and value 2015

National Data

Data sources + type of data source eg NFI, etc

References to sources of information	Additional comments
Ministry for Primary Industries 2015. Apiculture monitoring report. 12p	Available from: https://catalogue.data.govt.nz/dataset/horticulture-arable-and-apiculture-monitoring
New Zealand Fur Council – unpublished estimate of quantity and value of skins and fibre from Australian brushtail possums.	
Sphagnum industry sources – unpublished estimate of the quantity and value of sphagnum moss harvested in 2015.	

National classification and definitions

National Class	Definition
Honey obtained from forests	Honey production from forests and other wooded land.
Possum skins	Skins of Australian brushtail possums (*Trichosurus vulpecula*), an introduced pest species of marsupial in New Zealand forests.
Possum fibre	Fibre from Australian brushtail possums (*Trichosurus vulpecula*), an introduced pest species of marsupial in New Zealand forests.
Sphagnum moss	Mainly *Sphagnum cristatum* and *S. subnitens*, harvested from swamps on forest land in high rainfall areas.

Original data

Honey

New Zealand beekeepers produced 19,710 tonnes of honey in 2015 (Apiculture monitoring report 2015). Industry estimates suggest that c.38% of the honey crop comes from forests and other wooded land, and that the average price paid for forest-related honey was c. $15 per kg.

Possum skins

The New Zealand Fur Council estimates that 100,000 possum skins were processed in 2015, with a value to trappers of $1.2 million.

Possum fibre

This is plucked from the carcase while it is still warm. It is typically blended with merino wool to create high value garments. The New Zealand Fur Council estimates that 70,000 kg of possum fibre was processed in 2015, with a value to trappers of $8.4 million

Sphagnum

In 2015 New Zealand sphagnum producers harvested an estimated 253.3 tonnes of moss from forests and other wooded land, mostly on the West Coast of the South Island. The average price paid to the pickers was $10/kg.

	Name of NWFP product	Key species	Quantity	Unit	Value (1000 local currency)	NWFP category
#1	Honey	Apis mellifera	7 490	tonnes	112 000	11 Wild honey and bee wax
#2	Possum fibre	Trichosurus vulpecula	70 000	kg	8 400	16 Other non-edible animal products
#3	Sphagnum moss	Sphagnum cristatum	253 300	kg dry weight	2 533	8 Other plant products
#4	Possum skins	Trichosurus vulpecula	100 000	individual skin	1 200	10 Hides skins and trophies
#5						
#6						
#7						
#8						
#9						
#10						
All other plant products						
All other animal products						
Total					**124 133**	

Name of currency	New Zealand dollar

Comments

All honey production in New Zealand is from managed hives. The Varroa honey bee mite (Varroa destructor), which was first observed in New Zealand in 2000 and has now spread through most of the country, has wiped out all wild honey bee (*Apis mellifera*) populations.

Brushtail possums (*Trichosurus vulpecula*) were introduced to New Zealand from Australia in the mid-1800s, and now occupy most forested areas in the country. Possums cause damage to indigenous fauna and flora and are considered a pest species. Private trappers are one of the means used to reduce possum populations.

Sphagnum moss harvesting is concentrated in the high rainfall areas of the West Coast of the South Island. The moss is handpicked and where access is difficult helicopters are used to transport the moss to the nearest road-end.

8 Sustainable Development Goal 15

8a Sustainable Development Goal 15

SDG Indicator 15.1.1 Forest area as proportion of total land area 2015

Indicator	Percent							
	2000	2010	2015	2016	2017	2018	2019	2020
Forest area as proportion of total land area 2015	37.41	37.40	37.40	37.40	37.41	37.43	37.47	37.57

Name of agency responsible	New Zealand Ministry for Primary Industries

SDG Indicator 15.2.1 Progress towards sustainable forest management

Sub-Indicator 1	Percent						
	2000-2010	2010-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020
Forest area annual net change rate	-0.00	-0.00	0.00	0.04	0.04	0.11	0.27

Name of agency responsible	New Zealand Ministry for Primary Industries

Sub-Indicator 2	Forest biomass (tonnes/ha)							
	2000	2010	2015	2016	2017	2018	2019	2020
Above-ground biomass stock in forest	278.38	289.32	293.40	294.15	294.49	295.02	295.23	294.65

Name of agency responsible	New Zealand Ministry for Primary Industries

Sub-Indicator 3	Percent (2015 forest area baseline)							
	2000	2010	2015	2016	2017	2018	2019	2020
Proportion of forest area located within legally established protected areas	34.79	37.29	36.22	36.22	36.22	36.22	36.22	36.22

Name of agency responsible	New Zealand Ministry for Primary Industries

Sub-Indicator 4	Percent (2015 forest area baseline)							
	2000	2010	2015	2016	2017	2018	2019	2020
Proportion of forest area under long-term forest management plan	71.12	75.33	74.63	74.66	74.76	74.82	74.97	75.27

Name of agency responsible	New Zealand Ministry for Primary Industries

Sub-Indicator 5	Forest area (1000 ha)							
	2000	2010	2015	2016	2017	2018	2019	2020
Forest area under independently verified forest management certification schemes	19.70	1 071.84	1 262.90	1 263.82	1 271.38	1 283.36	–	–