

# ANNUAL REPORT 2015



LANDCARE RESEARCH  
MANAĀKI WHENUA





Landcare Research New Zealand Limited  
(Manaaki Whenua)  
Annual Report 2015

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to Section 44 of the Public Finance Act 1989.

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**Manaaki whenua – Manaaki tangata**  
**(Care for the land – Care for the people)**

Our Māori name means to care for the land in all senses. Māori are tangata whenua, the indigenous people of New Zealand, with whom we consult and collaborate.

[www.landcareresearch.co.nz](http://www.landcareresearch.co.nz)

Front cover image: Measuring the factors regulating the uptake and release of carbon dioxide on a commercial dairy farm (*John Hunt*)



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## > ABOUT US

### Our Organisation

Landcare Research was formed in 1992 and is one of the seven current Crown research institutes (CRIs). CRIs function as independent companies but are owned by and accountable to the New Zealand Government.

Our Core Purpose is to drive innovation in New Zealand's management of terrestrial biodiversity and land resources in order to both protect and enhance the terrestrial environment and grow New Zealand's prosperity.

Four National Outcomes outlined in this report (pages 6–13) will be achieved through effective science leadership and strong partnerships with our stakeholders who implement research outputs – the knowledge, tools, technology, systems and frameworks, and policy recommendations supporting economic, social, cultural and environmental well-being.

Our key stakeholders are:

- The Natural Resources Sector (Department of Conservation (DOC); Land Information New Zealand (LINZ); Ministry of Business, Innovation and Employment (MBIE); Ministry for the Environment (MfE); Ministry for Primary Industries (MPI); Te Puni Kōkiri (TPK); and regional councils)
- TBfree New Zealand (OSPRI)
- Māori organisations
- Private sector businesses and industry implementing sustainable good practice

### On the Web

More information about the scope of our research, operational activities, governance and philosophy is available on our web site. Each year we also publish new innovation case studies (referenced in this report) on the web to illustrate how research supported by Core funding is of benefit to New Zealand.

[www.landcareresearch.co.nz](http://www.landcareresearch.co.nz)

### National Science Challenges

Landcare Research is the host agency for New Zealand's Biological Heritage National Science Challenge.

[www.biologicalheritage.nz](http://www.biologicalheritage.nz)

## > CHAIR & CHIEF EXECUTIVE'S REVIEW

Welcome to Landcare Research's Annual Report for the year to 30th June 2015. We are delighted to report a very positive year in which our people have worked closely with stakeholders to produce world class science that will benefit our society, the natural environment and the economy.

Landcare Research also met its financial targets for the year in a difficult operating environment and contributed strongly to new structural initiatives in the New Zealand science sector.

### Vision and Mission

Our vision is that science leads to stronger social, economic and cultural development while enhancing and protecting our natural environment, both now and for future generations. Our mission is to combine our efforts with those of others to achieve outcomes that New Zealand needs for a sustainable future.

Landcare Research is an integrator – across organisations and scientific disciplines, across paddock boundaries and landscapes, across cultures and countries, and across timeframes from past to future. This reflects the fact that the natural environment affects many aspects of our lives over long timeframes. Its issues are complex and global, involving social, economic and cultural concerns, not just at a place or point in time.

### Strategic Direction

This year we launched Strategy 2017, which set our strategic priorities for enhancing science impact and ensuring Landcare Research's financial resilience. Strategy 2017 puts our primary focus on the value of our science to the public sector – central and local government. That involvement with government policy and its implementation enables us to bring very relevant expertise to the primary sector and to the issues of being internationally competitive and maintaining 'social licence to operate.' Our special affinity with Māori aspirations for sustainable land development is also identified in Strategy 2017 and we are responding to the growing desire of Māori organisations to engage with science and research. The clearer focus of Strategy 2017 has resulted in stronger financial performance compared to recent years.

### Innovation and Impact

Reflecting on a very productive year, we are proud of innovations and impacts created by Landcare Research. Some of the Core-funded innovations are summarised in this report (with full case studies available online). However, innovation is also integral to our other research – here are some of the best examples from 2014/15.

*Environmental reporting:* one of our senior scientists was seconded to MfE to lead the land domain in the 2015 New Zealand State of Environment Report. Our spatial informatics research and National Land Resource Centre have strongly supported environmental reporting and data developments for central and local government.

*Water reforms:* our NZFARM and LUMASS economic/environmental models helped central and local government to model the impacts of water management policies, while our soil research and SedNetNZ modelling played a key role in helping set environmental limits for fresh water.

*Māori development:* working with Māori trusts and incorporations, we have used our land knowledge and understanding of Māori cultural aspirations to support the sustainable development of Māori-owned land.

*Biosecurity risks:* we have used DNA tools and our Nationally Significant Collections to support MPI and industry in responding to serious pest incursions and outbreaks, e.g. Queensland fruit fly and kauri dieback disease.

*Pest control and 'Freedom from TB':* we have developed large-scale pest control techniques that have assisted TBfree New Zealand in combatting TB vectors (principally possums) with more efficient use of poisons, and knowing when an area can be reliably declared free from TB in wildlife. We have worked closely with communities that are potentially impacted by control operations and also highlighted when and where communities can play a strong role in helping with pest control efforts.

*National collections:* we have greatly enhanced the accessibility of the information they contain through development of online access, e.g. e-Biota, e-Flora.

*Weed biocontrol:* our biocontrol group calculated the major cost/benefit gains from previous programmes that have significantly reduced ragwort and St. John's Wort using introduced insect biocontrol agents. New releases in 2014/15 included a rust (fungus) for Lantana.

*Next generation biodiversity assessment:* we are continuing to develop DNA tools for characterising biodiversity at the ecosystem level as a tool for government agencies and businesses wanting measures of change. This project is an MBIE Smart Idea.

*S-map Online:* our soils knowledge and open-access digital soil data are being used widely as an input to farm nutrient modelling and planning. Use of S-map Online has increased dramatically (page 31).

*Commercialisation:* our soils and sensor technology is being developed in the irrigation market in the USA.

*International:* we commenced two major MFAT-funded projects focused on building quarantine capability and catchment management in Indonesia and Ecuador, respectively.

### National Science Challenges

National Science Challenges represent a step-change in collaboration and ambition for New Zealand science. We are delighted to be the host of the New Zealand's Biological Heritage Challenge, which aims to reverse the decline of New Zealand's biological heritage, improve our biosecurity and enhance our resilience to harmful organisms. Biological heritage includes what is natural to New Zealand and the imported species on which our economy depends heavily. Our Board of Directors is accountable to our shareholding Ministers for delivering the \$26 million Challenge contract, which we signed with MBIE during the year.

The Challenge brings together 17 collaborating parties including CRIs, universities, DOC and MPI. They will align science and other activities, pushing the boundaries of what we think can be achieved. It is an exciting philosophy that goes beyond business as usual. We are especially delighted to see Dr Andrea Byrom from Landcare Research appointed as Director of the Challenge. Our Dr Phil Lyver



is a kaihautu mātauranga to the Challenge and our Dr Thomas Buckley leads the biodiversity assessment theme.

Landcare Research is also a collaborating party in the Our Land and Water Challenge and the Deep South Challenge, contributing our expertise in land, land development and Māori science; and we lead a community-based project on kauri dieback in the Nation of Curious Minds Project.

### Lincoln Hub and the Primary Sector

Landcare Research has been a partner in the Hub concept since its inception in 2011. We see the Hub meeting New Zealand's aspirations for primary sector development by achieving a greater level of integration between research and development, tertiary education and industry. A major focus during the year has been development of Hub building plans. Progress has been made with integrating science and plans for a Joint Graduate School.

## Māori Science

Landcare Research has a strong affinity with Māori attitudes towards sustainable land development and protection of taonga (culturally significant) flora, fauna, fungi and places. Our partnerships with Māori organisations have deep roots and are now extending into new relationships with agri-business. This reflects their desire to engage with science to develop sustainable options for their land assets and to produce successful products for global markets.

To guide us on this path we have created a new role of General Manager Māori Development and are very pleased to have appointed Keith Ikin (Ngāti Maniopotō). His deep, practical understanding of Māori agri-business and his commitment to the principles of manaakitanga, kaitiakitanga and rangatiratanga are strongly aligned to our goals and our research. We have also recruited three additional Māori researchers who bring exciting new skills to our work, integrating across science and mātauranga (traditional Māori knowledge).

## Our People

Our staff are our greatest asset and advocates, each passionate about their area of expertise. We are committed to ensuring that our people continue to perform as effectively as possible. This year we initiated a Leadership Development Programme, building skills needed both within our organisation and in the wider science sector where we collaborate. We also assist staff to develop their science skills and networks through presenting at international conferences and publishing in international journals. We continue to support the next generation by investing in senior scientist time supervising over 80 doctoral and masters students at a number of universities.

We are also committed to operating a safe working environment and all staff going home each day safe and well. This year we initiated a well-being programme that provides a series of activities and personal assessments relating to wellness at home and in our personal lives. Uptake of the programme has been pleasing. We also commissioned an external audit of our safety policies and practice, which will be reported in the new year. Our directors signed a personal commitment to the organisation's health and safety goals during the year and the Board takes a vigilant and closely engaged stance on these matters.

## Financial Performance

Landcare Research performed very well, exceeding revenue and profit targets in its parent (science) business and exceeding profit and return on equity targets at the

group level (including the Enviro-Mark Solutions subsidiary). Parent revenue of \$55.9m (budget \$55.1m) was 7.3% up on the previous year (\$52.1m). This was achieved in spite of continuing budget pressure on our major clients. Revenue growth was achieved across all of our market sectors and also from the new New Zealand's Biological Heritage National Science Challenge.

At the group level our return on investment was 7.2% (budget 6.8%) before re-investment in science. Our group level EBIT (\$2.2m) included a \$0.7m re-structuring cost.

## Enviro-Mark Solutions

Enviro-Mark Solutions is a wholly-owned subsidiary. Their programmes (CEMARS® and carboNZero<sup>Cert</sup>™) continue to be recognised internationally as 'best in class' and our advice is called upon by overseas governments. Although growth in this area of the business in New Zealand has been slower than anticipated, client retention in the business is very high (>90%), reflecting a high quality product and commitment by our clients. Growth continues in the UK through our partner, Achilles Information, and also in Chile. Enviro-Mark Solutions and Landcare Research made submissions to the New Zealand Government on the choice of post-2020 climate change commitment.

## Board Appointments

At the end of the year we said farewell to Peter Schuyt, chair of the Board for three years, at the end of his term. Peter had been a director for six years and brought strong leadership to the Board. This year we welcome Professor Caroline Saunders, Lincoln University, and Dr Paul Reynolds, former Chief Executive at the Ministry for the Environment. We are excited by the dynamism and insights that both will bring from their very relevant experience.

In conclusion, we wish to thank our staff and our stakeholders for their support and dedication to the role that Landcare Research plays in New Zealand. We start the year in a strong position and are eager to expand on our successes to develop new initiatives and new partnerships for the good of our country and its people.



Jane Taylor  
Chair



Dr Richard Gordon  
Chief Executive



## > STAFF PHOTOGRAPHY COMPETITION 2015

The photography competition celebrates the many excellent photographers we have in Landcare Research and provides an opportunity for staff to share with colleagues interesting places and situations, including the humorous and intrepid aspects of fieldwork across all of our National Outcomes.



'Next generation ecologists' (John Hunt), Supreme winner; 'Pedology in a stony field' (John Hunt), first runner up; 'Bellbird in kōwhai' (Peter Sweetapple), second runner up; 'Fieldwork in Takahe Valley' (Moana Meyer), highly commended; 'Across the Hollyford' (Peter Sweetapple), highly commended.



# NATIONAL OUTCOME › BIODIVERSITY

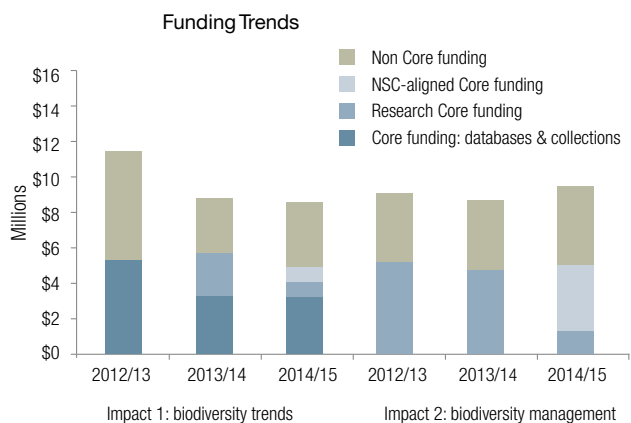


## › Improved measurement, management and protection of New Zealand’s terrestrial biodiversity, including in the conservation estate.

This National Outcome can only be achieved through the concerted actions of many agencies principally DOC, regional councils, the Sanctuaries of New Zealand network, NGOs and community groups, and also private landowners, Māori and primary sector businesses. All of these agencies need cost-effective consistent biodiversity management and monitoring tools that encompass the diversity of species and habitats within and outside the conservation estate. Consistency across diverse agencies supports a shared understanding of priorities for conservation management, and provides a more robust co-ordinated framework for assessing the effectiveness of management actions targeting these priorities.

Landcare Research’s role is to work closely with stakeholders to develop and apply monitoring and management systems across New Zealand, and to build and share knowledge about how to protect and enhance New Zealand’s valued biodiversity. This is also reflected in

our role as the host agency for New Zealand’s Biological Heritage National Science Challenge, which involves 17 collaborating parties focused on reversing the decline in New Zealand’s biodiversity.



Tōi mountain cabbage tree (*Cordyline indivisa*)



**Impact 1.1:**

Trends in national and regional biodiversity on public and private land are known and understood, based on best available definitions and descriptions for species and indices of ecological integrity.

We continued to improve understanding of what constitutes healthy biodiversity at local, regional and national scales. This information underpins evidence-based land management and conservation decisions. The threat status of species and ecosystems may change with land use (restoration or development) or through new insights into species relationships and descriptions, particularly as revealed by the use of DNA technologies. Our authoritative, up-to-date information and identification resources were readily available to users through the web and via new apps, training workshops, advisory and identification services, and technical advisory groups and key user forums.

We also supported citizen science initiatives such as the New Zealand Bio-Recording Network Trust.

*Key performance indicator 1.1: DOC and regional councils are using comparable metrics to measure status and trend and impacts of interventions on biodiversity within their jurisdictions.*

Core-funded progress for 2014/15 is reported in the achievements table, particularly under:

- Measuring Biodiversity Change (pages 14–15)
- Defining Land Biota (pages 15–16)
- Managing Invasive Weeds, Pests and Diseases (pages 18–19)

**Impact 1.2:**

Frameworks are in place to ensure the most threatened ecosystems, habitats and species are managed to reduce the risk of decline in native biodiversity.

Landcare Research is a key source of specialist biodiversity information to support RMA decision processes. This year, staff were called on as expert witnesses or asked to provide evidence in regard to managing dryland biodiversity, and wetland conservation and management. Our open-access, comprehensive web pages on naturally uncommon ecosystems continued to be a source of information in RMA hearings.

We used our strong ecological and informatics capability to support a variety of environmental modelling and decision support systems. Modelling risk and potential outcomes from various management scenarios is a highly cost-effective way of developing goal-focused, best-practice biodiversity management strategies. These data provide the evidence base to support decision-making by the agencies with regulatory responsibility for biodiversity management and the private sector. We also provided support for NGOs such as the Sanctuaries of New Zealand national network and the Predator Free New Zealand initiative.

*Key performance indicator 1.2a: Consents related to land use change under the Resource Management Act (RMA) are informed by a scientifically-based set of criteria that takes account of cumulative effects on habitat availability.*

Core-funded progress for 2014/15 is reported in the achievements table, particularly under:

- Measuring Biodiversity Change (pages 14–15)
- Managing Biodiversity (pages 16–17)

*Key performance indicator 1.2b: Management decisions by DOC, MPI and regional councils, aimed at reducing threats to species and habitats, are based on robust risk models that reflect best available knowledge about the efficacy, cost and acceptability of management strategies and tools.*

Progress for 2014/15 is reported in the Core-funding achievements table, particularly under:

- Measuring Biodiversity Change (pages 14–15)
- Managing Biodiversity (pages 16–17)
- Managing Invasive Weeds, Pests and Diseases (pages 18–19)
- Understanding Ecosystem Services and Limits (pages 20–21)
- Enhancing Policy Development (pages 22–23)

# NATIONAL OUTCOME › LAND RESOURCES

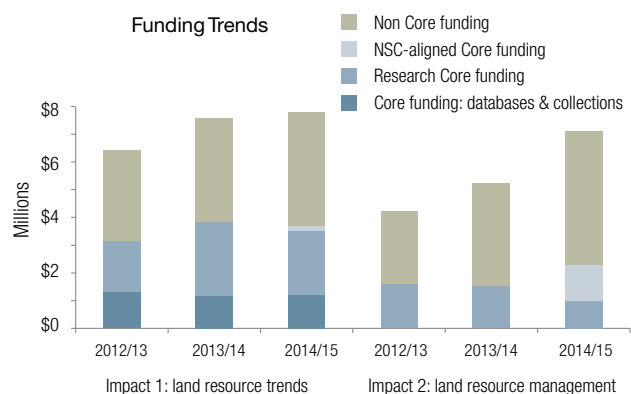


## › Achieve the sustainable use of land resources and their ecosystem services across catchments and sectors.

For this Outcome, we partner with both the primary sector and the national and regional authorities responsible for policy, regulation and operational decisions relating to land management, land use planning and optimisation, primary sector productivity, freshwater standards and allocation of water resources. Increasingly, we also work with Māori sector partners, such as Te Tumu Paeroa, Māori trusts and collectives, and iwi and hapū to support the development of Māori-owned land.

Our research focuses on 1) mapping soil and land resources at much finer scales than previously documented, and 2) developing new methods to assess and manage the ecosystem services that support the economy and our well-being. These data are key to identifying opportunities to improve land and water management. Our capabilities in the land resources area are complemented by strong informatics skills in accessing and analysing environmental information, mapping and geospatial visualisations, and making these data more widely and directly accessible.

The National Land Resource Centre, the 'Lincoln Hub' and the Our Land and Water National Science Challenge are critical to supporting 'green growth' in the primary sector while maintaining the intrinsic environmental and cultural values of the 'New Zealand brand'.





**Impact 2.1:**

The status and trends of land resources and ecosystem services (including their interactions) are known and understood.

The demand for environmental information to support effective management of land resources in New Zealand has been growing. We continued to invest in developing the nationally significant soil and land databases and information systems, supported by our remote sensing and informatics capability. This year, we released new updated versions of the Land Cover Database (LCDB) and S-map Online. Digital soil mapping techniques have proven vital to cost-effective coverage of new areas in S-map, particularly those areas prioritised by regional councils to underpin land development and new irrigation proposals. We also continued to develop innovative approaches to finer-scale mapping, which delivers data suitable for farm-scale nutrient budgets and environmental management plans.

Data is delivered via the LRIS Portal, S-map Online, Our Environment Portal, the WhenuaViz information tool, and the National Land Resource Centre. We also initiated marae-based workshops for Māori agri-business on the use of S-map and land resource information.

*Key performance indicator 2.1: LCDB (land cover), LUDB (land use), S-map (soil) and ESDB (ecosystem services) components of LRIS (Land Resource Information System) have been enriched and are being used under the New Zealand Government Open Access Licensing framework for web-services.*

Core-funded progress for 2014/15 is reported in the achievements table, particularly under:

- Characterising Land Resources (pages 19–20)

**Impact 2.2:**

Opportunities and threats to land resources are recognised and balanced to maintain or enhance the provision of ecosystem services.

Opportunities for improving land and water management have been supported by best available resource data, our innovative modelling and technological approaches, and our frameworks that recognise cultural values in freshwater management. We continued to quantify the potential for increased ground- and fresh-water contamination by nitrates, cadmium and microbes due to the rapid expansion of irrigation and intensified agriculture. Our research on soil and soil-water processes and carbon-nitrogen dynamics supports policy development and management decisions.

We continued to collaborate with other research providers and to share information with end users via the Sustainable Land Use Initiative (SLURI), the Fertiliser and Lime Research Council, Federated Farmers, DairyNZ, IrrigationNZ, the mining sector, the Land Monitoring Forum, Lake Taupo Protection Trust and other similar groups.

*Key performance indicator 2.2: Regional councils and the irrigation, pastoral, horticultural and arable sectors are using knowledge of soil variability to improve the match between land-use practices and land capability.*

Core-funded progress for 2014/15 is reported in the achievements table, particularly under:

- Characterising Land Resources (pages 19–20)
- Understanding Ecosystem Services and Limits (pages 20–21)
- Realising Land Potential (page 21)

# NATIONAL OUTCOME

## > GREENHOUSE GASES & CARBON SINKS

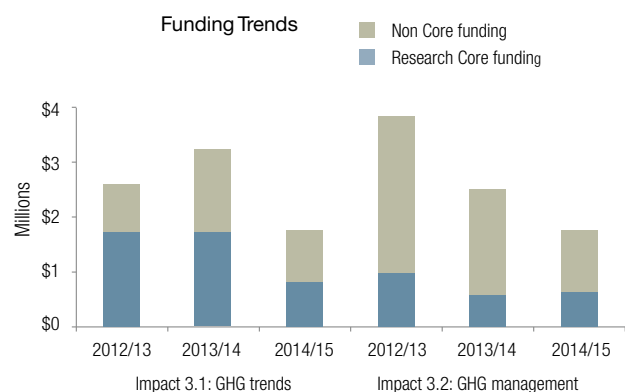


### > Improved measurement and mitigation of greenhouse gases from the terrestrial biosphere.

Under the United Nations Framework Convention on Climate Change, New Zealand has an obligation to decrease net emissions of greenhouse gases from terrestrial systems to below 'business as usual' levels, and must produce an annual national greenhouse gas emissions inventory. To ensure reporting of emissions and removals is as accurate as possible, it is necessary to have access to: (1) a robust inventory of net emissions and carbon storage, and (2) effective mitigation options for reducing net emissions—both of which must take into account emissions and carbon storage resulting from land management, land use change and global change.

The challenges to achieving these complex and interrelated objectives remain substantial, with significant gaps in science knowledge and associated policy and land

management settings. To achieve this National Outcome, we are working extensively in collaboration with a number of other research groups, as well as key end users in the Natural Resources Sector and the Primary Sector.



Unusual wave clouds form under particular atmospheric conditions (John Hunt)



**Impact 3.1:**

The status of terrestrial greenhouse gas emissions and removals is understood and quantified so that changes in relation to management strategies, land-use policies and global change can be predicted.

Key issues for New Zealand's reporting are the robustness of estimates in the annual inventory, understanding the complex processes that govern emissions and sinks, and the impact of land use. We have continued to develop new, more sophisticated methodologies to refine previous estimates with innovative technology, research and modelling across various scales and difficult forested terrain.

We met regularly with MPI and MfE to discuss research (e.g., hill country-specific emission factors that significantly reduce nitrous oxide emissions inventories) and the implications for national reporting to the Intergovernmental Panel for Climate Change (IPCC). Information was also shared via the Global Research Alliance (GRA), the New Zealand Agricultural Gases Research Centre (NZAGRC), the New Zealand Centre for Climate Change (NZCCC) and research networks.

*Key performance indicator 3.1: MPI and MfE are using verified estimates of greenhouse gas (GHG) emissions and carbon storage to reduce uncertainty in national inventories.*

Core-funded progress for 2014/15 is reported in the achievements table, particularly under:

- Measuring Greenhouse Gases and Carbon Storage (page 22)

**Impact 3.2:**

Land use options, asset management and other methods that increase carbon storage and mitigate greenhouse gas emissions are understood for environmental, economic and social benefits.

Our ongoing research has focused on improving understanding of soil carbon and nitrogen in relation to land management, and the role that soil microbial and fungal communities play in emissions and mitigation. We recalibrated the economic model CLiMAT-DGE baseline to align with government economic growth and projected greenhouse gas emissions, which enabled us to model potential climate policy scenarios to support New Zealand during international climate negotiations. We also started a new trial to investigate the potential of biochar and methanotrophic ('methane-eating') soil bacteria to mitigate methane emissions from housed dairy cows.

We worked with MPI, MfE, primary sector groups (DairyNZ, Fonterra, Synlait, Beef+Lamb NZ, and the pig and poultry sectors) and the fertiliser industry.

*Key performance indicator 3.2: Validated methodologies and land-use practices to mitigate greenhouse gas emissions and increase carbon storage and adapt to likely climate change effects.*

Core-funded progress for 2014/15 is reported in the achievements table, particularly under:

- Understanding Ecosystem Services and Limits (pages 20–21)
- Measuring Greenhouse Gases and Carbon Storage (page 22)
- Enhancing Policy Development (pages 22–23)

# NATIONAL OUTCOME

## > DEVELOPMENT WITHIN ENVIRONMENTAL LIMITS

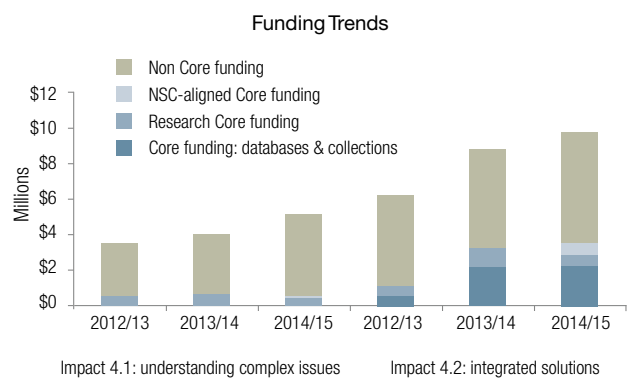


> Increase the ability of New Zealand industries and organisations to develop within environmental limits and meet market and community requirements.

New Zealand's primary sector exports, national tourism industry and our national reputation for spectacular film locations are all underpinned by the perceived environmental integrity of our landscapes – a key part of the 'New Zealand story'. To sustain this brand, and the well-being of our own society, sectors must operate within complex environmental limits, balancing the diverse needs of multiple stakeholders across government, the primary sector, Māori and communities.

Our research supports agencies tasked with developing and implementing effective environmental policy, regulation and practices for sustainable resource use. Increasingly, we are working with primary sector businesses and Māori entities to ensure that our productive sectors have a license to operate, both here in New Zealand and offshore in export markets. A key part of our work is to develop and apply integrated approaches to manage the impacts of primary production on the natural environment, and provide tools to demonstrate this to communities and consumers alike.

Our work also supports MPI and other operational agencies tasked with managing biosecurity on behalf of New Zealanders, New Zealand's Biological Heritage National Science Challenge, as well as DOC, regional councils and land managers responsible for weed and other pest management. Our partnership with TBfree New Zealand (OSPRI) to eradicate bovine TB by managing sources of infection in wildlife, in possums particularly, delivers significant benefit for biodiversity.



Natural sandstone pavement and waste rock dumps at Stockton Mine, mine site rehabilitation (Jo Cavanagh)



**Impact 4.1:**

Factors (including the form of institutions) required to resolve complex environmental issues are understood, and opportunities recognised for adapting to global change and reducing vulnerability to resource scarcity.

Sustainable development is a complex issue with no one 'right answer' for resolving multiple viewpoints relating to the management of New Zealand's natural resources. Communities can have polarised views on what constitutes acceptable development (e.g. in relation to land use intensification or mining) and on the associated impacts on natural resources (e.g. water quality and availability, biodiversity, cultural values). Our work has helped develop new ways to reach consensus on natural resource management and to understand the potential implications of decisions and regulations.

Society expects that weeds, pests and pathogens should be managed in ways that are cost-effective, humane and environmentally sensitive, and beneficial to primary production and biodiversity. In addition to developing the strategies and technologies to achieve this, we focused considerable effort on transferring these to stakeholders and end users, e.g. through the annual Biosecurity Bonanza workshop.

*Key performance indicator 4.1: Industry sectors, central and local government are making strategic use of research findings, associated indicators of performance, and new economic instruments to respond to complex environmental issues, global change processes and resource scarcity.*

Core-funded progress for 2014/15 is reported in the achievements table, particularly under:

- Managing Weeds, Pests and Diseases (pages 18–19)
- Characterising Land Resources (pages 19–20)
- Understanding Ecosystem Services and Limits (pages 20–21)
- Enhancing Policy Development (pages 22–23)

**Impact 4.2:**

Best solutions that integrate economic, social, cultural and environmental initiatives for business and industry are effective in maintaining or enhancing their international competitiveness, market access and social licence to operate.

Regulators, sector groups, consumers and communities increasingly expect evidence of sustainable management of land, soil and water resources, and environmental responsibility in the business sector. Through our use of scenario modelling and decision frameworks, underpinned by economic and environmental data, we have enabled more-informed exploration of policy options and management scenarios to better meet the government agenda and community and cultural values.

Landcare Research is TBfree New Zealand's leading science partner for the management and eradication of TB. A senior staff member was seconded 20% to the agency in an advisory and policy development role (and is now employed by them rather than seconded to them), and two other staff continue as members of TBfree New Zealand's high level advisory groups. We also contributed to formal revocation reviews for declaring areas free of TB.

*Key performance indicator 4.2a: An industry sector (dairy, horticulture or energy) is using a framework for integrating economic, environmental, social and/or cultural drivers to meet community and/or market requirements.*

Core-funded progress for 2014/15 is reported in the achievements table, particularly under:

- Understanding Ecosystem Services and Limits (page 20–21)
- Enhancing Policy Development (pages 22–23)
- Supporting Trade (page 23)

*Key performance indicator 4.2b: Bovine TB is eradicated by TBfree New Zealand (OSPRI) from vector populations in two extensive forest areas in programmes responding to economic, social, cultural and environmental drivers.*

Nationally, 1.1 million hectares have now been declared free of TB in wildlife (National Bovine TB Plan Review Consultation Document, June 2015). Core-funded progress for 2014/15 is reported in the achievements table:

- Supporting Trade (page 23)

## > CORE FUNDING ACHIEVEMENTS TABLE

Landcare Research received \$24.2 million Core Funding in 2014/15 for research to achieve:

**Outcome 1:** Improved measurement, management and protection of New Zealand's terrestrial ecosystems and biodiversity, including in the conservation estate

**Outcome 2:** Achieve the sustainable use of land resources and their ecosystem services across catchments and sectors

**Outcome 3:** Improved measurement and mitigation of greenhouse gases from the terrestrial biosphere

**Outcome 4:** Increase the ability of New Zealand industries and organisations to develop within environmental limits and meet market and community requirements

Our Core Funding investment and key 2014/15 achievements are shown in the following table.

Research activity 2014/15 Key Achievements	Core Funding Investment (\$M excl GST)		
	2013/14 (actual)	2014/15 (planned)	2014/15 (actual)
<b>MEASURING BIODIVERSITY CHANGE</b>	<b>\$1.99</b>	<b>\$2.03</b>	<b>\$2.17</b>
<b>End-users:</b> MfE; MPI; regional councils; DOC; landowners; Māori and other New Zealanders; non-governmental organisations (NGOs); consulting firms; community conservation groups.			
<b>Developing standardised measures of biodiversity – Outcome 1</b>		-	\$0.03
<ul style="list-style-type: none"> <li>Implemented standardised measures of terrestrial biodiversity through EMaR process, aligning us with key government agencies and councils to ensure consistent, defensible reporting of biodiversity across New Zealand landscape (e.g. for the new Environmental Reporting Act).</li> </ul>			
<b>Measuring biodiversity outcomes – Outcome 1</b>		\$0.17	\$0.14
<ul style="list-style-type: none"> <li>Developed a Vital Sites &amp; Action model, the first flexible and unified model of biodiversity change, pressures, and management. It's suitable for biodiversity planning, reporting, management and informing consents.</li> </ul>			
<b>National vegetation survey (NVS) databank – Outcome 1</b>		\$0.42	\$0.42
<ul style="list-style-type: none"> <li>Collaborated globally to develop new vegetation classification systems using standardised procedures. This provided a framework to advance classification practices that enjoyed broad international acceptance, harmonised approaches worldwide and standardised information content.</li> </ul>			
<b>Biodiversity condition and trends – Outcome 1</b>		\$0.61	\$0.36
<ul style="list-style-type: none"> <li>Estimated the number of breeding skua in the western Ross Sea using the relationship between south polar skua and Adélie penguin abundance. Our estimates contributed to identifying Important Bird Areas in Antarctica for management and protection and will also inform ecosystem food-web models for fisheries management and the designation of Marine Protected Areas in the Ross Sea.</li> </ul>			
<b>Interpreting measures of ecological integrity – Outcomes 1 and 4</b>		\$0.85	\$1.22
<ul style="list-style-type: none"> <li>Developed innovative cost-effective biodiversity monitoring by scrutinising and improving methods and contributing to global biodiversity monitoring initiatives. Early detection of biodiversity change, with known error, bias, or uncertainty, allows agencies to implement timely and cost-effective management responses. This meets the growing demand, for example from DOC and councils, for unbiased biodiversity information that can be readily used for multiple purposes.</li> <li>Developed two complementary tree distribution models, one based on plant traits, the other on NVS occurrence data. Applications of these models include guiding restoration activities and predicting where low-impact, high-value native tree honey-producing species (e.g. mānuka, tawari, kānuka) could best be established.</li> </ul>			



Research activity 2014/15 Key Achievements	Core Funding Investment (\$M excl GST)		
	2013/14 (actual)	2014/15 (planned)	2014/15 (actual)

- Overturned a recent claim that masting will be unresponsive to climate warming by showing warmer, wetter climates promote more frequent and larger mast events, resulting in an increased threat to avian populations. We demonstrated that managers should anticipate more frequent and intense mast seeding, and budget accordingly.
- Quantified spatial configuration of fungal diversity in salvage logs from Cyclone Ita. Fungi are an abundant yet poorly described part of the biodiversity on deadwood but, with the advent of affordable eDNA tools, their identification and quantification can be used to deliver enduring, robust, low-impact salvage strategies to MPI and DOC – providing conservation revenue and a high value resource.

<b>DEFINING LAND BIOTA</b>	<b>\$6.17</b>	<b>\$6.16</b>	<b>\$6.24</b>
<b>End-users:</b> MPI; DOC; MfE; EPA; regional councils; educators; museums; researchers; B3; National Science Challenges; Māori and other New Zealanders; primary industries and sector groups, notably the horticultural industry.			
<b>Defining plants – Outcomes 1 and 4</b>		\$2.25	\$2.25

- Progressed discovery, description and interpretation of New Zealand’s indigenous and naturalised flora:
  - improved eFlora information content for endusers (DOC, MPI, CRIs, universities) and public (c. 66,000 page views) by adding 5,000 diagnostic character images and fifteen new moss and fern treatments;
  - provided identification guides and described new species of algae, ferns, flowering plants and liverworts, and prepared for publication text and images for Flora of New Zealand Liverworts volume 2, essential information for DOC, MPI, EPA, MfE, universities and regional councils;
  - clarified species concepts in the diverse and taxonomically difficult genera *Craspedia* and *Cardamine* by genetic or morphological analyses - conservation priorities of DOC;
  - developed 'proof-of-concept' for spatial analyses of collection and phylogenetic data to identify hotspots of biodiversity thereby providing new information for conservation prioritisation and reporting for DOC and MfE;
  - added 4,300 specimens to Allan Herbarium, increased records and data quality in the Specimen Database (7,442 records added) and the Plant Names Database (889 records added), and digitised historic Armstrong collection (2,500 specimens) providing essential information to DOC, MPI and regional councils;
  - identified c. 1280 plants in response to queries related to biosecurity and biodiversity, including plants breaching border biosecurity, an essential service for DOC, MPI and regional councils.

<b>Ethnobotany – Outcome 1</b>		\$0.20	\$0.20
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- Progressed enhancement and use of National New Zealand Flax and other living collections, and the further development of the infobase Ngā Tipu Whakaoranga on cultural uses of plants.
- Increased access to information on collections through digitisation and integration with other platforms - e.g. NatureWatch, DigitalNZ. Visits to infobase up 4,000 on 2014 (16,300).

<b>Defining invertebrates – Outcomes 1 and 4</b>		\$1.93	\$1.79
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- Progressed discovery, description and interpretation of New Zealand’s indigenous and naturalised terrestrial invertebrate fauna for utilisation by New Zealand biosecurity and biodiversity end-users:
  - improved online information content by 8,500 new records and development of a web portal for New Zealand Land Invertebrates names, images and specimens;
  - revised the threatened species from the beetle genus *Syrphodes*. Undescribed entities on the DOC Threatened Species List have been resolved. Diagnostic keys, images, DNA sequences, and distribution maps will facilitate conservation management;
  - published a diagnostic tool for cynipoid wasps, an economically important group globally, allowing end-users to identify these species and differentiate native and exotic species;
  - described new species and generated diagnostic keys of *Tenuipalpidae* mites, which are of significant biosecurity importance, allowing biosecurity stakeholders to more rapidly identify these species when intercepted;
  - published taxonomic description, diagnostic tools and DNA sequences for nematode species from fig trees. The new species can now be differentiated from overseas species, many of which are significant pests;
  - described new species of stick insect from the Poor Knights Islands and Te Pahi. Taxonomic names were selected in consultation with kaumātua from Ngāti Kuri and Ngātiwai.

Research activity 2014/15 Key Achievements	Core Funding Investment (\$M excl GST)		
	2013/14 (actual)	2014/15 (planned)	2014/15 (actual)
<b>Defining fungi and bacteria – Outcomes 1 and 4</b>		\$1.34	\$1.51
<ul style="list-style-type: none"> <li>Progressed discovery, description and interpretation of New Zealand's fungi and bacteria: <ul style="list-style-type: none"> <li>PDD and ICMP specimens cited in 185 scientific articles, ensuring the taxonomy of New Zealand's fungi and bacteria remains internationally relevant;</li> <li>named threatened fungi on Chatham Island forget-me-not and <i>Powelliphanta</i> snails, a first step in developing plans to manage these threatened organisms;</li> <li>provided data on genetic diversity of powdery mildew to be used by the grape industry to develop effective control strategies for the disease;</li> <li>screened ICMP cultures for antibiotic genes in collaboration with Auckland University addressing the growing problem of antibiotic resistant bacteria;</li> <li>described a new genus of Southern Hemisphere restricted fungi, species previously placed in unrelated Northern Hemisphere genera;</li> <li>clarified the taxonomy of the 'black mould' <i>Stachybotrys chartarum</i> and relatives, allowing species toxic to humans to be reliably distinguished;</li> <li>redetermined <i>Ralstonia solanacearum</i> isolates from New Zealand following the splitting of this bacterial species into six separate taxa. Up to date taxonomy is essential for managing biosecurity risk;</li> <li>sequenced the genome of <i>Burkholderia andropogonis</i> revealing 94 genes coding resistance to antibiotics, and a type III secretion system, allowing understanding of pathogenicity in bacteria.</li> </ul> </li> </ul>			
<b>Developing information systems – Outcomes 1 and 4</b>		\$0.31	\$0.30
<ul style="list-style-type: none"> <li>Refactored the data access layer within the Collection Information System that is used to manage the collection data by the five DLB collection systems.</li> <li>Completed the design phase of the 'Annotation Tool' that is used to manage the descriptive content in eBiota and Māori Plant Use, providing for a web-based interface.</li> </ul>			
<b>Defining land biota initiatives – Outcomes 1 and 4</b>		\$0.13	\$0.20
<ul style="list-style-type: none"> <li>Progressed cross-portfolio research initiatives, Advisory Group of DLB and strategy developments: <ul style="list-style-type: none"> <li>developed a pilot project of a biodiversity app on beech trees;</li> <li>wrote an implementation plan for international review recommendations on managing the collections, databases and information infrastructure; research direction; end-user engagement; commercialisation and revenue generation against a lens of international best practice.</li> </ul> </li> </ul>			
<b>MANAGING BIODIVERSITY</b>	<b>\$3.46</b>	<b>\$3.30</b>	<b>\$3.39</b>
<b>End-users:</b> DOC; non-governmental conservation organisations (NGOs); community conservation/restoration groups; local government; Environment Court; researchers; Māori; consulting firms; community conservation groups; landowners/managers.			
<b>Biodiversity in production landscapes – Outcome 1</b>		\$0.68	\$0.66
<ul style="list-style-type: none"> <li>Updated the National Threatened Environment Classification, the basis for MfE's National Priority 1 for the protection of threatened indigenous biodiversity on private land. This is widely used by management agencies, providing standardised biodiversity-relevant information across all of New Zealand's land, for example informing consents related to land use change under the Resource Management Act.</li> <li>Provided management agencies with strong evidence of the conservation benefits of shrub reversion under low-intervention management on marginal land by demonstrating that indigenous birds, lizards, and plants benefit from woody plant succession in montane grasslands that have been retired for conservation.</li> <li>Clarified Site Standard and definitions appropriate for a dryland council in its review of indigenous vegetation and clearance definitions. This informs consents, providing greater certainty for landowners and more targeted protection for indigenous biodiversity in a district undergoing rapid land-use change.</li> </ul>			



Research activity 2014/15 Key Achievements	Core Funding Investment (\$M excl GST)		
	2013/14 (actual)	2014/15 (planned)	2014/15 (actual)
<b>Threatened species and ecosystems – Outcome 1</b>		\$0.74	\$0.77
<ul style="list-style-type: none"> <li>Reviewed for end-users the impacts of introduced viruses on a threatened native plant species, and how different management strategies can influence the outcome of introduced diseases in rare plants. This pioneering study is changing the approach to managing remaining populations.</li> <li>Applied genetic principles to management of iconic native species ngutukākā (<i>Clianthus maxim</i>) to enable DOC, Māori, NGOs, and private landowners to modify revegetation plantings to ensure improved population viability over time.</li> <li>Determined the proportion of threatened naturally uncommon and significantly reduced habitats under protection in New Zealand, and applied this as basis for MfE led State of the Environment reporting.</li> <li>Provided the first New Zealand-scale classification of non-forest vegetation types based on data from &gt;6,000 vegetation plots to enable standardised reporting by agencies and councils.</li> </ul>			
<b>Biodiversity management outcomes – Outcome 1</b>		\$0.63	\$0.64
<ul style="list-style-type: none"> <li>Verified that a Duvaucel's gecko accidentally caught at Maungatautari Ecological Island was the first relic mainland specimen seen for at least 60 years, demonstrating that removing all pests may change the behaviour of previously undetected rare species.</li> <li>Clarified biodiversity impacts of mice and presented results to national and international scientists and New Zealand end-users. Even when other pest mammals are removed, mice will be ecological and probably social nuisances.</li> <li>Used natural and artificial nests to show that predator control improves bird nesting success in Waikato forest fragments, supporting the widespread use of pest control.</li> </ul>			
<b>Strategic biodiversity initiatives – Outcome 4</b>		\$0.36	\$0.40
<ul style="list-style-type: none"> <li>Developed a transparent biodiversity risk assessment for farmers who are attempting to manage the balance between farming operations and securing biodiversity gains.</li> <li>Determined the vulnerability of threatened plant species along hydro-lake-shorelines under new lake-level regimes, thereby informing the consenting process and assisting sustainable renewable electricity generation.</li> </ul>			
<b>Ecosystem resilience – Outcome 1</b>		\$0.65	\$0.66
<ul style="list-style-type: none"> <li>Demonstrated that assigning conservation priority to wetlands, based only on rare and threatened plant species, failed to meet other conservation objectives. Results support networks of small wetlands to meet multiple priorities, including safeguarding and securing large wetlands to protect ecosystem services and to maintain populations of species. This can be used by councils to inform consents.</li> <li>Demonstrated that exotic mammals in New Zealand (deer and possum) are dispersing viable spores of invasive ectomycorrhizal fungi in their dung, which facilitate growth of invasive <i>Contorta</i> pine and Douglas fir. Effective long-term management of invasive conifers may therefore depend on controlling a suite of plant and animal species.</li> <li>Demonstrated how deforestation in the South Island occurred within decades of initial human arrival, and that equally rapid transitions can be expected in present-day regions wherever positive feedbacks support alternate fire-inhibiting, fire-prone stable states. Results inform fire risk assessment models.</li> <li>Applied new probabilistic 'sightings' methods to radiocarbon dates from all nine species of extinct New Zealand moa and showed how fast endemic avifauna can be driven to extinction, regardless of their body mass, habitat preferences, or region of origin.</li> </ul>			
<b>Biodiversity use by Māori – Outcomes 1 and 4</b>		\$0.25	\$0.26
<ul style="list-style-type: none"> <li>Demonstrated how customary harvest management as practiced historically by New Zealand Māori contributed to sustaining populations of burrow-nesting seabirds. Operationalised by Ngāti Awa and Hauraki within cross-cultural management of grey-faced petrel harvests on Moutohorā and the Ruamaahua Islands, they provide an exemplary model for sustaining valued resources.</li> </ul>			

Research activity 2014/15 Key Achievements	Core Funding Investment (\$M excl GST)		
	2013/14 (actual)	2014/15 (planned)	2014/15 (actual)
<b>MANAGING INVASIVE WEEDS PESTS AND DISEASES</b>	<b>\$2.95</b>	<b>\$2.80</b>	<b>3.10</b>
<b>End-users:</b> MPI; DOC; MFAT; OSPRI; researchers; New Zealand Defence Force; New Zealand Police; pest control companies; community conservation groups; businesses and industries; regional councils; Invasive Animals CRC.			
<b>Beating weeds – Outcomes 1 and 4</b>		\$1.03	\$1.13
<ul style="list-style-type: none"> <li>• Demonstrated that quantitative laboratory testing data can help predict risk of non-target attack, which will help ensure fewer environmentally safe candidate biocontrol agents are erroneously rejected.</li> <li>• Showed that poor performance of heather beetle as a biocontrol agent in New Zealand is due in part to genetic bottlenecking, resulting in small body size. Small beetles have proportionally less lipid and lower winter survival. Large UK beetles are being used to genetically rescue the New Zealand populations.</li> <li>• Set up monitoring plots to measure the impacts of the <i>Tradescantia</i> beetles, which are now causing impressive levels of damage to the target weed at several sites in the North Island.</li> <li>• Completed a quantitative analysis of rearing challenges with weed biocontrol agents and demonstrated links to taxonomic groups and feeding guild. This helped lead to breakthroughs in rearing agents such as the Honshu white admiral butterfly, the barberry weevil and field horsetail sawflies.</li> </ul>			
<b>Strategic pest control – Outcomes 1 and 4</b>		\$0.11	\$0.20
<ul style="list-style-type: none"> <li>• Developed testing capability for milk powder contamination with 1080 to MPI, New Zealand Police, Auckland DHB and ESR.</li> <li>• Developed and tested electronically-triggered 'drop off' radio collars for possums, enabling essential research for achieving TB eradication.</li> <li>• Established the bioinformatics capability necessary for genome mining for species specific toxin development.</li> </ul>			
<b>Invasive mammal impacts on biodiversity – Outcomes 1 and 4</b>		\$1.27	\$1.24
<ul style="list-style-type: none"> <li>• Designed a monitoring programme, now implemented by Hawkes Bay Regional Council, to measure biodiversity outcomes of broad scale predator control in the Cape-to-City initiative, and designed a survey rolled out by HBRC to quantify landholder participation in the initiative.</li> <li>• Set a clear threshold for predicting areas requiring pest control during the 2014 mega-mast, using a model relating summer temperatures to post-mast outbreaks of rodents in beech forest. DOC used our forecast to support a massive boost in pre-emptive control, costing \$21 million, in the 'Battle for Our Birds' campaign.</li> <li>• Motivated DOC managers to target rapid reinvasion by rodents across treatment boundaries using an analysis of intensive multi-species pest control in broadleaf forest.</li> <li>• Provided pest managers (DOC, regional councils, community initiatives) with guidelines for pest management, based on our synthesis of known relationships between vertebrate pest abundance and the damaging impacts of invasive mammals on native biodiversity.</li> </ul>			
<b>Preventing and managing disease impacts – Outcome 1</b>		\$0.10	\$0.13
<ul style="list-style-type: none"> <li>• Worked to prevent and manage disease impacts by: <ul style="list-style-type: none"> <li>○ identifying likely causes of diseases impacting kākāpō and penguins, using new metagenomic capability;</li> <li>○ developing a device for school children to survey streams for kauri dieback, now being used in an Unlocking Curious Minds project;</li> <li>○ developing a model predicting the response of avian malaria mosquito vectors to climate.</li> </ul> </li> </ul>			



Research activity 2014/15 Key Achievements	Core Funding Investment (\$M excl GST)		
	2013/14 (actual)	2014/15 (planned)	2014/15 (actual)
<b>Invasive species – Outcomes 1 and 4</b>		\$0.16	\$0.16
<ul style="list-style-type: none"> <li>• Collaborative research with Australia’s Invasive Animals Cooperative Research Centre that included: <ul style="list-style-type: none"> <li>○ Identifying the benign rabbit calicivirus that is interfering with RHD impact in New Zealand;</li> <li>○ integrating mouse modelling into an outbreak forecast system where landowners provide information through a mobile app;</li> <li>○ providing 'proof of freedom' recommendations for pest bird management activities.</li> </ul> </li> </ul>			
<b>Invasive invertebrates – Outcomes 1 and 4</b>		\$0.13	\$0.24
<ul style="list-style-type: none"> <li>• Demonstrated confidence in the eradication of Argentine ants from Kawau Island, using spatial 'proof of freedom' modelling.</li> <li>• Demonstrated that wasp nests infested with a newly discovered mite are 50–70% smaller than uninfested nests.</li> <li>• Developed techniques for the captive rearing of wasps that will aid the New Zealand’s Biological Heritage Challenge.</li> </ul>			
<b>CHARACTERISING LAND RESOURCES</b>	<b>\$3.32</b>	<b>\$3.07</b>	<b>\$3.11</b>
<b>End-users:</b> MPI; DOC; MfE; LINZ ; Statistics New Zealand; DairyNZ; educators; landowners; New Zealand public; data managers; regional councils; researchers; AgResearch; Māori; Antarctica New Zealand; Antarctic Treaty Countries; primary industries and sector groups, notably the fertiliser industry.			
<b>Soil mapping and modelling – Outcome 2</b>		\$0.38	\$0.79
<ul style="list-style-type: none"> <li>• Applied digital soil mapping (DSM) techniques to extend coverage of S-map, focusing on more complex terrains such as Southern Hawke’s Bay and Southland hill country. High quality soils information is fundamental to achieving policy goals of ‘export double’ while meeting the limits for water quality set under the National Objectives Framework. Soil characteristics are the predominant determinant of leaching of nutrients and other contaminants into waterways in New Zealand. Through DSM techniques we are advancing national coverage of S-map and providing a key resource for the next generation of Regional Plans, as well as a critical support for limit setting under the National Policy Statement for Freshwater Management.</li> <li>• Updated and released new versions of S-map Online, supported the release of the new version of Overseer (6.2) and increased data input standards. Better quality soil information will improve the calculation of nutrient budgets and allow farmers and their consultants to examine farm-scale nutrient management options to optimise production and minimise losses of nutrients to the environment. This will provide essential support for setting and meeting limits under the National Policy Statement for Freshwater Management. S-map Online has experienced significant and sustained growth in terms of access and use, with the Online application used to generate 927,519 map views; 60,432 queries with 40,660 soil factsheets requested/viewed and 2,574 maps created for printing.</li> </ul>			
<b>Data stewardship infoservices – Outcome 2</b>		\$1.71	\$1.52
<ul style="list-style-type: none"> <li>• Led the development of the Antarctic Environmental Portal (AEP ), which was launched at the meeting of the Antarctic Treaty System's Committee for Environmental Protection (CEP) in June. The Portal provides an important link between Antarctic science and policy, making science-based information available to the CEP and all the Antarctic Treaty nations. It also enables Antarctic scientists, particularly through the Scientific Committee on Antarctic Research (SCAR), to provide independent scientific advice to the Antarctic Treaty, including bringing new or emerging issues to the attention of policy makers. The Portal underlines New Zealand's and Landcare Research's key roles in providing science and a cutting-edge communication platform to the Treaty nations.</li> <li>• Upgraded the National Soils Database Repository (NSDR ) into a next generation system that is capable of efficient storage and interrogation of large quantities of highly variable soil attribute data. The NSDR is a crucial system for the maintenance of soil observation data, is essential to powering S-map and supports environmental reporting initiatives such as Environmental and Monitoring Reporting (EMaR).</li> </ul>			

Research activity 2014/15 Key Achievements	Core Funding Investment (\$M excl GST)		
	2013/14 (actual)	2014/15 (planned)	2014/15 (actual)
<b>Ecosystem services state and trend – Outcome 2</b>		\$0.39	\$0.80
<ul style="list-style-type: none"> <li>Enabled the New Zealand Government to achieve better quality land domain reporting and to be on the leading edge of terrestrial ecosystem environmental performance indicators by: <ul style="list-style-type: none"> <li>contributing to the 2015 State of Environment report, in support of the Environmental Reporting and RMA Bills before Parliament;</li> <li>developing the LUMASS tool to run spatial scenarios of the impact of agricultural intensification on ecosystem services provision and agricultural performance under potential irrigation schemes in the Ruamahanga catchment and Wairarapa Water Use Project;</li> <li>leading participation in the United Nations Inter-Governmental Panel of Biodiversity and Ecosystem Services (IPBES) and contributing to the regional assessment of biodiversity and ecosystem services for Asia and the Pacific;</li> <li>developing a hive carrying capacity model for honey bees that has attracted interest from DOC and MPI;</li> <li>drafting a manuscript on wetland extent change in Southland in partnership with DOC.</li> </ul> </li> </ul>			
<b>UNDERSTANDING ECOSYSTEM SERVICES AND LIMITS</b>	<b>\$2.75</b>	<b>\$2.86</b>	<b>\$2.91</b>
<b>End-users:</b> MPI, DOC; OSPRI; DairyNZ; regional councils; primary industries and sector groups; AgResearch; consulting firms; researchers.			
<b>Plant-soil interactions – Outcomes 1 and 2</b>		\$0.72	\$0.77
<ul style="list-style-type: none"> <li>Improved understanding of the ecology and ecosystem impacts of wilding conifers, the scale of the issue, and the risks and opportunities for future management. This is being used by DOC and MPI to support a more detailed business case to manage these invaders.</li> <li>Demonstrated that more diverse pastures can increase productivity with fewer fertiliser inputs. This research is now being used by DairyNZ in their Whole Farm Model to determine how diverse pastures on farms can help to optimise milk production whilst minimising negative environmental effects.</li> <li>Led a major review on the impacts of climate change on soil services across primary sectors in New Zealand. This highlights that management and adaptation of primary sectors overwhelms the likely effects of climate change, and as such, is essential evidence for future policy response of primary sectors.</li> <li>Developed capability in applying novel techniques in geochemistry to understand the rate of soil formation and its turnover in complex landscapes. This provides fundamental tools for understanding the creation, maintenance and function of soils in the landscape.</li> <li>Initiated research to better integrate social research with traditional ecology and weed management to understand the non-market impacts of wilding conifers. This provides new mechanisms for understanding complex environmental issues, cultural values, the social context and impacts of wildings.</li> </ul>			
<b>Consequences of land use intensification – Outcomes 2 and 3</b>		\$0.92	\$0.92
<ul style="list-style-type: none"> <li>Comparing emissions of greenhouse gases between new irrigated dairy pasture and neighbouring dryland pasture systems revealed that the irrigated pastures had more efficient water use and increased soil carbon. This helps the dairy industry understand how pasture management and weather affect carbon, water and nitrogen, and thus the balance between benefits to primary industry and environmental effects.</li> <li>Developed new capability to determine the potential for soil fungi to transform inorganic and organic nitrogen into nitrous oxide, carbon dioxide and di-nitrogen gases. This has the potential to regulate denitrification across scales and provide future tools for nutrient management.</li> </ul>			
<b>Soil processes – Outcome 2</b>		\$1.05	\$1.06
<ul style="list-style-type: none"> <li>Evaluated microbial (e.g. <i>E. coli</i>) bypass flow into groundwater for 25 different soils that are prevalent under dairying. This information was used to generate a national map that can be used to better match land use to soil capability to filter contaminants.</li> </ul>			

Research activity 2014/15 Key Achievements	Core Funding Investment (\$M excl GST)		
	2013/14 (actual)	2014/15 (planned)	2014/15 (actual)
<ul style="list-style-type: none"> <li>Compared nutrients in pasture, gorse shrublands and regenerating forest, and demonstrated that considerable increases in N leaching are likely from areas colonised by gorse, and that nutrient inputs by woody weeds on marginal lands should be included in nutrient budgets across scales.</li> <li>Generated fundamental knowledge of how nitrogen is immobilised or lost from soils through research on the ability of soil organic matter to buffer and filter nutrients (nitrogen). Our findings are being adopted to improve net N immobilisation estimation in the OVERSEER model, providing the basis for improved nutrient management across sectors.</li> <li>Deepened capability in soil biology and processes through determination of how microbial communities contribute to mechanisms of carbon and nitrogen cycling across soil types. This provides underpinning information about the function and services provided by soils, and may identify the biological mechanisms involved for future research or management.</li> <li>Surveyed end-user needs for a hydrological modelling platform that integrates soil data. Nitrogen and phosphorus dynamics were of most interest. This sets the direction for capability development linking soils data and nutrient cycling information with hydrological modelling.</li> </ul>			
<b>Ecosystem service forecasting – Outcome 2</b>		\$0.17	\$0.17
<ul style="list-style-type: none"> <li>Developed forecasting models to demonstrate that wilding conifer invasion in the Mackenzie country could remove water equivalent to that required for irrigating over 16,000 hectares of agricultural land. This information will be extremely useful to DOC and MPI in developing a detailed business case for the management of wilding conifers.</li> </ul>			
<b>REALISING LAND'S POTENTIAL</b>	<b>\$0.48</b>	<b>\$0.46</b>	<b>\$0.66</b>
<b>End-users:</b> MPI; SCION, AgResearch, MfE; regional councils; Māori; landfill operators; urban planners; primary industries and sector groups, notably the fertiliser and forestry industries.			
<b>Land and water management – Outcomes 1, 2 and 4</b>		\$0.38	\$0.54
<ul style="list-style-type: none"> <li>Assisted iwi trusts to improve decision making over land use options using a cultural values framework.</li> <li>Assessed sampling strategies for a range of sampling devices to best monitor leaching under large field trial plots. This included installation of large area lysimeters.</li> <li>Developed new sensor technology for real time feedback to improve commercialisation of precision irrigation services for both domestic and international markets.</li> <li>As part of a national team, assessed approaches, tools, methodologies and knowledge to best protect and improve the health (ora) of New Zealand rivers as part of Te Awaroa project.</li> <li>Tested the suitability of unmanned aerial vehicles to determine riparian vegetation structure.</li> <li>Assessed international best practice in integrated whole systems research to improve regional council catchment management.</li> <li>Contributed to national soil guideline values and human health guidelines for a range of contaminants and industry groups.</li> <li>Assessed soil and water quality changes in a restored wetland.</li> </ul>			
<b>Erosion process and hazards – Outcome 2</b>		\$0.08	\$0.12
<ul style="list-style-type: none"> <li>Reviewed options for updating erosion information in the NZLRI to support implementation of a National Environmental Standard for plantation forestry.</li> <li>Assessed root development in space-planted high UMF factor mānuka plantations.</li> <li>Developed rapid assessment of bank erosion using helicopter video capture to support SedNetNZ development.</li> </ul>			



Research activity 2014/15 Key Achievements	Core Funding Investment (\$M excl GST)		
	2013/14 (actual)	2014/15 (planned)	2014/15 (actual)
<b>MEASURING GREENHOUSE GASES AND CARBON STORAGE</b>	<b>\$1.39</b>	<b>\$1.31</b>	<b>\$1.31</b>
<b>End-users:</b> MfE; MPI; regional councils; researchers; primary industries and sector groups, notably the forestry industry and New Zealand Beef + Lamb.			
<b>Model and upscale greenhouse gas emissions – Outcome 3</b>		\$0.33	\$0.33
<ul style="list-style-type: none"> <li>Progressed the development of a CenW / DNDC hybrid model that combines the CenW plant processes and carbon cycling components with the detailed modelling of nitrous oxide fluxes in DNDC. This will eventually expand the capability of CenW to simulate nitrous oxide, nitrogen gas, and ammonia emissions and then add a more process-based estimate of nitrate leaching.</li> <li>Used our alternative accounting methodology to assess temporal aspects of the net emissions of carbon dioxide, leading to an international multi-authored comparisons of methods.</li> <li>Applied our simplified meta-models of nitrous oxide emission factors developed from NZ-DNDC at national scale to calculate direct nitrous oxide emissions from grazed pastures. This will inform future predictions.</li> </ul>			
<b>Carbon storage in soil and biomass – Outcome 3</b>		\$0.27	\$0.29
<ul style="list-style-type: none"> <li>Developed a new method for assessing soil carbon stock changes in pastoral land, using environmental datalayers to stratify the landscape and provide a framework for ongoing monitoring. Vis-NIR spectroscopy methods are being developed for time- and cost-effective soil carbon analysis. A system to automatically scan soil cores and predict volumetric soil carbon content is also being developed.</li> <li>Developed a new approach to measure net carbon exchange by forest canopies growing in complex terrain. It uses automated measurements of sap flow and the use of carbon isotopes in air respired to overcome the needs for access into canopies and complex instrumentation.</li> </ul>			
<b>Agricultural greenhouse gas and mitigation – Outcome 3</b>		\$0.71	\$0.69
<ul style="list-style-type: none"> <li>Shared New Zealand technology and methodological approaches and developments for use in national greenhouse gas inventories (as recommended by the IPCC) with Latin American conference participants, demonstrating our leadership.</li> <li>Researched microbial community richness and composition (denitrifier genes) at both functional and phylogenetic composition based on 16S rRNA profiling, supporting the notion that the use of nitrification inhibitor DCD for nitrogen management is a viable, ecologically safe option.</li> <li>Developed a new inventory methodology for hill country grazed by sheep, beef and deer resulting in hill-country-specific emission factors that reduces nitrous oxide emissions in hilly land by 52%, and also improves greenhouse gas emissions intensity.</li> <li>Demonstrated that farm soils and biochar can be used as a biofilter material to remove methane from animal wastes. Spiking farm soils and biochar with methanotroph-enriched medium and nutrient additions can enhance the growth and stabilisation of methanotrophs for methane removal.</li> </ul>			
<b>ENHANCING POLICY DEVELOPMENT</b>	<b>\$1.19</b>	<b>\$0.89</b>	<b>\$0.94</b>
<b>End-users:</b> MfE; DOC; regional councils; community groups; Māori and other New Zealanders; urban planners; stormwater engineers; landscape architects; primary industries and sector groups; Sustainable Business Council; Waterfront Auckland; Natural Resource Sector, Living Earth.			
<b>Mainstreaming ecosystem services in decision-making – Outcomes 2 and 4</b>		\$0.41	\$0.39
<ul style="list-style-type: none"> <li>Advanced the case for stakeholders' ability to take into account the full range of ecosystem services in environmental decision making, by: <ul style="list-style-type: none"> <li>providing further evidence for mainstreaming ecosystem services into policy and planning. This was illustrated using Special Housing Areas under the Auckland Plan (in partnership with Auckland Council);</li> <li>scoping new research to assess how people use monetary, quantitative (non-monetary) and qualitative data;</li> <li>augmenting the New Zealand Landscape Database by adding enhanced protected areas data, historic LINZ topographic data, time series of parcel data, and up-to-date AgriBase data;</li> </ul> </li> </ul>			

Research activity 2014/15 Key Achievements	Core Funding Investment (\$M excl GST)			
	2013/14 (actual)	2014/15 (planned)	2014/15 (actual)	
<ul style="list-style-type: none"> <li>making technical improvements to LUMASS to improve the usability of modelling framework, including exporting to the Windows operating environment, implementation of the CenW model as a demonstration, and application to several spatial optimisation studies.</li> </ul>				
<b>Responding to climate change pressures – Outcomes 3 and 4</b>		\$0.18	\$0.21	
<ul style="list-style-type: none"> <li>Improved New Zealand's ability to assess the implications of environmental policy by: <ul style="list-style-type: none"> <li>recalibrating the CLIMAT-DGE baseline to align with government economic growth and greenhouse gas emissions projections. This enabled us to successfully model potential climate policy scenarios to support New Zealand during international climate negotiations;</li> <li>conducting independent analysis of the implications of different approaches for allocating nutrient reductions in two catchments using NZ-FARM. This provided insight on challenging issues in water policy;</li> <li>enhancing knowledge of how people interact with green infrastructure and disseminating it to international and local audiences;</li> <li>developing methods to bring climate change adaptation into everyday decision-making.</li> </ul> </li> </ul>				
<b>The governance of complex systems – Outcome 4</b>		\$0.29	\$0.33	
<ul style="list-style-type: none"> <li>Enhanced capability and profile to support New Zealand's evolving environmental governance system by: <ul style="list-style-type: none"> <li>developing capacity and skill to increase research undertaken on the human dimensions of environmental science;</li> <li>recruiting and supporting emerging Māori research scientists, which led to uptake of a mātauranga Māori and science framework model;</li> <li>increasing the credibility of economic-environmental modelling (e.g. ARLUNZ) and other research that support land use decisions by publishing in international, peer-reviewed literature; and increasing end-user engagement (e.g. with MfE) and uptake through multiple conference and seminar presentations</li> </ul> </li> </ul>				
<b>SUPPORTING TRADE</b>		<b>\$0.72</b>	<b>\$0.36</b>	<b>\$0.36</b>
<b>End-users:</b> MPI; DOC; MfE; MFAT; TBfree New Zealand; researchers; regional councils; primary sector (SMEs); businesses; export industries; primary industries and sector groups.				
<b>Competitiveness and green growth – Outcomes 1 and 4</b>		\$0.03	\$0.03	
<ul style="list-style-type: none"> <li>Completed the second trial of modelling greenhouse gas reductions. Extracted heuristics that can be used to inform customers and potential customers of their likely progression in the carboNZero and CEMARS programmes. Completed modelling of combined greenhouse gas uncertainty for a representative sample of greenhouse gas-generating activities and emission factors, and demonstrated the soundness of the approach.</li> <li>Reviewed core elements of different environmental and sustainability schemes that could be applied as an updated version of Fern-Mark, NatureMark or similar new sustainability ranking scheme for New Zealand primary sector businesses.</li> </ul>				
<b>Production pests and environmental compensation – Outcome 1 and 4</b>		\$0.06	\$0.06	
<ul style="list-style-type: none"> <li>Completed research on production pest control, including: <ul style="list-style-type: none"> <li>host specificity testing of one biocontrol agent for the weed field horsetail;</li> <li>host testing of two insects, <i>Lathronympha strigana</i> and <i>Chrysolina abchasica</i>, imported from Europe in August 2014;</li> <li>identifying alternative live foods and artificial diets for rearing <i>A. limonicus</i> mites;</li> </ul> </li> </ul>				
<b>TB freedom – Outcome 4</b>		\$0.27	\$0.27	
<ul style="list-style-type: none"> <li>Used simulation modelling and data analysis to show how a new surveillance concept could be extended and adapted for new operational contexts. This has the potential to substantially reduce the time, effort, and cost required to be able to declare an area free of TB.</li> <li>Published nine reviews of TB in New Zealand wildlife and provided science support for the National Pest Management Plan review for TB.</li> </ul>				

## > INNOVATION CASE STUDIES

### Cost-effective biodiversity monitoring



There is an urgent need for cost-effective, co-ordinated biodiversity monitoring tools that encompass the full diversity of species and habitats. We developed a 'big picture' biodiversity monitoring framework that measures multiple biodiversity components at the same sampling points, maximising interpretative power while minimising the cost to individual agencies of sourcing and merging data sources. The framework and analysis tools have been adopted by the Environmental Monitoring and Reporting (EMaR) group within the Natural Resources Sector and Statistics NZ, and the BioHeritage National Science Challenge. All agencies are now using similar consistent methods and compatible indicators.

Inevitably, plot-based biodiversity and carbon field surveys miss some species and individuals, names are unwittingly misapplied or measurements noted incorrectly. A new step has been to quantify the degree of uncertainty and confidence in measurements, thus saving unnecessary time in the field. This framework has been adopted by DOC for Tier 1 monitoring, MfE for International Carbon Accounting,

and is available to regional councils for use in future State of the Environment reports.



Biodiversity monitoring (Tomas Easdale)

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Keywords: Biodiversity monitoring

## Transparent framework for setting biodiversity targets

Setting biodiversity management targets often relies on subjective processes such as expert opinion or political pressure. Other parties frequently question such targets as the processes used to identify them are not clear or repeatable. We are providing a transparent approach to address this – a risk assessment framework for guiding biodiversity management. This enables the identification of meaningful targets and the construction of defensible action plans, based on explicitly defined functional relationships between land management and biodiversity.

We conducted proof-of-concept work for the framework, using trait-based modelling to simulate the effect of different land-use scenarios on bird biodiversity in agricultural landscapes. For example, if the goal was to have twice as many native bird species as exotic ones in farmland, then at least 15% woody vegetation cover would be required. This proof-of-concept is currently being tested and refined with Greater Wellington Regional Council, with a view to incorporating the tool into the New Zealand Sustainability Dashboard. This will help our regional council and industry partners to set farmland biodiversity management targets.



Biodiversity in a pastoral landscape (Richard Gordon)

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Keywords: Biodiversity targets



# 'Hotspots' of endemism (biodiversity found only in NZ)

Herbarium records are increasingly available electronically. This, and the development of new computer programmes (e.g., Biodiverse) capable of quantifying areas and types of endemism, has enabled us to identify important priorities for conservation planning and management, and environmental reporting.

In a proof-of-concept project, we used Biodiverse to analyse georeferenced spatial data for the taxonomically-diverse indigenous fern, conifer and flowering plant genera and species from the entire New Zealand archipelago of over 700 islands. We also developed a DNA phylogeny showing relationships of all genera so that phylogenetic metrics could be analysed in conjunction with the spatial data. The scale of the project is unique.

The results confirmed previously identified 'hotspots' (with greater accuracy and detail than previous studies) and also revealed important new centres and patterns of endemism. Some of these hotspots are under-recognised and poorly protected, but this new scientific evidence should enable

more targeted use of limited conservation resources and enable conservation initiatives to be focused on the most important areas.



Northern offshore islands can be hotspots for endemic species (David Wardle)

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Keywords: Endemism hotspots

# How to tell wetlands from drylands

The RMA definition of a wetland is broad and often difficult to apply. Confusion over where a wetland starts and finishes has created difficulties, especially for regulatory authorities, land owners, DOC and the Environment Court. To provide greater clarity and consistency, we developed a delineation system for New Zealand, based on a similar system used in the USA for regulatory purposes. The system is vegetation-based because, although water levels fluctuate, plants respond to longer term changes.

Nearly 1000 native and exotic plant species were classified according to their prevalence and dominance in five wetland habitat classes. Where plant-only assessments are likely to be inconclusive (e.g., sparsely-vegetated sites, such as mudflats or following major disturbance, and some gumlands and ephemeral wetlands), additional assessments of soils and hydrology are recommended.

Training workshops and advice have been provided to nine councils, DOC, Meridian Energy, researchers and consultants. The system has been used by DOC and Environment Canterbury in hearing processes, and by

Northland Regional Council to delineate wetlands for protection in gumlands development consents.



Wetland delineation workshop led by Bev Clarkson (blue parka) (David Palmer)

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Keywords: Wetlands and drylands

## Contaminant leaching through stony soils

Farmers usually dispose of dairy shed effluent by irrigating pasture with it so that the soils can re-use the nutrients. However, if irrigation practices are not matched to the soil's natural capital, excess nutrients leach into ground water. Over the last decade land use on stony soils has intensified and, while environmental models consistently predict stony soils will be highly susceptible to leaching, relatively little was known in practice about the safe limits for effluent application. We tested this under controlled conditions using stony Canterbury soils.

Results confirmed that, for some land management practices, shallow groundwater under the stonier soils is vulnerable to nitrogen, phosphorous, cadmium and bacterial contamination, which may make it difficult for intensive farming systems to meet regional and national water quality objectives. To reduce leaching losses, particularly in intensively-used irrigated areas, management practices must be closely aligned to the low natural capital and poor environmental performance of stony soils across 1.68 million hectares of eastern New Zealand.



Sam Carrick setting up a large scale lysimeter in stony soil (Caroline King)

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Keywords: Contaminant leaching

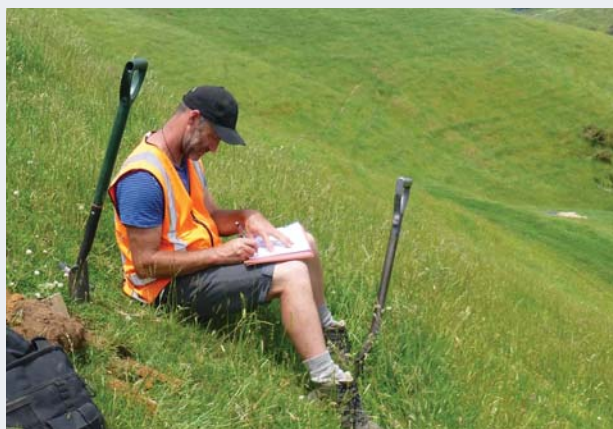
## S-map data use expanding rapidly

Increasing productivity of rural land is a national priority – as is reducing the adverse impacts on freshwater of intensive land use and large-scale irrigation schemes. Fine-tuning land management to meet both goals requires accurate soil information from S-Map, the digital soil map and information system for New Zealand.

S-map data is delivered via S-map Online, the free access website used by regional councils, farmers and industry consultants. Over the last three years, the number of unique visitors to S-Map Online has increased by 52% p.a.; visits by 77% p.a.; and 100,000 soil fact sheets have been downloaded.

A major development has seen S-map factsheets now include dedicated information for the OVERSEER® Nutrient Budgets tool. A new web data service was launched where data is delivered directly into OVERSEER and other third party systems rather than relying on manual transfer of data from S-map. Computers can now 'talk' directly with each other over the web in a common soils-computer language.

This initiative is supported by the Regional Council Land Monitoring Forum.



Scott Fraser assessing soils (David Palmer)

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Keywords: S-map data

## Antarctic Environments Portal launched

Antarctica is designated as a natural reserve devoted to peace and science. Changing climate, non-native species and human activities increasingly affect parts of the continent, including its biodiversity. Managing these issues is challenging for the Committee for Environmental Protection (CEP). To support the CEP and its member countries, we developed the open-access Antarctic Environments Portal, where high quality, apolitical, policy-ready research summaries address issues for governance attention or further investigation. Portal material is subject to rigorous editorial processes and is available in all four official languages of the Antarctic Treaty. The Portal also allows scientists to bring emerging issues to the attention of policy makers in a way previously not possible.

The Portal was officially launched in June 2015 at the 38<sup>th</sup> Antarctic Treaty Consultative Meeting and the 18<sup>th</sup> CEP Meeting in Bulgaria, where it was very well received by the Antarctic policy and science communities, with the Treaty Parties formally agreeing to its adoption.

The Portal maintains New Zealand's strong leadership in the management of Antarctica.



International flags, Scott Base, Antarctica (Richard Gordon)

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Keywords: AEP launch

## Irrigated dairying can increase soil carbon

Almost half of New Zealand's greenhouse gas emissions come from pastoral agriculture. Any intensification of agriculture could increase our greenhouse gas liability under international agreements. Environmentally sustainable production systems are needed to control pollution and support New Zealand's 'clean and green' brand. In a 3-year project on a commercial irrigated dairy farm in Canterbury, we measured the efficiency of water use and changes in soil carbon. Neighbouring irrigated and a dryland pastures were compared. On both pastures we measured CO<sub>2</sub> exchange continuously *in situ* (also CH<sub>4</sub> and N<sub>2</sub>O), dry matter production, water use, precipitation and evaporation, pasture consumption and all management activities to construct a complete carbon budget.

The first year's carbon results indicate the irrigated, intensively-managed pasture system gained more carbon than was removed by grazing, producing twice as much biomass as the dryland pasture, and water use efficiency increased by over 30%. Results suggest farm management decisions (e.g. irrigation and grazing) can be tuned to

enhance dry matter production, water use efficiency and soil carbon all at the same time.



Gabriel Moinet setting up equipment at the study site (John Hunt)

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Keywords: Irrigated dairying



# 'Mega-masts' and the management of invasive mammals

Many New Zealand plants periodically have very high seed production, called masts. In beech forest masts, rodent populations erupt, followed by a build-up in stoats and increased predation on indigenous species by rodents and stoats. In a mega-mast, widespread outbreaks of rodents and their predators can drive indigenous species closer to extinction, but the cost of pest control after a mega-mast can be prohibitive.

We have shown that masting is triggered by relative summer temperatures over successive years, which enables us to use national climate data to predict where a mast will occur the following year. Planning, budgeting and pest control programmes begin in advance, particularly when a mega-mast is expected. DOC used the 2014 mega-mast forecast to support a massive boost in pre-emptive pest control for areas with the most vulnerable biodiversity – the 'Battle for our Birds' campaign. The campaign has cost about \$21 million but an untargeted campaign to protect biodiversity across almost 4 million hectares of beech forest that was predicted to mast in 2014 would have cost about \$68 million.



Rats attacking a bird's nest (rodent numbers erupt following a mast year) (Ngā Manu Images)

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Keywords: Mega masts

# Grape powdery mildew now has sex

Powdery mildew disease of grapes has been present in New Zealand in asexual form for over 100 years. In 2013/14, the sexual stage was found for the first time in Hawke's Bay, a discovery that coincided with a season in which disease control proved particularly difficult. Having both sexual and asexual spores means that there is greater opportunity for the fungus to infect its host, and sexual populations tend to be more pathogenic and more prone to developing fungicide resistance.

Our preliminary genetic characterisation of the fungus in New Zealand indicates there are three genetically distinct populations, with one population consistently linked to difficult-to-control outbreaks of the disease. Further research and a much wider sampling programme will determine the geographic distribution of the different genotypes, and clarify whether there is a consistent relationship between sex and disease virulence. These basic data will underpin development of effective control

strategies for powdery mildew to ensure the future viability and profitability of the multimillion-dollar viticulture industry.



Sexual state of grape powdery mildew (Jerry Cooper)

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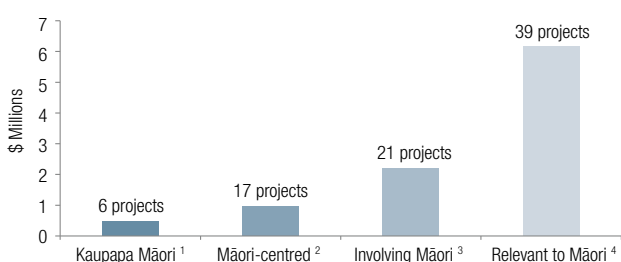
Keywords: Powdery mildew



## > VISION MĀTAURANGA MĀORI

Our goal is to be a key, preferred provider for Māori in enhancing the sustainable value of land-based natural resources. A formal agreement with Te Tumu Paeroa, the Office of the Māori Trustee, to work together is a significant step towards supporting sustainable development of Māori land assets. Up to 80% of Māori land (6% of the total New Zealand area) could be used more productively and sustainably, while supporting traditional values and aspirations. Areas of particular interest include land, soil, water and catchment management; land use opportunities; and improved management of biodiversity resources.

Value of research relevant to Vision Mātauranga Māori



<sup>1</sup> Grounded in 'te ao Māori' (the Māori world-view), focused on mātauranga Māori, and use kaupapa Māori research methodologies, e.g. Biodiversity use by Māori

<sup>2</sup> Mātauranga combined with science; are typically collaborative with Māori groups and Māori are the primary end users, e.g. the National New Zealand Flax Collection

<sup>3</sup> Directly relevant to Māori and may involve Māori but mātauranga Māori is not central to the project, e.g. Developing Māori capability in soils

<sup>4</sup> Māori are generally not directly involved and the mātauranga component is minimal but the research is relevant to Māori interests, e.g. S-map Online (page 26) and Wetland delineation (page 25)

### Biodiversity Use by Māori

Our research on coastal forest restoration in partnership with the Ruamaahua Islands Trust (Hauraki), Te Tapatoru a Toi (Ngāti Awa) and DOC has demonstrated the effectiveness of kaitiakitanga-based strategies for managing an ecosystem engineer, the grey-faced petrel. We have also facilitated the inter-iwi transfer of mātauranga between Rakiura and Ngāti Awa and revitalisation of customary practices relating to the harvest and processing of grey-faced petrels.

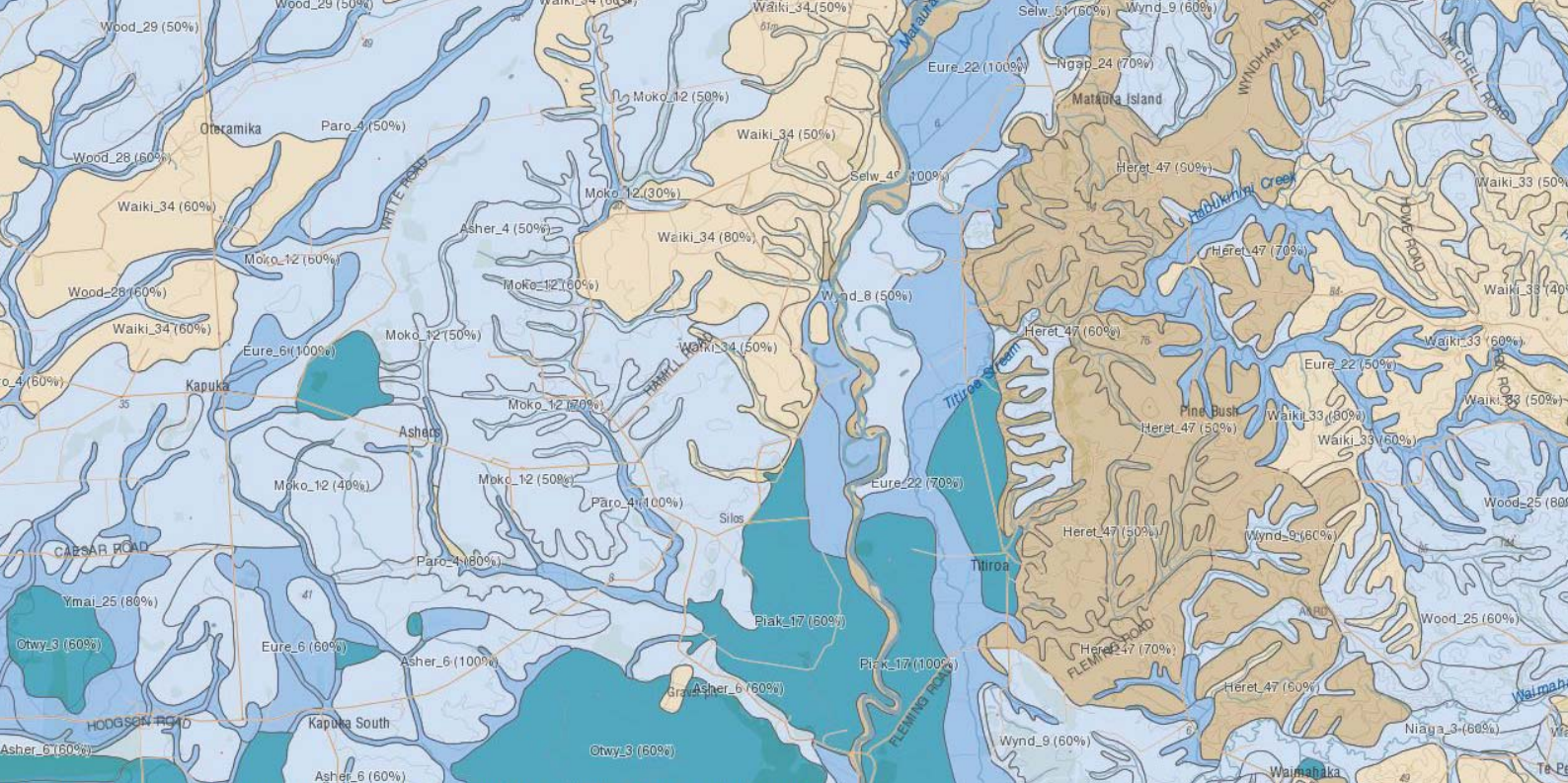
### National New Zealand Flax Collection

We are custodians of this Core-funded collection, which includes many cultivars of traditional importance to Māori. This year, 20 divisions were supplied on request for pā harakeke and we welcomed weavers wanting to harvest suitable leaves for particular projects. We hosted 53 visitors during the year. The very active Māori and Polynesian Textile Plants Facebook page has 1170 likes.

### Developing Māori Capability in Soils

In conjunction with Te Ara Pūtaiao (a pan-CRI partnership), Landcare Research is involved in regional scale and farm scale economic development projects, including with the Maniapoto Māori Trust Board and Makirikiri Aggregated Trust. Through effective relationship building, bespoke science/economic solutions, and the development of integrated decision-making tools, we are enabling Māori to create and implement successful, mātauranga Māori-based economic development schemes.





## › USE OF NATIONALLY SIGNIFICANT DATABASES & COLLECTIONS: 2014/15

Landcare Research is committed to ensuring our nationally-significant databases and collections and associated services are readily available and can be used efficiently and effectively.

### PLANT COMMUNITIES

Descriptions of vegetation communities in permanently or temporarily marked plots continued to be in demand and to contribute to international research (Measuring Biodiversity Change, page 14)

#### National Vegetation Survey databank

<http://nvs.landcareresearch.co.nz>

- 5208 data sets supplied to 35 users (100% service delivery)
- A new remote access service was released to MfE users so that they can view LUCAS (Land Use and Carbon Analysis System) data within NVS to aid international carbon reporting obligations
- Significant resources went into processing many boxes of hard-copy records resulting in 83 new projects being incorporated and available in NVS
- The data entry and management tool used by DOC for Tier 1 monitoring purposes was updated

### BIOLOGICAL COLLECTIONS

<https://scd.landcareresearch.co.nz>

We continued efforts to increase the value of and services from the biological collections and databases. (Defining Land Biota, pages 15-16).

#### New Zealand Flax Collection (Living Plants)

- 20 sets of divisions supplied, 10 enquiries (100% service delivery)
- 53 visitors
- Information and images of the Orchiston Collection and some of the Offshore Island Collection harakeke plants are now in NatureWatch NZ <http://naturewatch.org.nz>
- The harakeke collection is part of a National Library and DigitalNZ initiative aimed at making digital content easy to find, share and use

#### Ngā Tipu Whakoranga Ethnobotany Database

<http://maoriplantuse.landcareresearch.co.nz>

- 55,861 page views
- 16,297 visitors
- Technical updates have improved the display of information



### Allan Herbarium (CHR)

- 1280 specimens loaned, 65 transactions (100% service delivery)
- 686 identification and taxa enquiries
- 240 visitors to the collection
- The *Cotoneaster* identification key was updated with new information, new images, revised descriptions, and nomenclature; the key is important to biosecurity managers
- The online key to *Coprosma* was also launched as an app for smart phones and tablets
- >5000 images of diagnostic characters of weeds and native flowering plants were made available in the Image Gallery of the eFlora [www.nzflora.info](http://www.nzflora.info)
- A new service notifies DOC, MPI and other users of recent name changes in the Plant Names Database

### New Zealand Fungal Herbarium (PDD)

- 36 requests responded to (100% service delivery)
- 325 specimens loaned, 26 transactions
- 1176 identification and taxa enquiries
- 163 visitors to the collection
- Identification keys and diagnostic images prepared for over 140 described and undescribed fungal taxa are being tested by the Fungal Network of New Zealand and NatureWatch NZ

### International Collection of Microorganisms from Plants (ICMP)

- 643 cultured strains provided, 117 orders (100% service delivery)
- 450 identification enquiries
- 163 visitors
- ICMP and PDD are part of an international project of developing an authentic dataset of DNA sequences from fungal type specimens. Fungal identifications are now routinely based on a comparison of DNA sequences derived from cultures, dried specimens and from samples.
- Taxonomic updates from national and international research are made available to MPI and EPA via <http://nzfungi2.landcareresearch.co.nz>

### New Zealand Arthropod Collection (NZAC)

- 52 loan requests (96% serviced), 1425 specimens loaned
- 443 identification and taxa enquiries
- 105 visitors
- 13 online publications that include taxonomic keys of value to biodiversity and biosecurity users as well as the broader scientific community
- 1099 records added to the NZAC names data base (updates mainly for Lepidoptera and Coleoptera) <http://nzinverts.landcareresearch.co.nz>

## LAND AND SOILS

Land Resource Information Systems (LRIS) Portal and S-map Online continued to increase their value to the wider agricultural and environmental community (Characterising Land Resources, page 19).

### Land Resource Information Systems

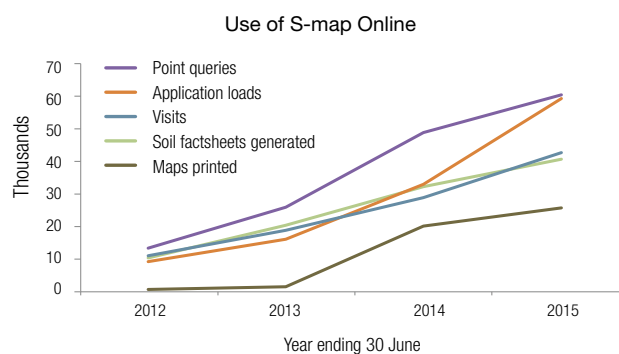
<http://iris.scinfo.org.nz>

- 24,408 visits
- 3919 users
- 4,936 data downloads

### S-map Online

<http://smap.landcareresearch.co.nz>

- 42,713 visits
- 40,660 soil factsheets generated
- 2574 maps printed
- 59,279 application loans
- 60,432 point queries



# KNOWLEDGE & TECHNOLOGY TRANSFER: KPIs



## End user engagement

81

stakeholders from 49 agencies on 10 of our advisory groups

227

stakeholder meetings in which our staff were invited to take part

## Our expertise is sought after

0.88 contract reports per scientist FTE  
\$51.5k per scientist FTE from commercial sources

137

contract reports provided to clients + 209 progress reports

37

staff on 65 stakeholder advisory boards and groups

900

days capacity building projects commissioned overseas

7

staff seconded to other organisations



## Formal agreements

11

MoU signed

12

new licensing agreements

2

Joint Ventures

1

new patent granted

## New or improved

60

products, processes & services

## Sharing knowledge

343

technical publications produced

278

presentations to stakeholders & communities

11

Wellington science-policy LINK seminars

97%

of our staff are located on or close by university campuses:

88

postgraduate students supervised  
62 PhDs 25 Masters

28

university positions held by our staff

19

of our staff delivered university lectures

## Social media

988

following Landcare Research on Facebook

1179

following Māori & Polynesian Textiles

755

members in the Garden Bird Survey Group on Facebook

2110

followers on Twitter



## Laboratory services

Our specialist laboratories offer fee-based services to a range of clients (mostly in government, local government and international conservation agencies) in addition to supporting our own research programmes.

# SCIENCE EXCELLENCE: KPIs



## Science papers produced

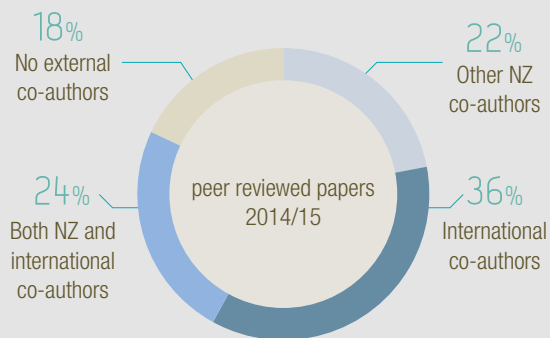
315

peer reviewed papers  
incl. early online & accepted

12.5%

of our peer reviewed papers  
were in journals with an impact  
factor > 5

## Research collaboration



## Globally well-connected

papers were co-authored with colleagues from

69 countries

18 months 2014/15



## Conference papers

250

conference presentations  
nationally & internationally

13

keynote addresses costs fully  
or partly covered

## Impact of our science

10.5

mean citation score for all of our  
papers published in the last 8 years

## Relative impact of our publications in 3 key areas:

(data from InCites™ Thomson Reuters)

Average citations/paper over 8 last years

- Landcare Research
- CRIs
- NZ Universities

Environment  
and Ecology

Biodiversity and  
Conservation

Soil Science



## Professional roles

37  
staff in 64

positions in professional societies  
(includes 8 Fellows)

42  
staff in 80

positions on editorial boards  
(64 international)

12  
staff in 17

directorships or board  
memberships (3 international)

66  
staff in 141

formal advisory positions  
(44 international)



# PEOPLE, LEARNING & CULTURE: KPIs



## Staff engagement

73% participation in the 2015 snapshot survey  
71.7% staff engagement index

## Leadership development

89% of Tier 3 managers participated in our leadership development programme

2 staff awarded Manaaki Tangata Fellowships for overseas study

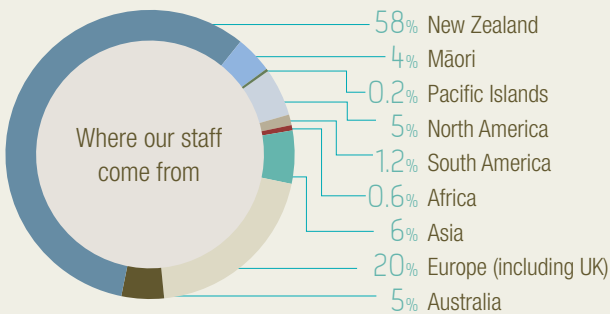
1 technician development grant awarded

12 writing scholarships awarded

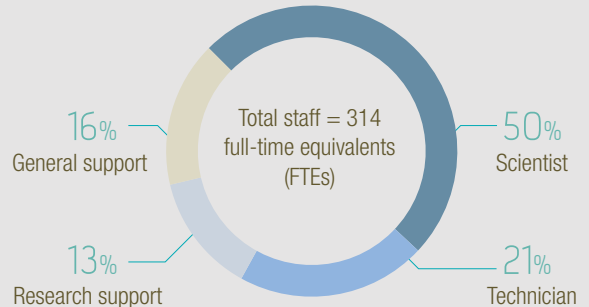
## Recruitment & diversity

60% of science staff recruited = female  
33% of science staff recruited were overseas appointments

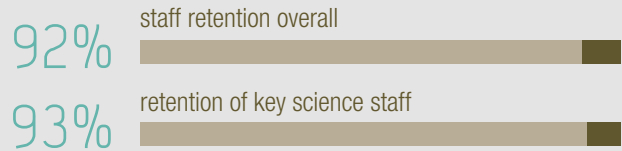
### International diversity (all staff)



## 314 staff at 9 sites



83% of scientists have postgraduate qualifications  
33% of technicians have postgraduate qualifications



## Health & safety

0 serious harm injuries  
0 lost time injuries  
10 minor injuries

Tertiary accreditation (the highest level) in the Accident Compensation Commission's programme for Workplace Safety Management Practices

## Environmental performance



certification for our environmental management system and practices



certification of our carbon-neutrality

We are committed to the highest standards of good employer practices, including well-being and safety of our staff, and equal employment opportunities for all regardless of role, age, ethnicity, gender, sexual orientation or (dis)ability. Similarly, we remain committed to best practice in reducing the environmental impacts of our operational activities.

## › AWARDS

### Awards & professional recognition

**Ellen Cieraad:** 'Best publication by a new researcher' awarded by the New Zealand Ecological Society

**Phil Cowan:** Japan Society for Promotion of Science Fellowship to visit key invasive species researchers

**Phil Cowan:** Invited presentation to Hokkaido University Veterinary School as part of 'Fostering Global Leaders in Veterinary Science for Contributing to One Health', an outstanding graduate school educational program supported by MEXT (Ministry of Education, Culture, Sports, Science and Technology), Japan

**Adam Daigneault, Oshadhi Samarasinghe and Suzie Greenhalgh:** New Zealand Association of Economists' Economic Policy Prize for their paper 'Agro-environmental policy impacts on regional land use in New Zealand'

**Penny Fisher:** Awarded a New Zealand – China Scientist Exchange Programme grant from the Royal Society of New Zealand

**Ronny Groenteman:** The Peter Ingram Memorial Award from the New Zealand Biosecurity Institute

**Grant Norbury, Andrea Byrom, Roger Pech, James Smith, Dean Clarke, Dean Anderson and Guy Forrester:** The New Zealand Ecological Society award for 'Best science paper on New Zealand ecology for 2014 published in international literature'

**Pranoy Pal:** Best Poster Award, 20th World Congress of Soil Science and International Union of Soil Sciences

**Pierre Roudier:** Nominated for the 'Best paper in pedometrics' award presented annually by the Pedometrics Commission of the International Union of Soil Sciences

**Surinder Saggat:** Award of Honour from the Ludhiana Chapter of the Indian Society of Soil Science for distinction in research and advancement of soil science

**Priscilla Wehi:** Awarded a Rutherford Discovery Fellowship from the Royal Society of New Zealand

**Priscilla Wehi:** Chosen by the Sunday Star-Times as one of their 'First XV for 2015' – a crack squad of kiwi entrepreneurs, politicians, scientists and artists likely to make the headlines this year

### Landcare Research awards to staff

#### Distinguished Service:

Les Basher, Pike Brown, Andrea Byrom, Thomas Buckley, Alison Collins, Janine Duckworth, Judy Grindell, Michelle Jones, Phil Lyver, Fraser Morgan, Markus Mueller, Peter Newsome, David Pairman, Pauline Wilson.

#### Health & Safety:

Andrea Airey, Scott Bartlam, John Dando, Elly Lang, Stuart Oliver, Delwene Pupuo.

#### Best Technician:

Birgit Rhode

## › NON-FINANCIAL PERFORMANCE SUMMARY

	Indicator as per the SCI 2014–19	2014/15 Actual
Stakeholder engagement	Percentage of relevant end-users who have adopted knowledge and / or technology from Landcare Research (data provided from MBIE's biennial external client survey; next survey 2015/16)	No survey in 2014/15
	Percentage of relevant funding partners and other end-users that have a high level of confidence in Landcare Research's ability to set research priorities (data provided from MBIE's biennial external client survey; next survey 2015/16)	No survey in 2014/15
	Revenue per FTE (\$000s) <sup>1</sup>	\$173.8
	Revenue per FTE from commercial sources (\$000s) <sup>1</sup>	\$51.5
	Commercial reports per scientist FTE <sup>1</sup>	0.88
Vision Mātauranga	Number of positive strategic partnerships with iwi and Māori organisations in which we are linking science and mātauranga and which address Māori goals and aspirations	44 projects (See page 29: Kaupapa Māori, Māori-centred and Involving Māori)
Science excellence & collaboration	Publications with collaborators <sup>1</sup>	Other NZ: 22% Overseas: 36% Both NZ & Int'l: 24% Joint papers (total): 82%
	Impact of scientific publications (mean annual SCImago ranking for the journals that we published in) <sup>1</sup>	3.0
	Percentage of relevant national and international research providers that have a high level of confidence in Landcare Research's ability to put together the most appropriate research teams (data provided from MBIE's biennial external client survey; next survey 2015/16)	No survey in 2014/15
Use of Databases & Collections	Availability of data from Landcare Research's Core-funded databases, collections and information systems (assessed by a variety of metrics appropriate to each)	(See pages 30–31)
	Specimen transactions, identification requests and visitors for our Core-funded biological collections and associated infrastructure. Revised this year to focus on service delivery	96–100% service delivery (See pages 30–31)
Technology Transfer	Number of new and existing licensing deals of Landcare Research-derived IP (including technologies, products and services) with New Zealand and international partners	12
People, Learning & Culture	Staff engagement in survey evaluations	71.7% engagement index
	Turnover of key science staff	6.7%

<sup>1</sup> Generic indicators as required by MBIE across all CRIs are at the Landcare Research Group level; the rest are at Parent level



# > FINANCIAL PERFORMANCE SUMMARY

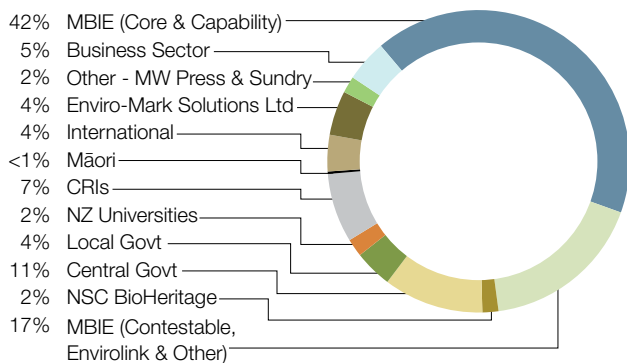
Summary table of group financial performance

For the year ending 30 June:	2013	2014	2015	2015	2016
	Achieved	Achieved	Target	Achieved	Target
Revenue, \$m	55.5	54.7	58.7	58.2 <sup>2</sup>	59.2
EBIT before investment, \$m	2.2	3.6	2.7	3.0	3.0
EBIT, \$m	0.8	2.9	2.0	2.2	2.1
Investment, \$m	1.4	0.8	0.7	0.8	0.8
Total assets, \$m	45.5	45.4	45.3	47.7	50.0
Return on equity	4.1% <sup>1</sup>	7.2%	5.0%	5.5%	5.0%
Dividend \$m	-	-	-	-	-
Equity ratio	61%	63%	72%	66%	66%
Gearing	0%	0%	0%	0%	0%
Interest cover	80	658	116	N/A	614

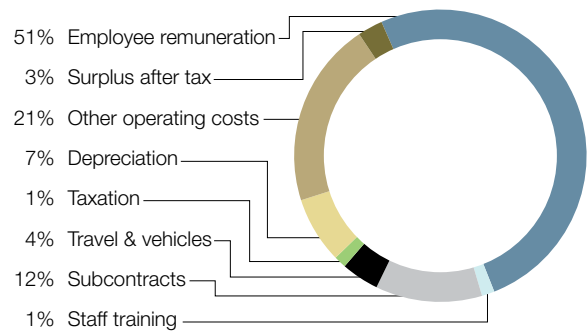
<sup>1</sup> 2013 Return on equity excludes extraordinary restructuring costs.

<sup>2</sup> Revenue excludes income from gain on sale of subsidiaries and interest on investments and from finance leases, \$0.2m for 2015 (2014: \$0.1m).

Revenue by source (2014/15)



Where our revenue goes (2014/15)

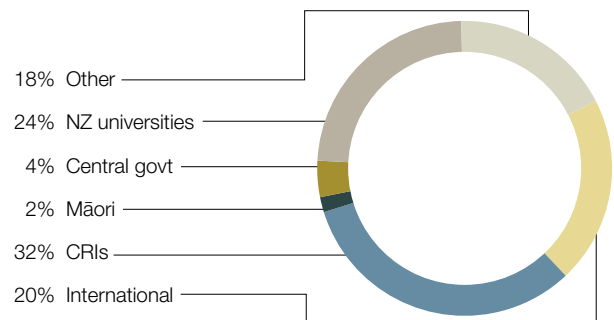


\$178,000 revenue per FTE (parent)

Graphs provide an indication of where our revenue comes from and where the revenue goes (expenditure). Graphs are not part of the audited accounts.

Subcontracts to research partners by sector

Total = \$6.98m in 2014/15 (\$6.28m in 2013/14)



Other includes business sector, NGOs and private individuals.



## DIRECTORS' REPORT

> for the year ended 30 June 2015

The Directors of Landcare Research New Zealand Limited are pleased to report that the Company fulfilled its obligations under the Crown Research Institutes Act 1992 for the year ended 30 June 2015. The disclosures relate to Landcare Research New Zealand Limited and its subsidiaries (the 'Group').

The Company is a private company limited by shares and incorporated in accordance with the Companies Act 1993.

### Principal activity

Landcare Research's principal activity is to provide scientific research that fulfils our Core Purpose in accordance the Crown Research Institutes Act 1992.

### Operating results

Group revenue for the year increased to \$58.4 million from \$54.7 million in the previous year. The consolidated net surplus before taxation expense for 2014/15 was \$2.4 million and the consolidated net surplus after tax attributable to Parent Company shareholders was \$1.7 million. Return on equity was 5.5%, compared to the target of 5.0%.

### Remuneration of Directors

Directors fees are set by the shareholding Ministers annually.

	2014/15 \$	2013/14 \$
Peter Schuyt	46,000	46,000
Chris Downs	23,000	22,334
Gavan Herlihy	23,000	22,334
Hon. John Luxton	-	22,334
Emily Parker	23,000	22,334
Tania Simpson	-	28,083
Steve Saunders	23,000	-
Jane Taylor	28,750	-
Victoria Taylor	23,000	26,334

### Changes to Board composition

Peter Schuyt retired from the Board on 30 June 2015 and Jane Taylor was appointed Chairman on 1 July 2015. Caroline Saunders and Paul Reynolds (Deputy Chairman) were appointed on 1 July 2015.

### Subsidiaries

The Directors of the two subsidiary companies are:

*Enviro-Mark Solutions Limited*

Victoria A Taylor

Robert G M Fenwick (resigned 04 November 14)

Richard F S Gordon

Nigel W Thomson

Landcare Research US Limited

Phil B S Hart

Nigel W Thomson

#### Directors' insurance

The Company has Directors and Officers' insurance cover in respect of any act or omission in their capacity as a Director of the Company. The Company has indemnified Directors and certain employees of the Company for costs and proceedings and for liabilities incurred by the employee in respect of any act or omission in his or her capacity as an employee of the Company. The indemnity for liabilities incurred does not extend to criminal liability or liability for breach of a fiduciary duty owed to the Company.

#### Dividends

No dividends have been declared or paid in respect of the 2015 financial year.

#### Directors' interests

Any business the Group has transacted with organisations in which a Director has an association has been carried out on a commercial 'arms-length' basis.

#### Compliance

The Directors confirm that the Company has operated in accordance with the Crown Research Institutes Act 1992 and the Companies Act 1993 during the year. The activities undertaken by the Company in the year are in accordance with the Landcare Research Statement of Core Purpose. No written direction was received from either shareholding Minister in the year.

No directors acquired or disposed of equity securities in the company during the year; and the Board has received no notices from directors of the company requesting to use company information received in their capacity as directors which would not otherwise have been available to them.

#### Donations

The Group has made various donations totalling \$1000 during the year (\$nil in 2013/14).

#### Auditors

John Mackey of Audit New Zealand was appointed as the audit service provider by the Auditor-General. The Auditor-General is the statutory auditor pursuant to section 14 of the Public Audit Act 2001 and section 21 of the Crown Research Institutes Act 1992. Their audit remuneration and fees are detailed in note 3 of the 'Notes to the financial statements'.

#### Events subsequent to balance date

The Directors are not aware of any matter or circumstance since the end of the financial year not otherwise dealt with in this report that has, or may have, a significant effect on the operation of the Company.

#### Employee remuneration

In accordance with section 211(1)(g) of the Companies Act 1993, the numbers of employees who received remuneration and other benefits totalling \$100,000 or more, in \$10,000 bands, during the year were:

Total cost to the Group	Number of Employees	
	2014/15	2013/14
\$440,000 - \$449,999	1 (*)	
\$420,000 - \$429,999		1 (*)
\$230,000 - \$239,999	1	
\$220,000 - \$229,999	3	
\$210,000 - \$219,999		
\$200,000 - \$209,999	3	2
\$190,000 - \$199,999		1
\$180,000 - \$189,999	2	2
\$170,000 - \$179,999		
\$160,000 - \$169,999	3	4
\$150,000 - \$159,999	3	1
\$140,000 - \$149,999	5	3
\$130,000 - \$139,999	7	7
\$120,000 - \$129,999	12	10
\$110,000 - \$119,999	19	11
\$100,000 - \$109,999	26	21

\* Chief Executive of Landcare Research New Zealand Limited.

This table includes no redundancy and termination payments in 2014/15 (2013/14: 2).

Signed for and on behalf of the Board



Jane Taylor  
Chair  
20 August 2015



Paul Reynolds  
Deputy Chair  
20 August 2015



# › AUDITED FINANCIAL STATEMENTS

of Landcare Research New Zealand Limited

## Statement of comprehensive income

for the year ended 30 June 2015

	Note	Consolidated			Parent		
		2015	2015	2014	2015	2015	2014
		Actual	Budget	Actual	Actual	Budget	Actual
		\$000s	\$000s	\$000s	\$000s	\$000s	\$000s
Revenue	2.	58,426	58,790	54,709	55,891	55,074	52,128
Finance costs	3.	0	52	11	0	52	11
Operating expenses	3.	56,012	56,700	51,780	53,404	53,168	49,176
<b>Profit / (Loss) before tax</b>		<b>2,414</b>	<b>2,038</b>	<b>2,918</b>	<b>2,487</b>	<b>1,854</b>	<b>2,941</b>
Income tax expense	24.	740	571	834	813	518	857
<b>Profit after tax</b>		<b>1,674</b>	<b>1,467</b>	<b>2,084</b>	<b>1,674</b>	<b>1,336</b>	<b>2,084</b>
<b>Total comprehensive income</b>		<b>1,674</b>	<b>1,467</b>	<b>2,084</b>	<b>1,674</b>	<b>1,336</b>	<b>2,084</b>

The accompanying notes form part of these financial statements.

## Statement of changes in equity

for the year ended 30 June 2015

	Group			Parent		
	2015	2015	2014	2015	2015	2014
	Actual	Budget	Actual	Actual	Budget	Actual
	\$000s	\$000s	\$000s	\$000s	\$000s	\$000s
<b>Balance at 1 July</b>	<b>29,858</b>	<b>28,892</b>	<b>27,776</b>	<b>29,858</b>	<b>28,848</b>	<b>27,775</b>
Total comprehensive income for the year ended 30 June	1,674	1,467	2,084	1,674	1,336	2,084
<b>Balance at 30 June</b>	<b>31,532</b>	<b>30,359</b>	<b>29,860</b>	<b>31,532</b>	<b>30,184</b>	<b>29,859</b>
<b>Total comprehensive income attributable to:</b>						
Parent company	1,674	1,467	2,084	1,674	1,336	2,084
	<b>1,674</b>	<b>1,467</b>	<b>2,084</b>	<b>1,674</b>	<b>1,336</b>	<b>2,084</b>

The accompanying notes form part of these financial statements.

# Statement of financial position

as at 30 June 2015

	Note	Group			Parent		
		2015	2015	2014	2015	2015	2014
		Actual	Budget	Actual	Actual	Budget	Actual
		\$000s	\$000s	\$000s	\$000s	\$000s	\$000s
<b>ASSETS</b>							
<b>Current assets</b>							
Cash and cash equivalents	4.	5,595	2,647	2,088	5,540	2,651	1,900
Trade and other receivables	5.	8,669	7,174	7,865	8,876	8,470	8,120
Inventories	6.	16	41	51	12	39	38
Finance lease receivable	7.	94	97	106	94	94	106
Derivative financial instruments	8.	40	0	0	40	0	0
<b>Total current assets</b>		<b>14,414</b>	<b>9,959</b>	<b>10,110</b>	<b>14,562</b>	<b>11,254</b>	<b>10,164</b>
<b>Non-current assets</b>							
Property, plant and equipment	9.	31,469	33,232	33,168	31,449	33,214	33,149
Patents and intellectual property	10.	544	551	506	128	141	96
Intangible assets	11.	718	1,066	1,003	718	1,066	1,003
Investments	12.	0	0	0	71	71	71
Finance lease receivable	7.	508	508	602	508	508	602
<b>Total non-current assets</b>		<b>33,239</b>	<b>35,357</b>	<b>35,279</b>	<b>32,874</b>	<b>35,000</b>	<b>34,921</b>
<b>Total assets</b>		<b>47,653</b>	<b>45,316</b>	<b>45,389</b>	<b>47,436</b>	<b>46,254</b>	<b>45,085</b>
<b>LIABILITIES</b>							
<b>Current liabilities</b>							
Trade and other payables	13.	6,061	4,544	5,442	5,978	5,919	5,344
Employee benefit liabilities	14.	4,214	4,172	4,104	4,085	4,067	3,951
Revenue in advance	15.	1,618	2,090	1,586	1,517	1,923	1,526
Tax payable		549	190	586	636	174	586
Derivative financial instruments	8.	0	0	3	0	0	3
<b>Total current liabilities</b>		<b>12,442</b>	<b>10,996</b>	<b>11,721</b>	<b>12,216</b>	<b>12,083</b>	<b>11,410</b>
<b>Non-current liabilities</b>							
Employee benefit liabilities	14.	694	712	566	688	712	549
Deferred tax liability	24.	2,985	3,249	3,242	3,000	3,275	3,267
<b>Total non-current liabilities</b>		<b>3,679</b>	<b>3,961</b>	<b>3,808</b>	<b>3,688</b>	<b>3,987</b>	<b>3,816</b>
<b>Total liabilities</b>		<b>16,121</b>	<b>14,957</b>	<b>15,529</b>	<b>15,904</b>	<b>16,070</b>	<b>15,226</b>
<b>NET ASSETS</b>		<b>31,532</b>	<b>30,359</b>	<b>29,860</b>	<b>31,532</b>	<b>30,184</b>	<b>29,859</b>
<b>EQUITY</b>							
Ordinary shares	16.	10,515	10,515	10,515	10,515	10,515	10,515
Retained earnings	16.	21,017	19,844	19,345	21,017	19,669	19,344
<b>Total equity</b>		<b>31,532</b>	<b>30,359</b>	<b>29,860</b>	<b>31,532</b>	<b>30,184</b>	<b>29,859</b>

The accompanying notes form part of these financial statements.



Jane Taylor  
Chair

20 August 2015



Paul Reynolds  
Deputy Chair

20 August 2015

# Statement of cash flows

for the year ended 30 June 2015

Note	Group			Parent		
	2015	2015	2014	2015	2015	2014
	Actual	Budget	Actual	Actual	Budget	Actual
	\$000s	\$000s	\$000s	\$000s	\$000s	\$000s
<b>Cash flows from operating activities</b>						
	57,673	59,254	54,382	54,706	54,493	51,730
Receipts from customers						
Interest received	95	103	36	154	103	36
Payments to suppliers and employees	(50,864)	(53,065)	(47,921)	(47,910)	(48,274)	(45,242)
Interest paid	0	(52)	(11)	(0)	(52)	(11)
Tax refund/(paid)	(1,030)	(493)	73	(1,030)	(446)	(106)
<b>Net cash generated from operating activities</b>	<b>5,873</b>	<b>5,747</b>	<b>6,559</b>	<b>5,920</b>	<b>5,824</b>	<b>6,407</b>
18.						
<b>Cash flows from investing activities</b>						
Cash transferred to assets held for sale	0	0	48	0	0	722
Proceeds from sale of property, plant and equipment	1	0	1	24	0	0
Purchase of property, plant and equipment	(2,224)	(3,908)	(3,258)	(2,234)	(3,901)	(3,579)
Purchase of intangible asset	(143)	(355)	(388)	(142)	(349)	(388)
Advances made (to)/from subsidiaries	0	0	0	73	(80)	(335)
<b>Net cash used in investing activities</b>	<b>(2,366)</b>	<b>(4,263)</b>	<b>(3,598)</b>	<b>(2,280)</b>	<b>(4,331)</b>	<b>(3,580)</b>
<b>Cash flows from financing activities</b>						
Drawdown (repayment) of borrowings	0	0	(2,038)	0	0	(2,038)
<b>Net cash generated from (used in) financing activities</b>	<b>0</b>	<b>0</b>	<b>(2,038)</b>	<b>0</b>	<b>0</b>	<b>(2,038)</b>
<b>Net increase/(decrease) in cash</b>	<b>3,507</b>	<b>1,484</b>	<b>923</b>	<b>3,640</b>	<b>1,493</b>	<b>789</b>
Cash, cash equivalents and bank overdrafts at beginning of the year	2,088	1,163	1,165	1,900	1,158	1,111
<b>Cash, cash equivalents and bank overdrafts at end of the year</b>	<b>5,595</b>	<b>2,647</b>	<b>2,088</b>	<b>5,540</b>	<b>2,651</b>	<b>1,900</b>

The accompanying notes form part of these financial statements.



# NOTES TO THE FINANCIAL STATEMENTS

› for the year ended 30 June 2015

## 1. Summary of Accounting Policies

### Reporting entity

Landcare Research New Zealand Limited is a Crown Research Institute governed by the Crown Research Institutes Act 1992, Crown Entities Act 2004, Companies Act 1993 and the Public Finance Act 1989. The Landcare Research Group ('the Group') consists of Landcare Research New Zealand Limited and its subsidiaries, Landcare Research US Limited (100% owned) and Enviro-Mark Solutions Limited (100% owned). Landcare Research New Zealand Limited and Enviro-Mark Solutions Limited are incorporated and domiciled in New Zealand; Landcare Research US Limited is incorporated and domiciled in the USA.

The core purpose of the Group is to drive innovation in New Zealand's management of terrestrial biodiversity and land resources in order to both protect and enhance the terrestrial environment and grow New Zealand's prosperity.

These audited financial statements of the Group are for the year ended 30 June 2015 and were authorised by the Board of Landcare Research New Zealand Limited on 20 August 2015.

### New standards

None of the new standards effective after 1 July 2014 had a material effect on the Group.

### Standards, amendments and interpretations issued but not yet effective

Standard/Interpretation	Effective for annual reporting periods beginning on or after	Expected to be initially applied in the financial year ending
NZ IAS 1 amendments – disclosure	1 January 2016	30 June 2017
NZ IFRS 9 Financial Instruments	1 January 2018	30 June 2019
IAS 16 and NZ IAS 38 Acceptable methods of depreciation and amortisation	1 January 2016	30 June 2017
NZ IFRS 15 Revenue from contracts and customers	1 January 2017	30 June 2018

The above standards and interpretations are not expected to have a material impact on the financial results. Except for the impending changes noted above there are no other standards or interpretations applicable to the Group that have been issued but are not yet effective.

### Basis of preparation

The financial statements of the Group have been prepared in accordance with generally accepted accounting practice. The financial statements comply with NZ IFRS, and other applicable financial reporting standards, as appropriate for Tier 1 for-profit entities. The financial statements also comply with IFRS.

The accounting policies set out below have been applied consistently to all periods presented in these financial statements.

The consolidated financial statements have been prepared on a historical cost basis, with the exception of derivative financial instruments that have been measured at fair value. The financial statements are presented in New Zealand dollars, the functional currency of the Group, and all values are rounded to the nearest thousand dollars (\$000).

Foreign currency transactions are translated into the functional currency, using the exchange rates prevailing at the dates of the transactions. Foreign exchange gains and losses resulting from the settlement of such transactions are recognised in the profit or loss.

## Subsidiaries

Where the Group has the capacity to control the financing and operating policies of an entity, so as to obtain benefits from its activities, all such entities are consolidated as subsidiaries within the Group financial statements. This power exists where the Group controls the majority voting power on the governing body, or where such policies have been irreversibly predetermined by the Group, or where the determination of such policies is unable to materially impact the level of potential ownership benefits that arise from the activities of the subsidiary.

The Group measures the cost of a business combination as the aggregate of the fair values, at the date of exchange, of assets given, liabilities incurred or assumed in exchange for control of the subsidiary, plus any costs directly attributable to the business combination. Any excess of the cost of the business combination over the Group's interest in the net fair value of the identifiable assets, liabilities and contingent liabilities is recognised as goodwill. If the Group's interest in the net fair value of the identifiable assets, liabilities and contingent liabilities recognised exceeds the cost of the business combination, the difference will be recognised immediately in the profit or loss.

## Basis of consolidation

The purchase method is used to prepare the consolidated financial statements; this involves adding together like items of assets, liabilities, equity, income and expenses on a line-by-line basis. All significant intragroup balances, transactions, income and expenses are eliminated on consolidation.

Landcare Research New Zealand Limited's investment in its subsidiaries is carried at cost less impairment in its 'Parent entity' financial statements.

## Revenue

Revenue is measured at the fair value of consideration received.

Revenue from the rendering of services is recognised by reference to the stage of completion of the transaction at balance date, based on the actual service provided as a percentage of the total services to be provided. Income received for goods and services that have not yet been supplied to customers has been recognised as Revenue in Advance. Sales of goods are recognised when a product is sold to the customer.

Core funding from the Ministry of Building, Innovation and Employment (MBIE) is treated as a government grant and generally recognised in the year of receipt. The only exception is where MBIE gives prior written consent to carry over to the next financial year any part of the Core

funding that will be allocated to specified long-term or large scale research activities that require the accumulation of funds over two or more financial years to fully fund those activities.

Interest income is recognised using the effective interest method, whereby the estimated future cash receipts are exactly discounted from the net carrying amounts through the expected life of the financial assets.

Dividends are recognised when the right to receive payment has been established.

## Borrowing costs

Borrowing costs directly attributable to the acquisition, construction or production of a qualifying asset (i.e. an asset that necessarily takes a substantial period of time to get ready for its intended use or sale) are capitalised as part of the cost of that asset in accordance with NZ IAS 23 Borrowing costs (revised). All other borrowing costs are expensed in the period they occur.

Borrowing costs consist of interest and other costs that an entity incurs in connection with the borrowing of funds.

## Income tax

Income tax expense in relation to the profit or loss for the period comprises current tax and deferred tax.

Current tax is the amount of income tax payable based on the taxable profit for the current year, plus any adjustments to income tax payable in respect of prior years. Current tax is calculated using rates that have been enacted or substantively enacted by balance date.

Deferred tax is the amount of income tax payable or recoverable in future periods in respect of temporary differences and unused tax losses. Temporary differences are differences between the carrying amount of assets and liabilities in the financial statements and the corresponding tax bases used in the computation of taxable profit. Deferred tax *liabilities* are generally recognised for all taxable temporary differences. Deferred tax assets are recognised to the extent that it is probable that taxable profits will be available against which the deductible temporary differences or tax losses can be utilised. Deferred tax is not recognised if the temporary difference arises from the initial recognition of goodwill, or from the initial recognition of an asset and liability in a transaction that is not a business combination, and at the time of the transaction affects neither accounting profit nor taxable profit. Deferred tax is recognised on taxable temporary differences arising on investments in subsidiaries and associates, and interests in joint ventures, except where the Company can control the reversal of the temporary difference and it is probable that

the temporary difference will not reverse in the foreseeable future. Deferred tax is calculated at the tax rates that are expected to apply in the period when the liability is settled or the asset is realised, using tax rates that have been enacted or substantively enacted by balance date.

Current tax and deferred tax are recognised against the profit or loss, except to the extent that they relate to a business combination, or to transactions recognised in other comprehensive income or directly in equity.

#### Finance leases

A finance lease is a lease that substantially transfers to the lessee all risks and rewards incidental to ownership of an asset, whether or not title is eventually transferred.

At the commencement of the lease term, the Group recognises finance leases as assets and liabilities in the Statement of Financial Position at the lower of the fair value of the leased item or the present value of the minimum lease payment. The amount recognised as an asset is depreciated over its useful life. If there is no certainty as to whether the Group will obtain ownership at the end of the lease term, the asset is fully depreciated over the shorter of the lease term or its useful life.

#### Operating leases

An operating lease is a lease that does not substantially transfer all the risks and rewards incidental to ownership of an asset. Lease payments under an operating lease are recognised as an expense on a straight-line basis over the lease term. Lease incentives received are recognised evenly over the term of the lease as a reduction in rental expense.

#### Cash and cash equivalents

Cash and cash equivalents include cash in hand, deposits held at call with banks, other short-term highly liquid investments with original maturities of three months or less, and bank overdrafts. Bank overdrafts are shown within borrowings in current liabilities in the Statement of Financial Position.

#### Trade and other receivables

Trade and other receivables are initially measured at fair value and subsequently measured at amortised cost, using the effective interest method, less any provision for impairment.

Loans are initially recognised at the present value of their expected future cash flows, discounted at the current market rate of return for a similar asset/investment. They are subsequently measured at amortised cost using the effective interest method. The difference between the face value and present value of expected future cash flows of the loan is recognised in the Statement of Comprehensive Income as a grant.

A provision for impairment of receivables is established when there is objective evidence that the Group will not be able to collect all amounts due according to the original terms of receivables. The amount of the provision is the difference between the asset's carrying amount and the present value of estimated future cash flows, discounted using the effective interest method.

#### Inventories

Inventories (such as spare parts and other items) held for distribution or consumption in the provision of services that are not supplied on a commercial basis are measured at the lower of cost and net realisable value. Inventories held for use in the production of goods and services on a commercial basis are valued at the lower of cost and net realisable value. The cost of purchased inventory is determined using the average cost method.

The write-down from cost to net realisable value is recognised in the profit or loss.

#### Financial assets

The Group classifies its financial assets into the following three categories: financial assets at fair value through profit or loss, loans and receivables, and financial assets at fair value through other comprehensive income. The classification depends on the purpose for which the investments were acquired. Management determines the classification of its investments at initial recognition and re-evaluates this designation at every reporting date.

Financial assets and liabilities are initially measured at fair value plus transaction costs unless they are carried at fair value through profit or loss, in which case the transaction costs are recognised in the profit or loss.

The fair value of financial instruments traded in active markets is based on quoted market prices at the balance sheet date. The quoted market price used is the current bid price. The fair value of financial instruments that are not traded in an active market is determined using valuation techniques. The Group uses a variety of methods and makes assumptions that are based on market conditions existing at each balance date. Quoted market prices or dealer quotes for similar instruments are used for long-term debt instruments held. Other techniques, such as estimated discounted cash flows, are used to determine fair value for the remaining financial instruments.

#### The three categories of financial assets are:

- *Financial assets at fair value through profit or loss*

This category has two sub-categories: financial assets held for trading, and those designated at fair value through profit or loss at inception. A financial asset is classified in this category if acquired principally for the purpose of selling



in the short term, or if designated as so by management. Derivatives are also categorised as held for trading unless they are designated as hedges. Assets in this category are classified as current assets if they are either held for trading or are expected to be realised within 12 months of the balance sheet date. After initial recognition they are measured at their fair values. Gains or losses on remeasurement are recognised in the profit or loss. Financial assets in this category include foreign currency forward contracts.

- *Loans and receivables*

These are non-derivative financial assets with fixed or determinable payments that are not quoted in an active market. After initial recognition they are measured at amortised cost using the effective interest method. Gains and losses when the asset is impaired or derecognised are recognised in the profit or loss. 'Trade and other receivables' are classified as loans and receivables in the Statement of Financial Position.

- *Financial assets at fair value through other comprehensive income*

Financial assets at fair value through other comprehensive income are those that are designated as fair value through other comprehensive income or are not classified in any of the other categories above. This category encompasses:

- Investments that the Group intends to hold long-term but which may be realised before maturity.
- Shareholdings that the Group holds for strategic purposes. The Parent's investments in its subsidiaries are not included in this category as they are held at cost (as allowed by NZ IAS 27 *Consolidated and Separate Financial Statements*) whereas this category is to be measured at fair value.
- Investment in Kiwi Innovation Network Limited.

After initial recognition, these investments are measured at their fair value. Gains and losses are recognised directly in other comprehensive income except for impairment losses, which are recognised in the profit or loss. In the event of impairment, any cumulative losses previously recognised in other comprehensive income will be removed from other comprehensive income and recognised in the profit or loss even though the asset has not been derecognised. On derecognition, the cumulative gain or loss previously recognised in other comprehensive income is recognised in the profit or loss.

### Impairment of financial assets

At each balance sheet date the Group assesses whether there is any objective evidence that a financial asset or group of financial assets is impaired. Any impairment losses are recognised in the profit or loss.

### Accounting for derivative financial instruments and hedging activities

The Group uses derivative financial instruments to cover the risk on foreign exchange. In accordance with its treasury policy, the Group does not hold or issue derivative financial instruments for trading purposes.

Derivatives are initially recognised at fair value on the date a derivative contract is entered into and are subsequently remeasured at their value. The Group does not designate derivatives as a hedging instrument and therefore accounts for derivative instruments at fair value through profit or loss. Changes in the fair value of derivative instruments are recognised immediately in the profit or loss.

### Non-current assets held for sale

Non-current assets held for sale are classified as held for sale if their carrying amount will be recovered principally through a sale transaction, not through continuing use. Non-current assets held for sale are measured at the lower of their carrying amount or fair value less costs to sell. Any impairment losses for write-downs of non-current assets held for sale are recognised in the profit or loss.

Any increases in fair value (less costs to sell) are recognised up to the level of any impairment losses that have been previously recognised. Non-current assets (including those that are part of a disposal group) are not depreciated or amortised while they are classified as held for sale. Interest and other expenses attributable to the liabilities of a disposal group classified as held for sale continue to be recognised.

### Property, plant and equipment

Property, plant and equipment consist of:

- *Operational assets* these include land, buildings, library books, plant and equipment, and motor vehicles.
- *Restricted assets* these are collections and databases, held by the Group, that provide a benefit or service to the community and cannot be disposed of because of legal or other restrictions.
- *Capital work in progress* this has been included within plant and equipment, and is not depreciated until ready for use.

Property, plant and equipment are shown at cost, less accumulated depreciation and impairment losses. Assets are not reported with a financial value in cases where they are not realistically able to be reproduced or replaced, and when they do not generate cash flows and where no market exists to provide a valuation.

### Additions

The cost of an item of property, plant and equipment is recognised as an asset if, and only if, it is probable that

future economic benefits or service potential associated with the item will flow to the Group and the cost of the item can be measured reliably. In most instances, an item of property, plant and equipment is recognised at its cost. Where an asset is acquired at no cost, or for a nominal cost, it is recognised at fair value as at the date of acquisition.

#### *Disposals*

Gains and losses are determined by comparing the proceeds with the carrying amount of the asset. Gains and losses on disposals are included in the profit or loss.

#### *Subsequent costs*

Costs incurred subsequent to initial acquisition are capitalised only when it is probable that future economic benefits or service potential associated with the item will flow to the Group and the cost of the item can be measured reliably.

#### *Depreciation*

Depreciation is provided on the Group's property, plant and equipment, other than land, at rates that will write off the cost of the assets to their estimated residual values over their useful lives. All Parent and Enviro-Mark Solutions depreciable assets are depreciated on a straight-line basis. The residual value and useful life of an asset is reviewed, and adjusted if applicable, at each financial year end.

<b>Depreciation rates</b>	<b>Parent and Enviro-Mark Solutions</b>
Buildings	1.67–10%
Plant and equipment	4–33%
IT equipment	25%
Motor vehicles	25%
Furniture and fittings	6.67–10%
Office equipment	20%
Finance lease assets	20%
Library books and periodicals	20–50%
Rare books collections	1%

## **Intangible assets**

### *Software acquisition and website development costs*

Acquired computer software licences are capitalised on the basis of the costs incurred to acquire and bring to use the specific software. Costs associated with maintaining computer software and websites are recognised as an expense when incurred. Costs that are directly associated with the development of software and websites for internal use by the Group are recognised as an intangible asset. Direct costs include the software development employee costs and an appropriate portion of relevant overheads.

### *Patents and intellectual property*

Patents and intellectual property are capitalised on the basis of costs incurred. The useful life of trade marks is assessed as being indefinite as the trade mark is renewed every ten years by paying the applicable fee, and continues in use.

### *Amortisation*

The carrying value of an intangible asset with a finite life is amortised on a straight-line basis over its useful life. Amortisation begins when the asset is available for use and ceases at the date that the asset is derecognised. The amortisation charge for each period is recognised in the profit or loss. The useful lives and associated amortisation rates of major classes of intangible assets have been estimated as follows:

Computer software	4 years	25%
Intellectual property	3–20 years	5–35%

### **Impairment of non-financial assets**

Non-financial assets that have an indefinite useful life are not subject to amortisation and are tested annually for impairment. Assets that have a finite useful life are reviewed for impairment whenever events or changes in circumstances indicate that the carrying amount may not be recoverable. An impairment loss is recognised for the amount by which the asset's carrying amount exceeds its recoverable amount. The recoverable amount is the higher of an asset's fair value less costs to sell or value in use.

Value in use is depreciated replacement cost for an asset where the future economic benefits or service potential of the asset are not primarily dependent on the asset's ability to generate net cash inflows and where the entity would, if deprived of the asset, replace its remaining future economic benefits or service potential. The value in use for cash-generating assets is the present value of expected future cash flows.

If an asset's carrying amount exceeds its recoverable amount the asset is impaired and the carrying amount is written down to the recoverable amount. The total impairment loss is recognised in the profit or loss.

## Employee benefits

### *Short-term benefits*

Employee benefits that the Group expects to be settled within twelve months of balance date are measured at nominal values based on accrued entitlements at current rates of pay. These include salaries and wages accrued up to balance date, annual leave earned to but not yet taken at balance date, retirement and long-service leave entitlements expected to be settled within twelve months, and sick leave.

The Group recognises a liability for sick leave to the extent that absences in the coming year are expected to be greater than the sick leave entitlements earned in the coming year. The amount is calculated based on the unused sick leave entitlement that can be carried forward at balance date; to the extent that the Group anticipates leave entitlements will be used by staff to cover those future absences.

The Group recognises a liability and an expense for bonuses where contractually obliged or where there is a past practice that has created a constructive obligation.

All actuarial gains and losses that arise subsequent to the transition date in calculating the Group's obligation with respect to long service leave, retirement gratuities and sick leave are recognised as an expense in the profit or loss.

### *Superannuation schemes*

- Defined contribution schemes: obligations for contributions to defined contribution superannuation schemes are recognised as an expense in the profit or loss as incurred.
- Defined benefit schemes: the Group makes contributions to the Government Superannuation Fund, which is a multi-employer defined benefit scheme. Insufficient information is available to use defined benefit accounting, as it is not possible to determine from the terms of the scheme the extent to which the profit or loss will affect future contributions by individual employers, as there is no prescribed basis for allocation. The scheme is therefore accounted for as a defined contribution scheme.

### *Long service leave, retirement leave and sick leave*

Entitlements that are payable beyond twelve months, such as long service leave, retirement leave and sick leave, have been calculated on an actuarial basis. The calculations are based on likely future entitlements accruing to staff, based on years of service, years to entitlement, payment history, the likelihood that staff will reach the point of entitlement, and contractual entitlements information.

## Provisions

The Group recognises a provision for future expenditure of uncertain amount or timing when there is a present obligation (either legal or constructive), as a result of a past event, that probable expenditures will be required to settle the obligation, and a reliable estimate can be made of the amount of the obligation. Provisions are not recognised for future operating losses. Provisions are measured at the present value of the expenditures expected to be required to settle the obligation, using a pre-tax discount rate that reflects current market assessments of the time value of money and the risks specific to the obligation. The increase in the provision due to the passage of time is recognised as an interest expense.

## Borrowings

Borrowings are initially recognised at their fair value. After initial recognition, all borrowings are measured at amortised cost, using the effective interest method.

## Goods and Services Tax (GST)

All items in the financial statements are stated exclusive of GST, except for receivables and payables, which are stated on a GST-inclusive basis. Where GST is not recoverable as input tax, it is recognised as part of the related asset or expense.

The net amount of GST recoverable from, or payable to, the Inland Revenue Department (IRD) is included as part of receivables or payables in the Statement of Financial Position. The net GST paid to or received from the IRD, including the GST relating to investing and financing activities, is classified as an operating cash flow in the Statement of Cash Flows.

Commitments and contingencies are disclosed exclusive of GST.

## Budget figures

The budget figures are those in the Statement of Corporate Intent approved by the shareholding Ministers at the beginning of the year. The budget figures have been prepared in accordance with NZ GAAP, using accounting policies that are consistent with those adopted by the Group for the preparation of the financial statements.

## Critical accounting estimates and assumptions

In preparing these financial statements the Group has made estimates and assumptions concerning the future. These estimates and assumptions may differ from the subsequent actual results. Estimates and judgements are continually evaluated and are based on historical experience and other factors, including expectations of future events that are believed to be reasonable under the circumstances.



The estimates and assumptions that have a significant risk of causing a material adjustment to the carrying amounts of assets and liabilities within the next financial year are discussed below:

#### *Revenue recognition*

The Group uses the percentage-of-completion method in accounting for its fixed-price contracts to deliver research services. Use of the percentage-of-completion method requires the Group to estimate the services performed to date as a proportion of the total services to be performed.

#### **Critical judgements in applying the Group's accounting policies**

Management has exercised the following critical judgements in applying the Group's accounting policies for the year ended 30 June 2015:

##### *1. Leases classification*

Determining whether a lease agreement is a finance or an operating lease requires judgement as to whether the agreement transfers substantially all the risks and rewards of ownership to the Company.

Judgement is required on various aspects that include, but are not limited to, the fair value of the leased asset, the economic life of the leased asset, whether or not to include renewal options in the lease term, and determining an appropriate discount rate to calculate the present value of the minimum lease payments. Classification as a finance lease means the asset is recognised in the Statement of Financial Position as property, plant and equipment, whereas for an operating lease no such asset is recognised.

The Group has exercised its judgement on the appropriate classification of property and equipment leases and has determined that one lease arrangement is a finance lease.

##### *2. Patents and intellectual property impairment*

The Company has exercised judgement on the impairment assessment of patents and intellectual property.

Determination as to whether and how much an asset is impaired involves director and management estimates on highly uncertain matters such as local and international changes in legislation, the continuation of existing customers with existing contracts, the outlook for global and local markets, and the level at which future contracts are based on assumptions that are consistent with the company's business plan and long-term decisions.

#### **Changes in accounting policies**

There were no changes in accounting policies during the financial year.

## Notes to the financial statements contd.

	Group		Parent	
	2015	2014	2015	2014
	Actual	Actual	Actual	Actual
	\$000s	\$000s	\$000s	\$000s
<b>2 REVENUE</b>				
<b>Revenue from operations consisted of the following items:</b>				
Research contracts funded by the Crown via Ministry of Business, Innovation and Employment				
Core	24,205	24,205	24,205	24,205
Other	9,357	7,376	9,357	7,377
Other New Zealand revenue	21,768	21,233	19,710	18,937
International revenue	2,883	1,790	2,406	1,504
<i>Interest revenue:</i>				
Bank deposits	154	36	154	36
Finance leases	59	68	59	68
Total interest	213	104	213	104
Gain on disposal of fixed assets	0	1	0	1
<b>Total revenue</b>	<b>58,426</b>	<b>54,709</b>	<b>55,891</b>	<b>52,128</b>

	Group		Parent	
	2015	2014	2015	2014
	Actual	Actual	Actual	Actual
	\$000s	\$000s	\$000s	\$000s
<b>3 PROFIT BEFORE INCOME TAX</b>				

### Profit before income tax has been arrived at after charging the following expenses:

<i>Finance costs:</i>				
Interest on loans	0	11	0	11
Inventory write off	24	0	24	0
Employee remuneration	29,501	27,789	27,684	26,169
Restructuring costs	755	31	719	31
Superannuation contributions	1,176	1,159	1,176	1,111
Employee entitlements increase/(decrease)	172	(91)	172	(176)
Net bad and doubtful debts	2	9	2	9
Donations	1	0	1	0
<i>Auditor's remuneration:</i>				
Audit New Zealand – audit services	139	129	99	95
Audit New Zealand – other services	1	1	1	1
Directors' fees	217	226	190	190
Depreciation and amortisation of property, plant, equipment and intangibles	4,303	4,418	4,296	4,414
Loss on sale of non-current assets	9	0	9	0
Operating lease rental	960	866	744	647
Cost of sales	518	498	26	15
Movement in inventory	(26)	2	(26)	(10)
Loss/(Profit) on foreign currency contracts fair value	(40)	15	(40)	3
Impairment of investment/receivable in subsidiary	0	0	208	103

	Group		Parent	
	2015	2014	2015	2014
	Actual	Actual	Actual	Actual
4 CASH AND CASH EQUIVALENTS	\$000s	\$000s	\$000s	\$000s
Cash at bank and in hand	318	465	263	277
Short-term deposits maturing three months or less from date of acquisition	5,277	1,623	5,277	1,623
<b>Total cash and cash equivalents</b>	<b>5,595</b>	<b>2,088</b>	<b>5,540</b>	<b>1,900</b>

The carrying value of short-term deposits with maturity dates of three months or less approximates their fair value.

**Cash and bank overdrafts include the following for the purposes of the cash flow statement:**

Cash at bank and in hand	318	465	263	277
Short-term deposits maturing within three months	5,277	1,623	5,277	1,623
	<b>5,595</b>	<b>2,088</b>	<b>5,540</b>	<b>1,900</b>

	Group		Parent	
	2015	2014	2015	2014
	Actual	Actual	Actual	Actual
5 TRADE AND OTHER RECEIVABLES	\$000s	\$000s	\$000s	\$000s
Trade debtors	7,268	6,080	6,701	5,518
Accrued income and sundry debtors	504	942	500	917
Receivables from controlled entities (note 21)	0	0	605	389
Prepayments	897	846	859	814
Loans to controlled entities (note 21)	0	15	210	491
	8,669	7,883	8,875	8,129
Less provision for impairment of receivables	0	(18)	0	(9)
<b>Total trade and other receivables</b>	<b>8,669</b>	<b>7,865</b>	<b>8,875</b>	<b>8,120</b>
<b>Total non-current portion</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Total current portion of trade &amp; other receivables</b>	<b>8,669</b>	<b>7,865</b>	<b>8,875</b>	<b>8,120</b>

The carrying value of trade and other receivables approximates their fair value. The carrying value of loans to related parties approximates their fair value.

Apart from the Ministry of Business, Innovation and Employment, which is Government owned, there is no concentration of credit risk to receivables outside the Group, as the Group has a large number of customers.

As of 30 June 2015, all overdue receivables have been assessed for impairment and appropriate provisions applied. Landcare Research holds no collateral as security or other credit enhancements over receivables that are either past due or impaired. The impairment provision has been calculated based on expected losses for Landcare Research's pool of debtors. Expected losses have been determined based on review of specific debtors.

**Movements in the provision for impairment of receivables are as follows:**

As at 1 July	18	56	9	46
Additional provisions made during the year	0	9	0	9
Receivables written off during the period	(18)	(47)	(9)	(46)
<b>As at 30 June</b>	<b>0</b>	<b>18</b>	<b>0</b>	<b>9</b>

Age of trade debtors:

Current	6,210	5,462	5,761	4,920
Outstanding	1,058	618	940	598
<b>Total trade debtors</b>	<b>7,268</b>	<b>6,080</b>	<b>6,701</b>	<b>5,518</b>

## 6 INVENTORIES

	Group		Parent	
	2015	2014	2015	2014
	Actual	Actual	Actual	Actual
	\$000s	\$000s	\$000s	\$000s
Finished goods	16	51	12	38
<b>Total inventories</b>	<b>16</b>	<b>51</b>	<b>12</b>	<b>38</b>

Inventories are valued at the lower of cost and net realisable value. Inventory cost includes the cost of direct materials. Net realisable value is the estimated selling price in the ordinary course of business less estimated costs necessary to make the sale.

## 7 ANALYSIS OF FINANCE LEASE RECEIVABLE

	Group		Parent	
	2015	2014	2015	2014
	Actual	Actual	Actual	Actual
	\$000s	\$000s	\$000s	\$000s
<b>Total minimum lease payments are receivable:</b>				
Not later than one year	143	165	143	165
Later than one year and not later than five years	314	379	314	379
Later than five years	451	530	451	530
Total minimum lease payments	908	1,074	908	1,074
Future finance charges	(306)	(366)	(306)	(366)
<b>Total present value of minimum lease payments</b>	<b>602</b>	<b>708</b>	<b>602</b>	<b>708</b>

### Present value of minimum lease payments are receivable:

Not later than one year	94	106	94	106
Later than one year and not later than five years	157	206	157	206
Later than five years	351	396	351	396
<b>Total</b>	<b>602</b>	<b>708</b>	<b>602</b>	<b>708</b>
Current	94	106	94	106
Non-current	508	602	508	602
<b>Total</b>	<b>602</b>	<b>708</b>	<b>602</b>	<b>708</b>

Finance lease receivable relates to the animal house facility. The building transfers to Lincoln University for nil consideration in 2016. Landcare Research New Zealand Limited has the right to continue occupying the building for a further 10 years to 2026 at a rent of \$1.00 per annum.

## 8 DERIVATIVE FINANCIAL INSTRUMENTS

### Current asset/(liability) portion

Foreign currency forward contracts	40	(3)	40	(3)
<b>Total derivative financial instruments</b>	<b>40</b>	<b>(3)</b>	<b>40</b>	<b>(3)</b>



## 9 PROPERTY, PLANT AND EQUIPMENT

2014	Parent					Group				
	Land	Buildings	Plant & equipment	Library assets	Total	Land	Buildings	Plant & equipment	Library assets	Total
	\$000s	\$000s	\$000s	\$000s	\$000s	\$000s	\$000s	\$000s	\$000s	\$000s
Cost at 1 July 2013	519	26,012	42,490	5,942	74,963	519	26,012	42,513	5,942	74,986
Accumulated depreciation and impairment charges	0	(7,756)	(28,564)	(4,733)	(41,053)	0	(7,756)	(28,572)	(4,733)	(41,061)
Net book value at the beginning of the year	519	18,256	13,926	1,209	33,910	519	18,256	13,941	1,209	33,925
Year ended 30 June 2014										
Net book value at the beginning of the year	519	18,256	13,926	1,209	33,910	519	18,256	13,941	1,209	33,925
Additions	0	468	2,318	453	3,239	0	468	2,327	453	3,248
Disposals and transfers	0	0	(333)	0	(333)	0	0	(334)	0	(334)
Accumulated depreciation on disposals and transfers	0	0	333	0	333	0	0	333	0	333
Current year depreciation	0	(479)	(3,020)	(501)	(4,000)	0	(479)	(3,024)	(501)	(4,004)
Net book value at the end of the year	519	18,245	13,224	1,161	33,149	519	18,245	13,243	1,161	33,168
At 30 June 2014										
Cost	519	26,480	44,473	6,395	77,867	519	26,480	44,504	6,395	77,908
Accumulated depreciation	0	(8,235)	(31,251)	(5,234)	(44,718)	0	(8,235)	(31,262)	(5,234)	(44,740)
Net book value at the end of the year	519	18,245	13,224	1,161	33,149	519	18,245	13,243	1,161	33,168

2015	Parent					Group				
	Land	Buildings	Plant & equipment	Library assets	Total	Land	Buildings	Plant & equipment	Library assets	Total
	\$000s	\$000s	\$000s	\$000s	\$000s	\$000s	\$000s	\$000s	\$000s	\$000s
Cost at 1 July 2014	519	26,480	44,473	6,395	77,867	519	26,480	44,505	6,395	77,899
Accumulated depreciation and impairment charges	0	(8,235)	(31,251)	(5,234)	(44,720)	0	(8,235)	(31,263)	(5,234)	(44,732)
Net book value at the beginning of the year	519	18,245	13,222	1,161	33,147	519	18,245	13,242	1,161	33,167
Year ended 30 June 2015										
Net book value at the beginning of the year	519	18,245	13,222	1,161	33,147	519	18,245	13,242	1,161	33,167
Additions	0	52	1,709	434	2,195	0	52	1,716	434	2,202
Disposals and transfers	0	0	(254)	0	(254)	0	0	(254)	0	(254)
Accumulated depreciation on disposals	0	0	231	0	231	0	0	231	0	231
Current year depreciation	0	(485)	(2,916)	(469)	(3,870)	0	(485)	(2,923)	(469)	(3,877)
Net book value at the end of the year	519	17,812	11,992	1,126	31,449	519	17,812	12,012	1,126	31,469
At 30 June 2015										
Cost	519	26,532	45,928	6,829	79,808	519	26,532	45,967	6,829	79,847
Accumulated depreciation	0	(8,720)	(33,936)	(5,703)	(48,359)	0	(8,720)	(33,955)	(5,703)	(48,378)
Net book value at the end of the year	519	17,812	11,992	1,126	31,449	519	17,812	12,012	1,126	31,469

## Heritage Assets

Heritage collection assets are those assets held for the duration of their physical lives because of their unique scientific importance. The Crown, when establishing Crown Research Institutes in 1992, transferred various national databases and reference collections to individual Institutes at nil value. Many of these databases and collections were specifically identified by the Foundation for Research, Science and Technology as being of significant national importance, and they have covenants attached to them restricting an Institute's ability to deal with them.

Landcare Research has the following nationally significant collections and databases that have been defined as heritage assets:

- The New Zealand Arthropod Collection (NZAC), including the New Zealand National Nematode Collection (NZNNC) and associated database NZACbugs, BUGS bibliography and Pacific database
- The New Zealand Fungal & Plant Disease Herbarium (PDD)
- The International Collection of Micro-Organisms from Plants (ICMP) and associated NZFungi Database
- The Allan Herbarium
- The National Vegetation Survey Databank (NVS)
- The 'Ngā Tipu Whakaoranga' Ethnobotany Database and New Zealand Flax and Living Plant collections

Further details on these heritage assets are shown in the company's Statement of Corporate Intent for 2015-20, page 29.

The nature of these heritage assets and their significance to the science and research that Landcare Research undertakes make it necessary to disclose them.

No reliable valuation is able to be obtained for these assets, and so they remain at nil value.

A rare books collection, previously considered to be part of the reference collections, was introduced in 2002/03 on a market value basis. This value has been accepted as deemed cost.

	Group	Parent
	Actual \$000s	Actual \$000s
<b>10 PATENTS AND INTELLECTUAL PROPERTY</b>		
<b>As at 1 July 2013</b>		
Cost	506	420
Accumulated amortisation and impairment	(16)	(16)
<b>Net book amount</b>	<b>490</b>	<b>404</b>
<b>Classified as Patents and Intellectual Property</b>	<b>490</b>	<b>80</b>
<b>Classified as Non-current Assets Held For Sale</b>	<b>0</b>	<b>324</b>
	<b>490</b>	<b>404</b>
<b>Year ended 30 June 2014</b>		
Opening net book amount	490	404
Additions	351	26
Disposals/transfers	(332)	(331)
Amortisation charge	(3)	(3)
<b>Closing net book amount</b>	<b>506</b>	<b>96</b>
<b>As at 1 July 2014</b>		
Cost	525	114
Accumulated amortisation and impairment	(19)	(18)
<b>Net book amount</b>	<b>506</b>	<b>96</b>
<b>Year ended 30 June 2015</b>		
Opening net book amount	506	96
Additions	41	36
Disposals/transfers	0	0
Amortisation charge	(3)	(3)
<b>Closing net book amount</b>	<b>544</b>	<b>129</b>
<b>As at 30 June 2015</b>		
Cost	566	150
Accumulated amortisation and impairment	(22)	(21)
<b>Net book amount</b>	<b>544</b>	<b>129</b>

Landcare Research has patents and trademarks amounting to \$544,000 (2014: \$506,000), which are carried at an indefinite life in the financial statements. These assets have not been impaired during the year (2014: no impairment writedown). Landcare Research has not recognised an impairment charge, as these assets are still used by the business.

	Group		Parent	
	Actual \$000s		Actual \$000s	
<b>11 INTANGIBLE ASSETS</b>				
<b>As at 1 July 2013</b>				
Cost	5,212		4,690	
Accumulated amortisation and impairment	(4,187)		(3,665)	
<b>Net book amount</b>	<b>1,025</b>		<b>1,025</b>	
<b>Year ended 30 June 2014</b>				
Opening net book amount	1,025		1,025	
Additions	388		388	
Amortisation charge/impairment charge	(410)		(410)	
<b>Closing net book amount</b>	<b>1,003</b>		<b>1,003</b>	
<b>As at 30 June 2014</b>				
Cost	5,600		5,078	
Accumulated amortisation and impairment	(4,597)		(4,075)	
<b>Net book amount</b>	<b>1,003</b>		<b>1,003</b>	
<b>Year ended 30 June 2015</b>				
Opening net book amount	1,003		1,003	
Additions	142		142	
Amortisation/impairment charge	(427)		(427)	
<b>Closing net book amount</b>	<b>718</b>		<b>718</b>	
<b>As at 30 June 2015</b>				
Cost	5,743		5,220	
Accumulated amortisation and impairment	(5,024)		(4,502)	
<b>Net book amount</b>	<b>718</b>		<b>718</b>	

	Group		Parent	
	2015	2014	2015	2014
	Actual \$000s	Actual \$000s	Actual \$000s	Actual \$000s
<b>12 INVESTMENTS</b>				
Investment in Landcare Research US Limited	0	0	71	71
<b>Total investments</b>	<b>0</b>	<b>0</b>	<b>71</b>	<b>71</b>

Landcare Research New Zealand Limited has 100% interest in Landcare Research US Limited and Enviro-Mark Solutions Limited (previously called carboNZero Holdings Limited.)

The subsidiaries are unlisted companies, and accordingly, there are no published price quotations to determine the fair value of these investments; therefore, they are accounted at cost less impairment as per the accounting policies.

Landcare Research New Zealand Limited has a 49% share in Staron LLC. This Company is non-trading.

### 13 TRADE AND OTHER PAYABLES

	Group		Parent	
	2015	2014	2015	2014
	Actual	Actual	Actual	Actual
	\$000s	\$000s	\$000s	\$000s
Trade payables	3,965	2,897	3,871	2,815
Amounts due to controlled entities	0	0	101	76
Amounts due to directors	5	1	0	0
GST & PAYE	1,240	1,141	1,202	1,083
Sundry creditors and accruals	851	1,403	804	1,369
<b>Total trade and other payables</b>	<b>6,061</b>	<b>5,442</b>	<b>5,978</b>	<b>5,343</b>

The carrying value of trade and other payables approximates their fair value.

### 14 EMPLOYEE BENEFIT LIABILITIES

	Group		Parent	
	2015	2014	2015	2014
	Actual	Actual	Actual	Actual
	\$000s	\$000s	\$000s	\$000s
Accrued pay	0	803	0	764
Annual leave	2,037	1,871	1,954	1,784
Long service leave	1,165	1,018	1,159	1,001
Retirement leave	19	40	19	40
Time in lieu	126	94	123	93
Sick leave	59	61	58	59
Staff incentives and at risk payments	851	783	810	759
Restructuring provision	650	0	650	0
<b>Total employee benefit liabilities</b>	<b>4,907</b>	<b>4,670</b>	<b>4,773</b>	<b>4,500</b>
<i>Comprising:</i>				
Current	4,213	4,104	4,085	3,951
Non-current	694	566	688	549
<b>Total</b>	<b>4,907</b>	<b>4,670</b>	<b>4,773</b>	<b>4,500</b>

Entitlements that are payable beyond 12 months, such as long service leave and retirement leave, have been calculated on an actuarial basis by Eriksen and Associates Limited as at 30 June 2015. The calculations are based on:

- Likely future entitlements accruing to staff, based on years of service, years to entitlement, likelihood staff will reach the point of entitlement and contractual entitlements information; and
- Present value of estimated future cash flows using the following key assumptions:
  - \* Discount rates of 2.97% – 4.99% based on the risk-free rates as calculated from the yields on New Zealand Government Bonds
  - \* Inflation factor of 2.5% was based on the expected long-term increase in remuneration of employees.

Staff incentives and at risk payments include a contracted profit share of \$437,000 (2014 \$419,000).

The Parent Company's Profit Share Policy establishes a contractual Profit Share Scheme which provides a means for staff to share in the Company's profits. Any changes to the scheme during its existence require ratification by staff who are eligible Public Service Association members.

### 15 REVENUE IN ADVANCE

	Group		Parent	
	2015	2014	2015	2014
	Actual	Actual	Actual	Actual
	\$000s	\$000s	\$000s	\$000s
MBIE public good science funding	562	437	562	437
MBIE capability funding	0	0	0	0
Commercial contracts	1,055	1,149	954	1,089
	<b>1,617</b>	<b>1,586</b>	<b>1,516</b>	<b>1,526</b>

The carrying value of revenue in advance approximates fair value.



	Group		Parent	
	2015	2014	2015	2014
	Actual	Actual	Actual	Actual
	\$000s	\$000s	\$000s	\$000s
<b>16 EQUITY</b>				
<b>Retained earnings</b>				
As at 1 July	19,343	17,261	19,343	17,260
Profit / (loss) for the year	1,674	2,084	1,674	2,084
<b>As at 30 June</b>	<b>21,017</b>	<b>19,345</b>	<b>21,017</b>	<b>19,343</b>
<b>Share capital</b>				
As at 1 July	10,515	10,515	10,515	10,515
<b>As at 30 June</b>	<b>10,515</b>	<b>10,515</b>	<b>10,515</b>	<b>10,515</b>

The issued capital of the company is 10,515,000, fully paid up, and equally ranking shares.

The shares have no par value.

No Dividends were paid during the year ended 30 June 2015. (2014: \$0).

## 17 CAPITAL MANAGEMENT

The Group's capital is its equity, which comprises retained earnings and other reserves. Equity is represented by net assets.

The Group is subject to the financial management and accountability provisions of the Crown Research Institutes Act 1992, which imposes certain restrictions in relation to borrowings, acquisition of securities, issuing guarantees and indemnities and the use of derivatives.

The Group manages its equity as a by-product of prudently managing revenues, expenses, assets, liabilities, investments, and general financial dealings to ensure the Group effectively achieves its objectives and purpose, while remaining a going concern.

	Group		Parent	
	2015	2014	2015	2014
	Actual	Actual	Actual	Actual
	\$000s	\$000s	\$000s	\$000s
<b>18 RECONCILIATION OF NET PROFIT / (LOSS) AFTER TAX TO NET CASH FLOW FROM OPERATING ACTIVITIES</b>				
Profit / (loss) after tax	1,674	2,084	1,674	2,084
<i>Add/(less) non-cash items:</i>				
Depreciation and amortisation	4,303	4,418	4,296	4,414
Movement in non-current employee entitlements	128	(156)	139	(154)
Increase/(decrease) in deferred tax	(257)	(7)	(267)	(8)
<i>Add/(less) items classified as investing or financing activities:</i>				
(Gain)/loss in fair value of financial assets	(43)	(1)	(43)	(1)
Movement in finance lease receivable	106	96	106	96
Advances to Enviro-Mark Solutions Limited	0	0	(73)	335
<i>Add/(less) movements in working capital items:</i>				
Inventory	35	(14)	26	(38)
Trade and other receivables	(795)	(27)	(733)	(385)
Trade and other payables	580	498	670	373
Employee benefit liabilities	110	36	134	6
Revenue in advance	32	(368)	(9)	(316)
<b>Net cash inflow/(outflow) from operating activities</b>	<b>5,873</b>	<b>6,559</b>	<b>5,920</b>	<b>6,406</b>

19 CAPITAL COMMITMENTS AND OPERATING LEASES	Group		Parent	
	2015	2014	2015	2014
	Actual	Actual	Actual	Actual
	\$000s	\$000s	\$000s	\$000s

#### Capital commitments

Estimated capital expenditure contracted for at balance date but not paid or provided for	313	31	313	31
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#### Operating lease commitments

Lease commitments under non-cancellable operating leases:

Within one year	721	648	505	431
Later than one year and not later than two years	445	466	438	412
Later than two years and not later than five years	995	1,073	994	1,065
Later than five years	3,464	2,378	3,464	2,378

In addition to the above the Parent has \$1m committed to New Zealand eScience Infrastructure.

## 20 CONTINGENCIES

The Group is not aware of any significant contingent liabilities as at balance date (2014:nil).

## 21 RELATED PARTY TRANSACTIONS

Landcare Research New Zealand Limited is the ultimate parent of the Group and controls two entities, being Landcare Research US Limited and Enviro-Mark Solutions Limited.

Intercompany transactions between Landcare Research New Zealand Limited and its subsidiaries are transacted on a commercial basis. No transaction between companies within the Landcare Research Group took place at nil or nominal value during the year.

The following transactions were carried out with related parties:	Parent	
	2015	2014
	Actual	Actual
	\$000s	\$000s
<i>Enviro-Mark Solutions Limited:</i>		
Services provided to Enviro-Mark Solutions Limited	163	132
Products and services provided by Enviro-Mark Solutions Limited	56	131
Loan outstanding	210	506
Intercompany current account receivable/(payable)	580	388
Subvention payment	23	113
Impairment of investment/receivable in subsidiary	208	103
Services provided by Enviro-Mark Solutions Limited - payable	14	14
Products and services provided to Enviro-Mark Solutions Limited - receivable	30	41
<i>Landcare Research US Limited:</i>		
Intercompany current account receivable/(payable)	(71)	(71)

Landcare Research New Zealand Limited has capitalised Landcare Research US Limited for a sum of USD 50,000, but the amount has been held by the Parent company pending requirement, and will be paid out on request.

Key management personnel compensation	Group		Parent	
	2015	2014	2015	2014
	Actual	Actual	Actual	Actual
	\$000s	\$000s	\$000s	\$000s
Salaries and other short-term employee benefits	2,470	2,489	1,971	1,969

Key management personnel include Directors, Chief Executive Officer and other senior management personnel.

During the year Director remuneration payments (including expense reimbursements) were made to the following entities at the request of the Directors and relate exclusively to Director remuneration payments that would have otherwise been paid directly to the existing Directors.

	2015	2014	2015	2014	2015	2014
	Services received from	Services received from	Services provided to	Services provided to	Amounts (Payable to)/ Receivable	Amounts (Payable to)/ Receivable
	\$000s	\$000s	\$000s	\$000s	\$000s	\$000s
Luxton & Co. Limited	0	26	0	0	0	0
Hall Family Trust	25	32	0	0	0	0
The Commonwealth Scientific & Industrial Research Organisation	21	21	0	0	0	0

During the year Landcare Research provided services to or received services from the following companies, in which Directors and Senior Management have declared an interest. These transactions were conducted on normal commercial terms. Related parties have ceased and commenced during the year due to changes in directorships as noted.

	2015	2014	2015	2014	2015	2014
	Services received from	Services received from	Services provided to	Services provided to	Amounts (Payable to)/ Receivable	Amounts (Payable to)/ Receivable
	\$000s	\$000s	\$000s	\$000s	\$000s	\$000s
AgResearch	0	985	0	1,657	0	311
Dairy NZ Ltd	1	29	98	10	0	12
Enviro-Mark Solutions Limited	56	94	163	132	(16)	64
Hire Pool Limited	6	0	0	0	0	0
Luxton & Co Limited	0	26	0	0	0	1
Science New Zealand	68	59	29	0	(12)	0
Silver Fern Farms Limited	0	0	4	0	0	0
Sustainable Business Council	12	12	30	29	0	0
The Commonwealth Scientific & Industrial Research Organisation	119	286	1	4	0	0
University of Canterbury	157	169	75	19	(57)	(60)
Waikato River Authority	0	0	0	56	0	(65)

In conducting its activities Landcare Research New Zealand Limited is required to pay various taxes and levies (such as GST, FBT, PAYE and ACC levies) to the Crown and entities related to the Crown. The payment of these levies and taxes, other than income tax, is based on the standard terms that apply to all tax and levy payers.

Landcare Research New Zealand Limited also supplies and purchases goods and services from entities controlled, significantly influenced or jointly controlled by the Crown. Sales to and purchases from these entities during the year ended 30 June 2015 were:

	2015	2014	2015	2014	2015	2014
	Services received from	Services received from	Services provided to	Services provided to	Amounts (Payable to)/ Receivable	Amounts (Payable to)/ Receivable
	\$000s	\$000s	\$000s	\$000s	\$000s	\$000s
Crown entities, SOEs and government departments	6,167	6,868	46,238	42,749	1,987	2,213

## 22 EVENTS AFTER THE BALANCE SHEET DATE

Nil to report

## 23 FINANCIAL INSTRUMENT RISKS

The Group has a series of policies to manage the risks associated with financial instruments. The Group is risk averse and seeks to minimise exposure from its treasury activities. Treasury and cash management policies approved by the Board do not allow any transactions that are speculative in nature to be entered into.

### Market risk

#### Price risk

Group price risk is the risk that the value of a financial instrument will fluctuate as a result of changes in market prices. The Group is not exposed to price risk as it does not hold financial assets held at fair value through other comprehensive income.

#### Currency risk

Group currency risk is the risk that the value of a financial instrument will fluctuate due to changes in foreign exchange rates. The Group operates internationally and is exposed to foreign exchange risk arising from various contract exposures, primarily with respect to the US dollar, Australian dollar, Euro and UK pound. Currency risk arises when future commercial transactions, recognised assets and recognised liabilities are denominated in a currency that is not the entity's functional currency.

At 30 June 2015, if the US dollar had weakened/strengthened by 10% against the New Zealand dollar with all other variables held constant, profit after tax for the year would have been \$3,000 (2014: \$4,000) higher/lower, mainly as a result of foreign exchange gains/losses on translation of US-dollar-denominated trade payables and receivables and the US dollar bank account.

At 30 June 2015, if the Australian dollar had weakened/strengthened by 10% against the New Zealand dollar with all other variables held constant, profit after tax for the year would have been \$23,000 (2014: \$27,000) higher/lower, mainly as a result of foreign exchange gains/losses on translation of Australian-dollar-denominated trade payables and receivables and the Australian dollar bank account.

At 30 June 2015, if the Euro had weakened/strengthened by 10% against the New Zealand dollar with all other variables held constant, profit after tax for the year would have been \$1,000 (2014: \$0) higher/lower, mainly as a result of foreign exchange gains/losses on translation of Euro-denominated trade payables and receivables.

At 30 June 2015, if the UK pound had weakened/strengthened by 10% against the New Zealand dollar with all other variables held constant, profit after tax for the year would have been \$4,000 (2014: \$7,000) higher/lower, mainly as a result of foreign exchange gains/losses on translation of UK-pound-denominated trade payables and receivables.

The Group foreign exchange management policy is to cover the risk on any foreign currency transactions greater than \$50,000.

### Interest rate risk

Cashflow interest rate risk is the risk that the cashflows from a financial instrument will fluctuate because of changes in market interest rates. Short term bank deposits which receive variable interest rates expose the Group to cash flow interest rate risk.

### Contractual maturity analysis of financial liabilities, excluding derivatives

The table below analyses the Parent and Group's financial liabilities into relevant maturity groupings based on the remaining period at balance date to the contractual maturity date. Future interest payments on floating rate debt are based on the floating rate on the instrument at balance date. The amounts disclosed are the contractual undiscounted cash flows and include interest payments.

2014	Carrying amount \$000s	Contractual cash flows \$000s	Less than 1 year \$000s	1–2 years \$000s	2–5 years \$000s	More than 5 years \$000s
<b>Group</b>						
Creditors & other payables	5,442	5,442	5,442	0	0	0
<b>Total</b>	<b>5,442</b>	<b>5,442</b>	<b>5,442</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Parent</b>						
Creditors & other payables	5,344	5,344	5,344	0	0	0
<b>Total</b>	<b>5,344</b>	<b>5,344</b>	<b>5,344</b>	<b>0</b>	<b>0</b>	<b>0</b>



2015	Carrying amount \$000s	Contractual cash flows \$000s	Less than 1 year \$000s	1–2 years \$000s	2–5 years \$000s	More than 5 years \$000s
<b>Group</b>						
Creditors & other payables	6,061	6,061	6,061	0	0	0
<b>Total</b>	<b>6,061</b>	<b>6,061</b>	<b>6,061</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Parent</b>						
Creditors & other payables	5,978	5,978	5,978	0	0	0
<b>Total</b>	<b>5,978</b>	<b>5,978</b>	<b>5,978</b>	<b>0</b>	<b>0</b>	<b>0</b>

#### Credit risk

Credit risk is the risk that a third party will default on its obligation to Landcare Research, causing Landcare Research to incur a loss. Landcare Research has a significant concentration of credit risk with the Ministry of Science and Innovation; however, the risk is mitigated as this entity is also Government owned. The Group's maximum exposure to credit risk is the amount of Receivables.

#### Liquidity risk

Liquidity risk is the risk that the Group will encounter difficulty raising liquid funds to meet commitments as they fall due. Prudent liquidity risk management implies maintaining sufficient cash and the availability of funding through an adequate amount of committed credit facilities. The Group aims to maintain flexibility in funding by keeping committed credit lines available.

## 24 TAXATION

#### Components of tax expense

	Group		Parent	
	2015 Actual \$000s	2014 Actual \$000s	2015 Actual \$000s	2014 Actual \$000s
Current tax	924	877	1,009	906
Adjustments to current tax in prior years	72	(44)	71	(46)
Deferred tax expense	(256)	1	(267)	(3)
<b>Income tax expense</b>	<b>740</b>	<b>834</b>	<b>813</b>	<b>857</b>

#### Relationship between tax expense and accounting profit

	Group		Parent	
	2015 Actual \$000s	2014 Actual \$000s	2015 Actual \$000s	2014 Actual \$000s
Profit / (loss) before tax	2,413	2,918	2,487	2,941
Tax at 28%	686	817	696	825
Non-deductible expenditure	7	12	74	37
Non-taxable income	44	3	43	0
Prior-year adjustment	3	2	0	(5)
<b>Total income tax expense</b>	<b>740</b>	<b>834</b>	<b>813</b>	<b>857</b>

	Property, plant and equipment \$000s	Employee entitlements \$000s	Other provisions \$000s	Total \$000s
<b>Deferred tax assets/(liabilities)</b>				
<b>Parent</b>				
Balance at 1 July 2013	(4,141)	803	63	(3,275)
Charged to profit / (loss)	163	(135)	(21)	8
Balance at 1 July 2014	(3,978)	669	42	(3,267)
Charged to profit / (loss)	166	106	(6)	266
<b>Balance at 30 June 2015</b>	<b>(3,812)</b>	<b>775</b>	<b>36</b>	<b>(3,001)</b>
<b>Group</b>				
Balance at 1 July 2013	(4,143)	824	65	(3,254)
Charged to profit / (loss)	168	(135)	(21)	12
Balance at 1 July 2014	(3,975)	689	44	(3,242)
Charged to profit / (loss)	165	105	(13)	257
<b>Balance at 30 June 2015</b>	<b>(3,810)</b>	<b>794</b>	<b>31</b>	<b>(2,985)</b>

25 CATEGORIES OF FINANCIAL INSTRUMENTS	Group		Parent	
	2015	2014	2015	2014
	Actual \$000s	Actual \$000s	Actual \$000s	Actual \$000s
<b>Financial assets</b>				
<b>Financial assets at fair value through profit and loss</b>				
Foreign exchange forward contracts	40	(3)	40	(3)
<b>Loans and receivables</b>				
Receivable from subsidiary company	0	0	605	389
Loan to subsidiary company	0	15	210	491
Cash and cash equivalents	5,595	2,088	5,540	1,900
Trade Receivables	7,268	6,080	6,701	5,518
<b>Financial liabilities</b>				
<b>Other financial liabilities</b>				
Trade payables	3,965	2,897	3,871	2,815

## 26 EXPLANATION OF SIGNIFICANT VARIANCES AGAINST BUDGET AND BETWEEN YEARS

There were the following significant variances:

### Statement of Comprehensive Income

- June 2015 result was impacted by achieving increased contestible revenue;
- A \$650k provision for redundancy was created at 30 June 2015 as the Company aligns future revenue streams with staff capability.

### Statement of Financial Position

- Cash on hand increased substantially over budget and prior year due to deferred capital expenditure.

## › STATEMENT OF RESPONSIBILITY

The Directors are responsible for presenting financial statements for each financial year that give a true and fair view of the financial position of Landcare Research New Zealand Limited (the Company) and its subsidiaries (the Group) and of the financial performance and cash flows for that period.

The Directors consider the financial statements of the Group and the Company have been prepared using appropriate accounting policies consistently applied and supported by reasonable judgements and estimates, and that all relevant financial reporting and accounting standards have been followed.

The Directors are responsible for establishing and maintaining a system of internal control designed to provide reasonable assurances as to the integrity and reliability of the financial reporting.

The Directors believe that proper accounting records have been kept, which enable, with reasonable accuracy, the determination of the financial position of the Group and facilitate compliance of the financial statements with the Financial Reporting Act 1993.

The Directors believe that they have taken adequate steps to safeguard the assets of the Group and to prevent and detect fraud and other irregularities.

The Board of Directors of Landcare Research New Zealand Limited approved and authorised the financial statements for the year ending 30 June 2015 set out on pages 40 to 62 for issue on 20 August 2015.



**Jane Taylor**  
Chair

20 August 2015



**Paul Reynolds**  
Deputy Chair

20 August 2015

## INDEPENDENT AUDITOR'S REPORT

To the readers of  
**Landcare Research New Zealand Limited's and Group's  
financial statements  
for the year ended 30 June 2015**

The Auditor-General is the auditor of Landcare Research New Zealand Limited (the company) and its New Zealand domiciled subsidiary. The Auditor-General has appointed me, John Mackey, using the staff and resources of Audit New Zealand, to carry out the audit of the financial statements of the company, and the financial statements of the company and its subsidiary (collectively referred to as 'the Group'), on her behalf.

### Opinion

We have audited the financial statements of the company, and the Group, on pages 40 to 62, that comprise the statement of financial position as at 30 June 2015, the statement of comprehensive income, statement of changes in equity and statement of cash flows for the year ended on that date and the notes to the financial statements that include accounting policies and other explanatory information.

In our opinion the financial statements of the company and the Group:

- present fairly, in all material respects the company's and the Group's:
  - financial position as at 30 June 2015; and
  - financial performance and cash flows for the year then ended; and
- comply with generally accepted accounting practice in New Zealand and have been prepared in accordance with New Zealand equivalents to International Financial Reporting Standards and International Financial Reporting Standards.

Our audit was completed on 26 August 2015. This is the date at which our opinion is expressed.

The basis of our opinion is explained below. In addition, we outline the responsibilities of the Board of Directors and our responsibilities, and we explain our independence.

### Basis of opinion

We carried out our audit in accordance with the Auditor-General's Auditing Standards, which incorporate the International Standards on Auditing (New Zealand). Those standards require that we comply with ethical requirements and plan and carry out our audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

Material misstatements are differences or omissions of amounts and disclosures that, in our judgement, are likely to influence readers' overall understanding of the financial statements. If we had found material misstatements that were not corrected, we would have referred to them in our opinion.

An audit involves carrying out procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on our judgement, including our assessment of risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, we consider internal control relevant to the preparation of the company and the Group's financial statements in order to design audit procedures that are appropriate in the circumstances but not for the purpose of expressing an opinion on the effectiveness of the company and the Group's internal control.



An audit also involves evaluating:

- the appropriateness of accounting policies used and whether they have been consistently applied;
- the reasonableness of the significant accounting estimates and judgements made by the Board of Directors;
- the adequacy of the disclosures in the financial statements; and
- the overall presentation of the financial statements.

We did not examine every transaction, nor do we guarantee complete accuracy of the financial statements. Also we did not evaluate the security and controls over the electronic publication of the financial statements.

We believe we have obtained sufficient and appropriate audit evidence to provide a basis for our audit opinion.

### **Responsibilities of the Board of Directors**

The Board of Directors is responsible for the preparation and fair presentation of financial statements for the company and the Group that comply with generally accepted accounting practice in New Zealand.

The Board of Directors' responsibilities arise from the Crown Research Institutes Act 1992.

The Board of Directors is responsible for such internal control as it determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error. The Board of Directors is also responsible for the publication of the financial statements, whether in printed or electronic form.

### **Responsibilities of the Auditor**

We are responsible for expressing an independent opinion on the financial statements and reporting that opinion to you based on our audit. Our responsibility arises from section 15 of the Public Audit Act 2001.

### **Independence**

When carrying out the audit, we followed the independence requirements of the Auditor-General, which incorporate the independence requirements of the External Reporting Board.

In addition to the audit, we completed an assurance engagement reporting on the profit calculation pursuant to the staff profit share scheme. This engagement is compatible with the independence requirements of the Auditor-General.

Other than the audit and the assurance engagement performed, we have no relationship with or interests in the company or the Group.



John Mackey  
Audit New Zealand  
On behalf of the Auditor-General  
Christchurch, New Zealand

## > FINANCIAL INDICATORS

Financial key performance indicators as required by MBIE (not part of the Audited Financial Statements).

<i>For year ending 30 June:</i>	Actual 2015	Business Plan 2015
<b>Efficiency:</b>		
Operating margin	11.2%	10.4%
Operating margin per FTE	\$19,679	\$18,265
<b>Risk:</b>		
Quick ratio	1.33	1.06
Interest coverage	N/A	117
Operating margin volatility	12.8%	10.9%
Forecasting risk	1.0%	-0.2%
<b>Tailored rate of return:</b>		
ROE before investment	7.2%	6.8%
Return on equity (ROE) (based on NPAT)	5.5%	5.0%
<b>Growth/investment:</b>		
Revenue growth	6.4%	3.2%
Capital renewal	0.5	0.9

### Operating margin:

$\text{EBITDAF} \div \text{Revenue}$ , expressed as a percentage. (EBITDAF is EBIT before depreciation, amortisation and fair value adjustments.)

### Quick ratio:

$(\text{Current assets} - \text{Inventory} - \text{Prepayments}) \div (\text{Current liabilities} - \text{Revenue in advance})$ .

### Interest coverage:

Interest is the cost of debt and financial leases. Interest cover =  $\text{EBITDAF} \div \text{interest}$ . (EBITDAF is EBIT before depreciation, amortisation and fair value adjustments.)

### Forecasting risk:

5-year average of return on equity less forecast return on equity.

### Return on equity:

$\text{NPAT} \div \text{Average shareholders' funds}$ , expressed as a percentage. (NPAT: net profit after tax.)

### Shareholders' funds:

Includes share capital and retained earnings.

### Capital renewal:

$\text{Capital expenditure} / \text{Depreciation expense plus amortisation expense}$ .

## > GLOSSARY & GUIDE TO ACRONYMS

ARLUNZ	Agent-based Rural Land Use New Zealand model
B3	Better Border Biosecurity, a multi-partner science collaboration
BusinessNZ	New Zealand's largest advocacy group for enterprise
CEMARS	Certified Emissions Management and Reduction Scheme
CRC	Cooperative Research Centre (Australia)
CRI	Crown research institute
CSIRO	Commonwealth Scientific and Industrial Research Organisation (Australia)
DairyNZ	DairyNZ is the 'industry good' organisation, representing New Zealand's dairy farmers
DCD	Dicyandiamide, a nitrification inhibitor
DHB	District Health Board
DOC	Department of Conservation
DNDC	DeNitrification-DeComposition computer simulation model
ECan	Environment Canterbury
<i>E. coli</i>	<i>Escherichia coli</i> , a bacterium commonly found in the lower intestine of mammals
ESR	A Crown research institute
Ecosystem services	The 'free' services that healthy ecosystems provide, e.g. clean water, fertile soil, storm water retention, erosion prevention
Environmental limit	The point at which ecosystem services collapse, e.g. the soil's biological community is depleted to the extent that it can no longer replenish nutrients
EMaR	Environmental Monitoring and Reporting
EPA	Environmental Protection Authority
Harakeke	Māori name for New Zealand flax
IPCC	International Panel on Climate Change
Kaitiakitanga	Traditional guardianship of natural resources
KPI	Key Performance Indicator
LCDB	Land cover database
LINZ	Land Information New Zealand
LUCAS	Land Use and Carbon Analysis System
LUMASS	Land Use Management Support System
Mātauranga	Traditional cultural knowledge
MBIE	Ministry of Business, Innovation and Employment
MFAT	Ministry of Foreign Affairs and Trade
MfE	Ministry for the Environment
MPI	Ministry for Primary Industries
NES	National Environmental Standard (MfE)
NGO	Non-governmental organisation
NLRC	National Land Resource Centre
NZAGRC	New Zealand Agricultural Greenhouse Gas Research Centre
NZFARM	New Zealand Forest and Agriculture Regional Model
NZLRI	New Zealand Land Resource Inventory
OSPRI	Operational Solutions for Primary Industries, comprised of the TBfree New Zealand and the National Animal Identification and Tracing programmes
RHD	Rabbit haemorrhagic disease
RMA	Resource Management Act
SCION	A Crown research institute
S-map	Digital soil map for New Zealand
SME	small-medium enterprise
TB	Tuberculosis
TPK	Te Puni Kōkiri
UMF	Unique mānuka factor
Vis-NIR	Visible near infrared

### Chemical symbols

C	Carbon	CO <sub>2</sub>	Carbon dioxide	NH <sub>3</sub>	Ammonia
CH <sub>4</sub>	Methane	N	Nitrogen	N <sub>2</sub> O	Nitrous oxide
				P	Phosphorous

# > DIRECTORY

## DIRECTORS

Jane Taylor (Chair) LLB(Hons), LLM, Dip.Acc., CA, CFinD  
Chris Downs BSc, MSc, PhD, GAICD  
Gavan Herlihy MAgSc (Hons)  
Prof. Emily Parker BSc (Hons), PhD  
Paul Reynolds (Deputy Chair) BSc (Hons), PhD  
Prof. Caroline Saunders BSc (Hons), PhD, ONZM, MInstD  
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Katrina Benedetti BSc, MSc (Hons), PGDiplndOrgPsysc	General Manager, People & Communications
Phil Hart BSc, MAgSc (Hons), PhD	General Manager, Development
Keith Ikin BA, ISLMBA	General Manager, Māori Development
Peter Millard BSc (Hons), PhD	General Manager, Science
Nigel Thomson BCA, BSc, CA	General Manager, Corporate Services
David Whitehead BA (Hons), PhD, FRSNZ	Chief Scientist

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Audit New Zealand on behalf of the Auditor-General

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# ANNUAL REPORT 2015

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**LANDCARE RESEARCH**  
**MANAAKI WĒNUA**