



DISCOVERY

August 2008 ISSUE 23

Bovine Tb Under The Spotlight



Andrea Byrom

Dr Graham Nugent, leading research into Tb elimination.

The Marlborough high country will again this spring be the focus of intensive research into more effective pest and Tb control.

Landcare Research staff, led by Dr Graham Nugent, will initiate a series of research trials that are collectively looking to greatly reduce the use of 1080 poison, reduce the costs of pest control operations and reduce levels of Tb in possums and livestock.

The work is part of Landcare Research's commitment to find more effective ways to control pests and is aligned with ERMA's recommendation last year for more research to be undertaken into alternative methods of possum control.

Continues on page 4

CONTENTS

- | | | | |
|---|---|---|---|
| 2 | Chief Executive's Column | 6 | TIFBIS Updates |
| 3 | Antarctic Treaty Members Accept New Zealand Expertise | 7 | New Office for Sirtrack |
| 4 | Bovine Tb Under The Spotlight (from Page1) | 8 | Erosion Modelling Presents Stark Findings |
| 5 | Preliminary Results of 2008 Garden Bird Survey | 8 | Briefs |

Land Use Change

Land use change in New Zealand has been rapid, and with record prices for dairy and crop commodities as well as the prospect of carbon trading at more than \$30 per tonne making reforestation of marginal pastoral land more attractive, this change looks set to continue.



History shows changes in land use have had significant economic and environmental impacts on issues such as biodiversity, greenhouse gas emissions and carbon sequestration, primary production, water yield and quality, weeds and pests, landscape aesthetics and the scope for alternative future use.

Getting the right land use balance to meet immediate pressures such as urban population growth or for the provision of renewable energy, and ensuring the best long-term outcome for New Zealanders, is not easy. That we are continuing to lose land from production areas with A-grade soils is concerning given increasing world food and energy shortages resulting from increased demand from developing economies and supply pressures due to the declining global availability of water and land. The rapid increases in costs of and application of fertiliser also mean these higher quality soils will take on a greater prominence in New Zealand's future than perhaps some have considered in the recent past.

We believe there is a better way to inform and direct land use change, although none of us holds a crystal ball! Landcare Research has been a leader in the development and application of scenario planning in New Zealand – we have evaluated both qualitative and quantitative approaches with respect to national, regional and catchment-level planning. This research, even though some is still at an early stage, confirms the value of adopting time frames in excess of 30 years to assess the effects of land policy, technology, population change and other drivers on productivity, environmental performance, landscapes and economic well-being.

We have built links with leading international research groups working in this domain and started to incorporate improved visualisation and other techniques to help stakeholders envision alternative futures. This will help prioritise where the greatest returns from collecting additional data for planning can be made and to design practical indicators for monitoring the effects of land use change over intergenerational time frames. Much work remains to be done but the early signs are promising. Furthermore, we are uniquely placed to draw on the huge store of information in the national databases and collections we host, to exploit the high speed KAREN computer network and benefit from the expertise of colleagues in local government, industry and other research providers. In future editions of Discovery we will update you with progress in this field.

Over the past century changes in land use have dramatically altered the landscape and habitat for birdlife. Eric Spurr has been undertaking fascinating survey work to quantify how bird species and populations are changing in our gardens – you can read more about this on page 5.

Changes in land cover have also altered the habitats for pests that are vectors for diseases such as Tb. Eradicating possums from our landscapes remains an enormous challenge but, as Graham Nugent describes on page 4, excellent progress has been made over the past few years in targeting the use of toxins such as 1080 and maintaining the efficacy of possum eradication. This research has integrated our expertise in spatial information, pest control technologies and population dynamics.

We have also applied our knowledge about landscapes and environmental classification to the Antarctic and are delighted Antarctic Treaty members recently adopted our Environmental Domains of Antarctica classification system, as outlined on page 3.

Warren Parker
Chief Executive
Landcare Research

Antarctic Treaty Members Accept New Zealand Expertise

Antarctic Treaty members have accepted a Landcare Research-developed environmental management system that will help ensure the ongoing protection of Antarctica.

Treaty members overwhelmingly accepted the proposal, which is based on a classification of the physical environment of the entire continent.

Landcare Research scientist Fraser Morgan says the classification, Environmental Domains of Antarctica, highlights environmental variables that can be used for a range of management activities in Antarctica including prioritising sites for protection and ongoing environmental monitoring.

'We're delighted with this result and there's no doubt it's a significant milestone. It's also pleasing that our New Zealand partners – Ministry for the Environment, Ministry of Foreign Affairs and Trade, Department of Conservation and Antarctica New Zealand – are being shown to be leading the way in the ongoing protection of the remarkable continent,' Mr Morgan says.

The Antarctic Treaty, signed in 1959, designates the continent as an internationally managed natural reserve devoted to peace and science. As a party to the Treaty and its protocol on environmental protection, New Zealand is committed to the protection of Antarctica and its dependent and associated ecosystems. Antarctica New Zealand's environmental manager Neil Gilbert says the announcement marks a significant milestone for the continent's ongoing protection.

Until now there has been no environmental or geographic framework to identify and implement a representative network of specially protected areas that include important examples of plant and animal species, geological, glaciological or geomorphic features or important breeding colonies.

Previous attempts at environmental zoning classifications (developed by researchers in other countries) were subjective, of limited value and were not used for practical management purposes, says Dr Harry Keys from the Department of Conservation.

'We now have an agreed systematic basis to ensure we are managing and protecting some surprisingly vulnerable environments in the face of increasing people pressure and risks.'

'The support New Zealand received at the Treaty Meeting will help ensure we can apply the new tool to conserve the Antarctic continent, rather than being sidetracked in ongoing debate. It will help us identify and protect areas that need to be kept in a wilderness state to maintain Antarctica's unique role in global science and environmental monitoring.'

The project followed a review of the Antarctic protected area system conducted by New Zealand in 2000, which revealed a gap in the Antarctic legal system that the Domains project has now filled. The classification framework allows similar environments (including small distinctive environments that are otherwise easily overlooked at the continental scale) to be grouped based on their environmental character regardless of their geographic location.

The different environments are identified and characterised by combining a suite of variables including climate data (from 106 weather stations across the continent), slope, geology, land cover, and ice cover. Significant computing time and a lot of patience was needed to repeatedly run the computer programs over the more than 3.5 million data points to produce the final classification, and ensure it was realistic and practical.

Contact: Fraser Morgan
Landcare Research, Auckland
morganf@landcareresearch.co.nz



The Environmental Domains of Antarctica classification - designed to help protect key ecosystems

Brian Karl

Tb under the Spotlight *(continued from Page 1)*

It also follows on from the highly successful work done on Molesworth Station over the past three years by Landcare Research's Wildlife Ecology and Epidemiology science team.

That research identified the key habitats and places used by the main wild-animal hosts of bovine Tb – possums, ferrets and wild pigs – as well as their movements between catchments and interactions. That work strongly suggested that a strategy of low-cost partial control of possums that targeted just the most favoured habitats – which mostly occur at lower altitudes – would be successful in breaking the Tb cycle in wildlife.

Dr Nugent says three significant projects, beginning this spring, will take that work even further.

The first focuses on combining the concept of targeted coverage of key habitat only with other research outcomes showing that sowing 1080 baits at much lower rates than usual can be highly effective provided the bait is sown in narrow strips or clusters rather than broadcast widely at very low densities.

To test these possibilities, a Landcorp–Animal Health Board Tb-possum operation covering 28,000ha of Molesworth Station will compare outcomes of four different treatments: the normal approach used on Molesworth, a partial-coverage option, a low-sowing-rate option, and a combined option.

For the partial-coverage option, two different thresholds are being tested, one where possum trap-catch rates exceed 10% (so the probability of Tb continuing to cycle is high) and one where they're predicted to be above 5% (where Tb may or may not be able to cycle). Controlling possums only where they exceed 10% is obviously cheaper but riskier than controlling the bigger area in which they exceed 5%. For the sowing rate options, the team will compare the normal application rate for broadcast bait with a rate that is 60% lower.

The team wish to determine which strategy produces the lowest residual possum densities within the areas poisoned, and, over the next three years, which has the greatest effect in reducing Tb levels in wildlife.

'We'll use released pigs as "Judas" animals, or sentinels, as a way of measuring the level at which Tb continues to cycle or persist in wildlife. They're very good at this because they rarely pass on Tb, but because they move around over large areas, they quickly pick up Tb by scavenging any Tb-infected possum carcasses that inevitably occur if possums are still becoming infected,' Dr Nugent says.

This sentinel pig work will identify which is ultimately most cost effective in stopping Tb transmission to cattle.

The second project will investigate the effectiveness of a vaccine to protect cattle from Tb-infected possums.

'In some ways the idea of vaccinating cattle is a backup to possum control; it takes years to completely eliminate Tb from wildlife so farmers might start looking to vaccinate cattle as a quick interim fix. There is vaccine available, BCG, which is the same as the one long used in humans, and we know it protects cattle against experimental challenge with Tb. What we don't know is whether it will protect cows from "natural" challenge from Tb-infected possums, so this trial is the first ever real-world field trial of that,' Dr Nugent says.

'Over the next three years we'll vaccinate three groups of cattle at weaning, using different methods such as injections and oral doses, and see 2 years later if any have Tb.'

At the same time, the scientists will begin a FRST-funded project to determine whether the same vaccine can also help stop Tb from cycling in possum populations. The aim is to compare whether vaccination alone, or vaccination in conjunction with very small amounts of poison, could break the cycle of Tb as effectively as just using poisoning alone.

'Using a poison and vaccine simultaneously is probably a global first – the idea is to use the smallest possible amount of toxin to knock numbers down and then use the vaccine to ensure that the Tb cycle is well and truly broken. The argument is they'll work far better together than they would alone.'

Dr Nugent's team want to reduce the use of 1080 by 95%, even if that results in what by today's standards is a poor kill of only 90%. The hope is that they will be able to vaccinate the survivors at the same time to ensure any infected survivors cannot pass on the disease.

'So, we could sow maybe 20 1080 baits for each bait containing the BCG vaccine (which will be completely different in taste and texture to the 1080 bait). At those rates, most of the possums will hit a 1080 bait first and most of them will be killed. Those that survive will avoid any 1080 baits, but the hope is they will still pick up one of the small number of expensive vaccine baits. That's the theory at least!'

Contact: Dr Graham Nugent
Landcare Research, Lincoln
nugentg@landcareresearch.co.nz

Preliminary Results of 2008 Garden Bird Survey

Analysis of the first 1500 of this year's garden bird survey returns shows some major differences from 2007, says survey organiser Dr Eric Spurr.

'One of the most notable changes is a slight drop in silvereye numbers, from 10.2 per garden last year to 9.0 per garden this year. There are some other differences too.

'House sparrow numbers are up slightly on last year (10.9 per garden this year compared with 9.4 per garden last year). House sparrows are most abundant birds this year.

'Chaffinch, tui, and dunnock appear to be more common, and greenfinch, song thrush, and goldfinch less common.'

Tui moved from 11th most common bird last year (0.67 per garden) to 6th this year (1.2 per garden).

Only about two-thirds of the returns have been entered into the computer, so the results could change slightly as more returns come in.

As in 2007, people were very enthusiastic in their response to the survey. Dr Spurr received lots of comments, such as 'I love birds', 'we get a lot of enjoyment watching our feathered friends', and 'they are so amazing and fill my life with sheer joy every single day'. One lady said, 'I'm 94 and have fed and watched birds all my life.'

A Christchurch rest home incorporated the survey into their weekly outing, taking afternoon tea to the Groynes, some binoculars, bird books to identify species, and bread from the kitchen. Apparently, everyone had a great time and one resident even spotted 'two lovebirds' (a couple kissing on a bench).

A teacher at one participating school said the children thoroughly enjoyed taking part.

'Graphs of the results are already displayed in the classroom and we were able to compare this year's findings with last year's. There were interesting viewpoints in the discussions as to why the results were similar in some cases and quite different in others.'

One question this year asked people how many cats they had and comments included 'my cat never eats birds', 'our cat is too fat and old to catch anything', and 'the cat can't catch birds because it has only three legs and one eye and stays inside mostly'.

One of the more unusual birds recorded in gardens this year was the stitchbird. Until 2005, stitchbirds were confined to offshore islands. They were introduced into the predator-proof-fenced

Karori Wildlife Sanctuary in 2005 and the Waitakere Ranges in 2007. One survey participant living about 2 km from the Waitakere Ranges has had a male stitchbird come and visit her garden for the last month. 'What a thrill,' she said.

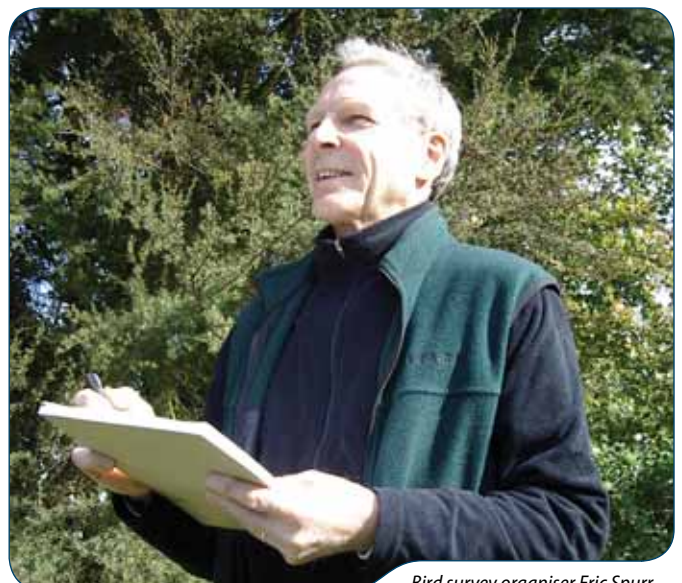
Up-to-date results are available on: <http://www.landcareresearch.co.nz/research/biocons/gardenbird/>

Dr Spurr says the survey has several aims, mainly to encourage people to become interested in birds and the environment, but also to be able to look at trends in bird numbers over time. Scientists need to know if birds such as tūi, bellbirds, kererū, grey warblers and fantails are increasing or declining in our gardens and in our towns and cities.

Top 10 birds per garden			
2007		2008*	
Silvereye	10.2	House sparrow	10.9
House sparrow	9.4	Silvereye	9.0
Starling	3.1	Starling	3.7
Blackbird	2.7	Blackbird	2.8
Greenfinch	1.2	Chaffinch	1.3
Song thrush	0.98	Tui	1.2
Chaffinch	0.95	Dunnock	1.0
Goldfinch	0.87	Fantail	0.90
Fantail	0.86	Song thrush	0.89
Dunnock	0.79	Greenfinch	0.83

*Preliminary results after 1516 returns

Contact: Dr Eric Spurr
Landcare Research, Lincoln
spurre@landcareresearch.co.nz



Bird survey organiser Eric Spurr

TIFBIS Updates

The TFBIS – Terrestrial and Freshwater Biodiversity Information System – programme was established as part of the Biodiversity Strategy 2000 and aimed to consolidate and share information about indigenous biodiversity.

The Department of Conservation administers the programme and Landcare Research scientists have made a large contribution to its success by undertaking projects that enable the digitisation of collections, observation records, books and journal articles.

Some recent projects include:

Singers with Wings

What could be more characteristic of the New Zealand summer than the chirruping of cicadas?

But how many species are there? What do they look like? Where are they found?

The ability of biodiversity managers, researchers, students, and members of the public to access such information has been difficult due to the scattered and often highly technical nature of available publications.

The Virtual Identification Guide to New Zealand Cicadas Project brings it all together in a format more palatable to non-specialists.

In a world first, Landcare Research has digitised diagnostic information from the literature, insect collections, and a private photo library to provide a freely accessible web-based identification and information retrieval tool covering the cicada fauna of an entire country.

The Virtual Identification Guide to New Zealand Cicadas provides a reassessment of the scattered scientific literature.

'Studies have already demonstrated that cicadas can be key indicators of species richness hotspots and areas with unique animal and plant life. Consequently, cicadas are a group of high

interest to biodiversity and conservation workers as well as to the general public,' Dr Marie-Claude Larivière says.

Three out of the five cicada genera and all 42 native species and subspecies currently recorded from New Zealand are found nowhere else in the world. In spite of this, the identity of over 30% of New Zealand species has never been studied in detail and, although cicadas have recently received renewed interest from molecular biologists, much of the information that is available for species recognition is either incomplete or has not been updated since the 1980s.

<http://www.landcareresearch.co.nz/research/biosystematics/invertebrates/hemiptera/cicada/>

Grass Key

Led by Kerry Ford, researchers have developed an illustrated Internet-based key to the different species of grasses found throughout the country.

Grasses are the second largest plant family in New Zealand with 460 species (187 indigenous species and 273 naturalised species) making up 11% of seed plants in New Zealand (indigenous & naturalised). A staggering 84% of species are found nowhere else in the world.

The key includes 430 species and 4 hybrid taxa of indigenous and naturalised grasses and 1400 illustrations.

'We wanted to provide a tool for people to be able to identify grasses easily and in the case of DOC and biosecurity managers to distinguish between indigenous and naturalised grasses that often occur together in many different habitats,' Kerry Ford says.

Staff could carry specimens back to their computer and, following the simple steps in the key, establish the exact species of grass they were looking at. Management decisions could then be made quickly and effectively based on the findings.



The goal of the key, as well as being a diagnostic tool, is to make information on grasses more accessible generally and to act as an updateable information hub.

<http://www.landcareresearch.co.nz/research/biosystematics/plants/grasskey/>

Plant Chromosomes

All known chromosome numbers for New Zealand's native plants are now freely available online.

'Humans have 23 pairs of chromosomes,' says project leader Murray Dawson.

'It's one of the characteristics that define us and separate us from other organisms and it's the same for plants. Their chromosomes are important because they are major biodiversity indicators. They provide valuable characters that help resolve taxonomic and evolutionary relationships between species, and provide another means to distinguish them.

New Office For Sirtrack

A Landcare Research subsidiary producing state of the art wildlife technology to the world is experiencing significant growth that has required the development of new purpose-built facilities.

Since 1986 Sirtrack have been the specialists in the design and manufacture of wildlife tracking equipment and have been commercially supplying customised tracking solutions to researchers, conservationists and wildlife managers throughout the world.

In late July the company opened new \$1.5 million premises in Goddard Lane in Havelock North.

Sirtrack has manufactured telemetry equipment for research on more than 550 species of wildlife from small insects through to heavyweights including elephants and whales. Their products have been put to the test in more than 75 countries around the world, from the Arctic Circle to the Florida Everglades and to the Antarctic.

One successful product is the Micro GPS, which is locally designed and produced and is the world's smallest GPS for use in wildlife research. Weighing just 22 g and with a rechargeable battery the Micro GPS is being used by Auckland University for research on gannets at Cape Kidnappers.

Chief Executive Mike Kelly says the shift is exciting and reflects significant belief in the ongoing success of the company.

'Our wildlife tracking sales have more than doubled in the last three years from \$2.2 million to \$4.8 million and we expect them to double again in the next 5 years.

'Investment in new products, specifically GPS-based products

'The first chromosome count of a New Zealand plant was in 1908, so I have now gathered some 3,500 individual records spanning the last 100 years,' Mr Dawson says.

'Currently, I estimate that more than 80% of New Zealand's vascular plant species have chromosome counts. To be exact, 1,726 species are now counted from some 2,144 described species of native vascular plants.

'80% is an impressive achievement and among the best coverage of any flora in the world'.

<http://www.landcareresearch.co.nz/publications/researchpubs/chromosome2008.pdf>

including Micro GPS, GPS Argos (satellite retrieval of data) and Fastloc, are driving this growth. These are exciting times for us'

Mr Kelly says a commitment to creating products for specific research as well as extended sales and marketing reach and representation in the United States are also driving growth.

'I think clients come to Sirtrack for assistance from around the world because they know of our reputation of providing the best service available as well as our flexibility to adapt to their specific research needs – and our truly unique products.'

www.sirtrack.com

Contact: **Mike Kelly**
Chief Executive, Sirtrack
kellym@sirtrack.com



Sirtrack staff outside their new facility

Erosion Modelling Presents Stark Findings

Erosion in the Manawatu River catchment could increase by approximately 50% under future climate change scenarios, according to new research.

The research was part of a thesis predicting erosion and sedimentation in the Manawatu catchment under future climate change scenarios undertaken by Christina Schierlitz, a student from the University of Bonn who was based at Landcare Research in Palmerston North.

Ms Schierlitz found that under the A1B climate change scenario (generated by NIWA from the emission scenario assuming low global population growth and a balanced mix of technologies and supply resources) in the year 2040 mean annual rainfall would increase by 3% on the western side of the Manawatu catchment and would reduce by 3% on the eastern side.

Meanwhile, air temperature would increase by about one degree on average throughout the Manawatu catchment, which would result in storm rainfalls being 8% greater on average as warmer air is able to hold more water vapour.

Assuming that present land use in the catchment did not change, then the increased magnitude of storm rainfalls would increase erosion in the Manawatu catchment by approximately 50%, she found.

The 50% increase in erosion would result in an increase in sediment yield in the Manawatu River from 4 to 6 million tonnes per year (and most likely resulting in increased flood risk, and a decrease in water quality and aquatic ecosystem health).

Ms Schierlitz said the findings were concerning.

'However, not only the climatic changes but also unsustainable land use practices have a serious impact on erosion and aggravate the situation under climate change. Farmers may not realise the extent to which erosion in the hill country is accelerated under pastoral land use as compared with natural vegetation.'

Ms Schierlitz hoped the information would be used to emphasise the seriousness of the erosion problem and its potential impacts.

'The worst-case scenario could be prevented if sound soil conservation measures were put into practice now. The extreme-event approach could be further developed and applied around New Zealand and could help identify hotspots of erosion that may need greater attention in the future.'

Supervisor John Dymond said the findings illustrated the importance of taking action to combat erosion now.

'Previous modelling had shown that soil conservation on 10% of farms with the worst erosion would reduce the total sediment yield in the Manawatu River by 50%', Dr Dymond said.

However, Dr Dymond said that figure did not take climate change into account. If it was taken into account then this new research indicated we had to reach this soil conservation target to simply remain at the current state of erosion and sedimentation.

Contact: Christina Schierlitz
chrlitz@gmx.de

Dr John Dymond
Landcare Research, Palmerston North
dymondj@landcareresearch.co.nz

Briefs

Dave Morgan (Lincoln) was a finalist in the agriculture and environment section of the recent Bayer Innovators Awards. He has focused his work on possum feeding and learning behaviour, bait development, toxicology, engineering development and large-scale field evaluations of new pest control tactics.

Bruce Warburton has been awarded the Peter Nelson Memorial Trophy by the New Zealand Biosecurity Institute. The trophy is awarded annually for achievement in vertebrate pest management and recognises Bruce's outstanding contributions to research and its practical application to improving vertebrate pest management in New Zealand over the last 30 years

© Landcare Research New Zealand Ltd 2008. This information may be copied and distributed to others without limitation, provided Landcare Research New Zealand Limited is acknowledged as the source of the information. Under no circumstances may a charge be made for this information without the express permission of Landcare Research New Zealand Limited.

Editor: Tom Fraser
Layout: Anouk Wanrooy
Thanks to: Christine Bezar

Published by: Manaaki Whenua - Landcare Research
PO Box 40, Lincoln 7640, New Zealand
Ph +64 3 321 9999
Fax +64 3 321 9997

ISSN 1175-7329 (Print)
ISSN 1175-7329 (Electronic)

If you wish to be included on the mailing list for *Discovery*, contact Tom Fraser, Landcare Research, Lincoln (03) 321 9719 frasert@landcareresearch.co.nz
All photographs contributed by Landcare Research staff unless otherwise indicated. *Discovery* is also available online at www.LandcareResearch.co.nz/publications/discovery/