Like No Other

NETS2014
New Plymouth

New Zealand Biosecurity Institute

National Pest Control Agencies

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Welcome...

...to the 64th annual NZBI National Education and Training Seminar (NETS) and the third shared conference with NPCA.

The theme for Biosecurity Month and NETS2014 is 'Like No Other'. This year's organising committee have a great three days lined up for you, with a wide range of speakers, fieldtrips that showcase biosecurity efforts in Taranaki, and social events to build biosecurity networks.

As many who have been involved in organising a NETS conference will know, there has been an extensive amount of work involved into bringing you these valuable three days. Our thanks to the organising committee chair, Steve Ellis and his team - Andrea Murray, Dave West, Catherine Law, Robin Hughes, Kerry Matthews, Shane Grayling, Darion Embling, Craig Davey, Bill Martyn, Maurice Kennedy and Emily King - and conference organiser Carolyn Lewis for the tireless effort they have put in to bring us here today.

It is important to remember that an event like NETS is not possible without the generous and on-going support of our sponsors. I would like to thank Taranaki Regional Council, Ministry for Primary Industries, NIWA, Landcare Research, Key Industries, Ospri New Zealand, and Hawkes Bay Regional Council.

Finally, as we open NETS2014, I would like to encourage you to use this time for networking, meeting new faces and discussing where to from here for biosecurity. Most importantly, celebrate our successes and look for dynamic solutions for the future.

- Rebecca Kemp, New Zealand Biosecurity Institute President

It is my pleasure to extend a warm welcome to everyone joining us for the 2014 'Like No Other' NETS conference in New Plymouth.

This is the third time that the NPCA has partnered with the NZ Biosecurity Institute to bring you the NETS conference. There has been significant positive feedback regarding the combined approach, and our partnership with the NZ Biosecurity Institute fits perfectly with the NPCA's main role of bringing industry organizations together for the benefit of pest control in New Zealand.

This year's programme offers attendees an opportunity to learn more about the current challenges facing biosecurity in New Zealand and in particular some of the issues facing biosecurity in Taranaki. There is a great line up of presentations covering the areas of weeds, vertebrates, and aquatic, marine, pathways and responses, by some of those people taking on the biosecurity challenges. Technology transfer and best practice hold more relevance than ever and in a strategic or operational sense getting it right first time is critical and the wide range of presentations on offer will provide us with information to help us do what we do better.

I would like to thank, in advance, all the speakers and participants for sharing their knowledge with us, and to thank the wonderful conference planning committee of and our conference organiser for once again doing a fantastic job and dedicating their time and energy to bring us 'Like No Other' NETS2014.

On behalf of the NPCA I would like to sincerely thank our sponsors without who we would not be able bring you such a wonderful event.

So, make the most of what this NETS conference has on offer and enjoy the great Taranaki hospitality.

- Brent Rohloff, National Pest Control Agencies

Day 1 Wednesday 30 July 2014

9.00 Conference opening - powhiri, official welcomes and opening speaker

10.00 *Morning tea*

10.30 How should we deal with ignorance and ambiguity in invasive species risk assessments? (*Philip Hulme, Lincoln University)*

10.50 Telling a unique history: the NZ Biosecurity Institute's story as told through oral histories (*Shona McCahon)*

11.10 GEMS - a variety of short updates and poster presentations (*various*)

11.40 Using Citizen Science to learn about invasive urban pests (*Heidy Kikillus, Victoria Unversity)*

11.50 NatureWatch (*Jon Sullivan, Lincoln University)*

12.00 *Lunch*

	WEEDS	VERTEBRATES	MARINE, PATHWAYS & RESPONSES
1.00	Forty years of Mysore Management on Raoul Island *D. Havell, DOC*	Ecological costs and benefits of aerial 1080 – long term DOC project *G. Elliot, DOC*	On Farm Biosecurity - responsibilites for managing pest spread *L. Smith, ECan*
1.20	Chinese knotweed - Not in our backyard! *M. Stewart, Auckland Council*	Camera traps for monitoring pest animals *A. Glen, Landcare Research*	Radicalising DOC's island biosecurity arrangements *E. Kennedy, DOC*
1.40	Wanganui Urban Weed Programme - a model for an urban weed awareness campaign *N. Gallagher, Horizons Regional Council*	Camera-trapping as a method to monitor feral pigs at low density in the Waitakere Ranges *R. Vennell, Auckland University*	An assessment of risk pathways from commercial businesses to pest-free islands of the Hauraki Gulf *S. Morgan, Unitec*
2.00	Biocontrol programme for field horsetail (*Equisetum arvense*) begins *L. Smith, Landcare Research*	Anticoagulant residues in the environment: monitoring update from Southland *P. Fisher, Landcare Research*	Domestic transfer of marine pests; approaches for managing this increasingly important pathway *I. Middleton, Northland Regional Council*
2.20	How has yellow bristle grass managed to spread so rapidly? *T. James, AgResearch*	The potential of using thermal imaging for surveying animal populations *B. Warburton, Landcare Research*	Managing domestic marine biosecurity pathways – what are New Zealand's options? *R. Bird, MPI*

2.40 *Afternoon tea*

	WEEDS	VERTEBRATES	MARINE, PATHWAYS & RESPONSES
3.10	Let others do the walking *T. Paul, Scion*	Field trial results of novel, resetting possum control devices *L. Shapiro, Connovations / Lincoln University*	Detecting marine invaders in the 21st century: New Zealand's marine surveillance programmes *T. Riding, MPI*
3.30	Not easy, but achievable! A holistic approach to demonstrating cause and effect in weed biocontrol *R. Groenteman, Landcare Research*	Bite Me! Possum interaction rates with chew cards *S. Brown, Landcare Research*	Pests and pipes: Are rats using the storm water network for transport? *I. Keenan, Wellington City Council*
3.50	Innovation vs. Invasion: innovative techniques to assist the eradication of weed populations *B. Chandler, MPI*	Novel lures to increase possum detections and reduce rat interference at Chew Cards. *J. Waters, Unitec*	Joint agency response to *Sabella spallanzanii* (Mediterranean fanworm) in the Coromandel *A. Pande, MPI*
4.10	WRASP: A spatial weed risk assessment tool *J. Beautrais, AgResearch*	Developing a bird repellent to protect kea at aerial 1080 cereal operations *M. Crowell, DOC*	Exotic bird incursion response operation *A. Polkanov, DOC*
4.30	Searching for biocontrol agents for pampas (*Cortaderia* spp) *L. Hayes, Landcare Research*	Using wireless networks for remotely monitoring traps *B. Warburton, Landcare Research*	Development of a Fiordland Marine Pathways Plan *D. Richards, Environment Southland*

4.50 *New Zealand Biosecurity Institute Annual General Meeting*

6.00 *Mix 'n' Mingle, Devon Hotel*

Day 2 Thursday 31 July 2014

Taranaki - Like No Other

9.00 Developing the Taranaki Biodiversity Accord (*Karen Schmacher, East Taranaki Environment Trust*)

9.20 Taranaki biodiversity plans: a site-led case study (*Rob Corkill, Taranaki Regional Council*)

9.40 East Taranaki Environment Trust's 'Purangi kiwi project': a community project (*Karen Schmacher, East Taranaki Environment Trust*)

10.00 Helicopter Gunnera control on coastal Taranaki cliffs (*Jared Coombes, DOC*)

10.10 Returning Tamanui – An Iwi-led project to return Kokako to Taranaki (*Conrad O'Carroll, Tiaki te Mauri o Parininihi Trust*)

10.20 *Morning tea*

Technology - Like No Other

10.50 Drones and other technologies for field surveillance (*Richard Parker, Scion*)

11.20 Drone pest control: authorisation and opportunities in NZ (*Hamish Kendal, Flightworks Ltd*)

11.30 Aerial robotics capabilities for biosecurity (*Aeronavics*)

11.50 *LUNCH*

FIELDTRIPS

The first stop for all fieldtrips will be an off-site demonstration of drone technology by Aeronavics.

ROTOKARE
Rotokare Scenic Reserve is a stunning 230 hectare forested hill-country catchment, extensive wetlands and 17.8 hectare natural lake. Mature tawa, rewarewa and mahoe dominated forest is home to tui, bellbird, keruru, grey warbler, and North Island robin, plus a variety of other bird species. The lake edge habitat consists of raupo, flax, and pukatea/kahikatea swamp forest – home to notable fauna such as fernbird, spotless crake, as well as eels and banded kokopu in the streams and lake. The local community trust raised funds for a pest proof fence enabling the area to be used as a kiwi crèche and they have set up a conservation education programme that recently celebrated its 5000th student. The trust are looking forward to hosting members of the Institute during NETS.

COASTAL TARANAKI
This trip will visit Waikirikiri Lagoon, an ephemeral wetland and home to NZ and banded dotterel. This area has a TRC biodiversity plan where council works with the local community to undertake pest control and revegetation. Bring your boots to this one as we have set aside some plants for delegates to plant! This trip will continue on looking at TRC's self-help possum control programme on the way to Pukeiti, a council-owned and nationally recognised garden and rain forest adjacent to Egmont National Park which is the site of ongoing pest control operations.

BIOSECURITY INCURSION SIMULATION
During this simulation, based out of The Taranaki Emergency Management Office, experience an incursion response first hand (prize for best species name!). You will be split into teams and given simulated tasks to complete. This will be run by Asure Quality and would be excellent for all you National Biosecurity Capability Network people.

EGMONT
This trip will leave New Plymouth heading to Egmont National Park Visitors Centre, where DOC staff will tell you about the kiwi and blue duck programmes, and the longest running goat control programme in the country. You will have a chance to walk some of the short walks from the visitor centre or just wander through the displays. This is the main gateway to New Zealand's second oldest National Park.

BUSTING CLAYS
The annual competition for the claybird shooting trophy takes place again at a local gun club. If you would rather kill than cuddle, and busting clays is your thing, here's a chance to get your name on the trophy.
Limited to 20 people and a charge applies.

6.00 *Happy Hour*

7.00 *Conference Dinner*

Day 3 Friday 1 August 2014

	INSECTS	VERTEBRATES	AQUATICS
9.00	Response to Queensland Fruit Fly in Whangarei *A. Murray, Asure Quality*	Rainbow skink invasion: The development of control and eradication protocols *J. Wairepo, Auckland Council*	Like no other: weeds and potential threats from watery habitats in the United States *K. Bodmin, NIWA*
9.20	Overview of brown marmoreted stink bug - a risk to NZ and what MPI is doing *C. Duthie, MPI*	NAWAC & new animal welfare regulations *K. Littin, MPI*	Turning the tide on a weed invader in Lakes Waikaremoana and Wanaka *M. De Winton, NIWA*
9.40	The Great White Butterfly, Nelson: update on eradication of this threat *C. Green, DOC*	Goodnature automatic traps for vertebrate pest control - field trials *D. Peters, DOC*	Beauty or the beast: Cape pondweed in Waiwhetu Stream *M. Merrett, Open Polytechnic*
10.00	Aerial spot spraying: An additional tool for insect eradication response *E. Yamoah, MPI*	Rook trapping with call birds *P. Quinn, Waikato Regional Council*	Imazapyr - a new tool in the aquatic weed control toolbox *P. Champion, NIWA*
10.20	Mutinous scum on Norfuk Ailen! An update on the Argentine Ant management programme. *P. Craddock, Flybusters*	Expectations, motivations, and barriers: landowner engagement in pest control in the Waikato Region. *C. Monk, Waikato Regional Council*	Pest fish eradication in Taranaki – a window of opportunity *J. Steven, DOC*

10.40 *Morning tea*

Closing Session

11.10 Guest speaker: Dr Geoff Harley, NEXT Foundation Chair, and director of Project Janszoon Trust and Rotoroa Island Trust

11.50 Awards presentations and NETS2015, Dunedin

12.00 Closing address, President of the NZ Biosecurity Institute

12.20 *Lunch*

How should we deal with ignorance and ambiguity in invasive species risk assessments?

Philip Hulme, Lincoln University

Philip Hulme is Professor Plant Biosecurity at Lincoln University, New Zealand and leads the Biosecurity theme in the Bio-Protection Research Centre, a national centre of research excellence. A plant ecologist by training, he has published widely on the issues of invasive plants and biological invasions with particular emphasis on tools to prevent and/or mitigate the impacts on agricultural production, biodiversity and ecosystem services. He has also addressed the importance of the role of trade and wealth creation on invasion rates. He has also recently contributed to international biosecurity perspectives that have addressed topics as diverse as climate change, bioterrorism, food safety and tourism. He currently is a Council Member of the Better Border Biosecurity Collaboration, a member of the NZ Biosecurity Ministerial Advisory Committee and a lead researcher in the Australian Plant Biosecurity Cooperative Research Centre. He was elected to the Fellowship of the Royal Society of New Zealand in 2013.

Invasive alien species pose significant environmental and/or economic problems, and methods to assess the potential risk of species introductions are key components in the management of invasions. Risk assessment is a scientifically based process that is used to identify hazards, characterize their adverse impacts, evaluate the level of exposure of a target to those hazards, and estimate the risk. In general, invasive species risk assessment requires the identification of one or more negative consequences (usually termed a hazard) likely to result from the successful establishment of an alien genotype or species and an estimate of the likelihood of each consequence.

The risk is the product of each consequence and likelihood. In an ideal world both likelihood and consequence of species introductions would be known perfectly and measured without error and this would allow perfect assessment of potential risks. Different levels in the knowledge of consequences and likelihoods shape the most appropriate strategies to address the threats posed by biological invasions. To date most effort in developing invasive species risk assessments has focused on likelihoods and much less thought has been given to quantifying consequences.

In this paper I shall address the challenges involved in quantifying the consequences of invasive species, and predicting the outcomes of a species introduction for natural environments. Current risk assessment approaches are limited by problems in obtaining an objective measure of the hazards posed by alien species, challenges of predicting complex hierarchical and nonlinear systems, difficulties in quantifying uncertainty and variability, as well as cognitive biases in expert judgement. Other approaches include scenario planning that seeks qualitative inputs regarding hypothetical events to facilitate long-range planning using multiple alternatives each explicit in their treatment of uncertainty. This represents a change from prevention towards adaptive management where the difficulty in prediction is acknowledged and investment targets early detection, mitigation and management.

Telling a Unique History: the NZ Biosecurity Institute's Story as told through Oral Histories

Shona McCahon, Oral Historian

Shona McCahon is a self-employed oral historian, writer and editor. Her oral history work is often related to conservation and resource management and includes projects for the Queen Elizabeth II National Trust, Department of Conservation and New Zealand Institute of Landscape Architects. She is a member of the National Oral History Association of New Zealand. She originally trained as a landscape architect, a field in which she worked for 18 years, specialising in open space assessment and landscape planning. During that time, she developed an interest in New Zealand's history, particularly in oral history in which she trained. For a number of years, Shona has assisted the National Pest Control Agencies with its publications and special projects. In 2012, she carried out preliminary research for the NZBI's archive project, which provided useful background for the NZBI oral history project she recently completed.

In 2012, the New Zealand Biosecurity Institute (NZBI) initiated a project to establish an Institute archive. This was in response to member concerns that the Institute's records, which date back to the 1950s through its predecessor organisations, might be lost. An oral history project was also initiated, with New Zealand Lottery Board funding, to (1) gather information useful in establishing the archive and (2) establish an NZBI oral history collection.

Oral historian, Shona McCahon, was commissioned to select, in consultation with the Institute, six interviewees whose recollections would be likely to inform the archive project whilst also providing representative career stories within the pest plant and pest animal threads of the Institute's and biosecurity sector's history. Between them, the six selected interviewees had worked in seven regions in both the North and South islands, as well as offshore islands, and one had worked nation-wide as a field officer. The interviews, which averaged four hours in duration, were tailored to each individual and covered family background, career path and involvement in NZBI affairs.

Collectively, the individual histories painted a consistent picture, in both pest plant and pest animal management, of the biosecurity sector's early days and subsequent development in New Zealand. The early practitioners were mainly self-taught men of the outdoors, who often worked in relative isolation and developed their skills and knowledge through field experience and practical know-how. In establishing the Institute's predecessor organisations, they not only sought collegiality but also pooled their knowledge, shared new techniques and were instrumental in setting up training programmes. They had all experienced the administrative restructurings and amalgamations that occurred in the sector over several decades and the major changes in funding, such as the withdrawal of government farming subsidies that had underwritten pest control work in many areas during the 1970s.

The interviews also reflect the broader history of biosecurity in New Zealand: the broadening of pest control objectives to protect indigenous biodiversity as well as agriculture; the ever-increasing variety and distribution of pests, especially plants, requiring control; and the trend towards more community education and involvement in pest control.

The Institute's history is, to quote the NETS2014 theme, 'Like No Other'. It is unique and this paper will highlight, using audio excerpts from the interviews, the value of the oral histories in recording the personal recollections and perceptions of those who have been involved, which would otherwise go undocumented.

Using Citizen Science to learn about invasive urban pests

Heidy Kikillus, Dr. Philip Roetman, Victoria University of Wellington

Dr. Heidy Kikillus is a Postdoctoral Fellow specialising in "Cities and Urban Nature" at Victoria University of Wellington. Previous research has involved investigating non-native species within the pet trade and their likely impact on the New Zealand environment.

Citizen Science refers to projects that involve community participation in scientific research. It allows professional researchers to engage with the public to collect or analyse data within a cooperative framework of research and education. Scientists and community participants both benefit, with scientists able to conduct large-scale projects (e.g. - collecting data long-term from otherwise inaccessible locations), while community participants are able to engage with their surroundings and learn more about a topic of interest. We will discuss current and upcoming Citizen Science projects in the Wellington region which investigate both the ecological and social impacts of invasive mammalian pests.

NatureWatch NZ as a citizen science tool for pest and weed surveillance in NZ

Jon Sullivan, Lincoln University
Colin Meurk, Jerry Cooper, Shane Orchard, Steve Pawson

Jon Sullivan is a senior lecturer in ecology at Lincoln University. He has a strong interest in NZ biosecurity, particular weeds and their impacts. He is also increasingly involved with citizen science, connecting people with modern technologies to greatly increase our understanding of New Zealand's native and exotic biodiversity. Jon is co-founder and the current secretary of the NZ Bio-Recording Network Trust, the charitable trust that operates NatureWatch NZ. You can learn more about Jon's research at jonsullivan.canterburynature.org.

The established mantra for biosecurity is early det ection and prompt action. Many new species establish in NZ every year and the earlier a new pest incursion is detected, the more likely it can be eradicated. Doing this well requires a lot of eyes open in the community, plus a method of capturing and identifying observations and promptly getting them to the right people.

NatureWatch NZ is a citizen science tool that does this. It is a rapidly growing website, mobile app, and online community dedicated to identifying and recording any species anywhere in NZ. In the 19 months between our launch in August 2012 and March 2014, 786 people have contributed 47,418 observations of 6,307 taxa. This includes 85,342 photos (many of species with no prior photographs on the internet). Lots of unusual sightings have been uploaded as "ID Please" and subsequently identified by the NatureWatch NZ community, which now includes prominent NZ experts in many groups, from fungi to spiders to ants.

Among these are the first NZ observations of more than 50 species, including the first observation of the recent giant willow aphid incursion and several first records of pests and weeds in NZ regions. There have also been important observations of native species, including one new native moss and the second ever observation of a red listed native mushroom.

NatureWatch NZ is filled with projects set up by its users to target particular places, species, and activities. For example, 61 people have chosen to join the the "Pest Plants (weeds) of NZ" project and added almost 1,500 observations of 375 weed species. Many of those observations began with a request for ID of an unknown plant. Community restoration groups and school groups are increasingly setting up projects on NatureWatch NZ to keep track of the species in their patches. You can create projects in your area to assist with surveillance.

All observations from projects can be streamed live on any external website, and soon observations will be able to be added externally too. NatureWatch NZ projects could therefore operate embedded into your institution's website. Project specific iPhone and Android apps can also be created.

With thousands of observations now flooding into NatureWatch NZ, we now need to ensure that the right observations promptly reach the right people. You can become one of those. NatureWatch NZ can send you email alerts when observations are made of species and areas in which you are interested. More formal regular reporting can be provided to institutions on request.

Concurrent 1 - Weeds

Forty years of Mysore Management on Raoul Island

David Havell, Department of Conservation

David has worked as a technical support officer in Auckland for the Department of Conservation since 2006. He is now part of DOC's Northern Transformation and Threats team. Prior to working for DOC David worked for the Manawatu Polytechnic - UCOL and Grasslands Divison, DSIR, Palmerston North. He now live in a small patch of the Waitakere Ranges fighting ginger and pampas, and keeping other weeds out.

Mysore thorn (*Caesalpina decapetala*) has been managed on Raoul Island for over 40 years. In the early stages of control hormones sprays were used to clear large areas of Mysore thorn from Denham Bay and Ravine 8. However there is very little information apart from hand drawn maps and photopoints from this period. From 1996 infestations were monitored more intensively by counting the number of individuals found at each infestation, these were eventually GPS'd. Intensive grid searching and hand management are now the main management tools. Occasional adults and seedlings are still found. Most major infestations are now relatively inactive, though some infestations still have bursts of seedling activity. The distribution of Mysore thorn has been contained and new infestations within the distribution area are rare. Natural recovery at some control site has been slow, in part due the replacement of Mysore thorn by dense fern growth. The Mysore thorn programme on Raoul has benefited from improvements in GPS, GIS and animal pest control programmes, as well as the commitment of staff and volunteers.

Chinese knotweed - Not in our backyard!

Mary Stewart, Auckland Council

Mary works in the Biosecurity Team of Auckland Council as a Senior Biosecurity Advisor - Pest Plants. Much of her work involves Total Control Pest Plants and working with community. Mary has also worked for Taranaki Regional Council as a Land Management Officer and MAF Quarantine at Port Taranaki and Ports of Auckland.

Pest plant eradication programmes can be very cost effective and more likely to succeed when populations are detected early. Chinese knotweed (*Persicaria chinensis*) was first detected in Auckland in 2009 and was declared an Unwanted Organism by the Ministry of Primary Industries. Since 2009 six additional sites have been found in Auckland and two in Hamilton. Chinese knotweed has the potential to be highly invasive in the New Zealand climate and could already be present in other parts of the country. This presentation outlines where Chinese knotweed has been found, how it is spread and key identification features. Control methods are discussed and contacts to notify are given.

Wanganui Urban Weed Programme - A model for an urban weed awareness campaign

Neil Gallagher, Horizons Regional Council

Neil has been an Environmental Management Officer (Plants) with Horizons Regional Council since 2005, also taking on the role of Weedbusters coordinator for that region. He recieved a 2013 NZBI travel award and attended the New South Wales Weeds Conference. Neil has a strong interest in all things botanical, and before 2005, ran his own successful garden maintenance/ landscape business, as well as being involved in weed control of varying scales since the mid-1980's. Neil is a past NZBI VP and branch chairperson.

The ecology of pest plants is complex, and strategic management of pest plants needs to acknowledge and incorporate such complexies. The urban landscape is diverse, ranging from uncared for sections and unused areas to manicured gardens. Pest plant problems reflect this diversity and are compounded by social issues. Areas of waste space, council and community plantings and road verges act as breeding grounds for weeds. Absentee landowner and rental accommodation make occupier responsibilities less clear cut. Hence the approach for urban areas will always be focused on awareness campaigns, self-responsibility and behavior change. Horizons Regional Council Pest Plant Management Strategy is based on ten principles, and a programme like this satisfies seven of those principles including: surveillance; 'easy-wins'; interagency relationships; monitoring and reporting; community participation; education and awareness; and funding.

During the springs of 2011, 2012 and 2013 Horizons ran the Wanganui Urban Weed Programme. This programme involves a promotional phase and an activity phase.There is a single plant focus. Emphasis is always on the promotional phase which involves requests to residents to tell us if they have the weed on their property or can alert us to its location. The less attractive features of the plant are highlighted. Promotional tools include live radio air time, social media, HRC website, mail- out flyers to selected suburbs, creation of a weed mascot and participation in community events. The activity phase involves visits to properties of respondents where we help respondents control infestations of the programmes focus weed.

Success of this programme is measured in the number of responses created by the promotion. The 2013 programme received the greatest response since the programme was initiated in 2011. The Wanganui Urban Weed Programme is a twist on a standard weed awareness and promotion campaign that really gets results. This model (approach) has immense public relations/awareness value. It provides tangible gains in terms of biosecurity management and provides a sense of 'value-for-money' for urban rate payers who contribute a significant proportion of the biosecurity rate. This a model that can be scaled across the biosecurity portfolio to address a number of weed and pest issues with a single cost-effective programme.

Biocontrol programme for field horsetail begins

Lindsay Smith, Landcare Research
Chris Winks, Stanley Bellgard

Lindsay works in the Biodiversity and Conservation group at Landcare Research, mostly in their containment facility at Lincoln, testing and rearing new weed insect biological control agents.

Field horse tail (*Equisetum arvense*), a fern-like plant native to North America and Eurasia, has become a serious invasive pest of pasture, crop and riparian areas in wetter regions of New Zealand. Traditional control measures are costly and are failing to control or reduce the spread of this weed. Biocontrol potentially offers a cost-effective and enduring solution. A feasibility study has suggested that prospects for biocontrol of FHT are extremely promising and has identified some potential control agents. The Rangitikei Horsetail Group (RHG) was formed in 2013 to promote the control of horsetail and manage the implementation of such a

programme, including invertebrate and pathogen surveys, importation and testing of up to four potential agents, and preparation of an Environmental Protection Authority (EPA) application to release at least one agent. New Zealand field surveys of FHT for damaging invertebrates and pathogens have been completed and first shipments from the UK of potential biocontrol agents have been sent to Landcare Research's containment facility at Lincoln to begin host specificity testing.

How has yellow bristle grass managed to spread so rapidly?

Trevor James, AgResearch
Claire Dowsett

Trevor James has been researching weed control for 40 years. His work has covered many important environmental weeds as well as agricultural and horticultural weeds. More recently Trevor has been involved in biosecurity, both at the border and within New Zealand, from a weeds perspective.

The rapid spread of yellow bristle grass throughout the major dairy farming regions of the North Island can only be explained by some long-distance vectors being involved. Further, these vectors are most likely to be users of the roading network. In this presentation three possible vectors will be identified and discussed along with possible methods for reducing their culpability. The three vectors are: cartage of chopped maize silage, roadside mowing and movement of dairy cows.

Concurrent 1 - Vertebrates

Ecological costs and benefits of aerial 1080 – long term DOC project

Graeme Elliott, Department of Conservation

Beech forests comprise about two-thirds of all New Zealand's native forests and last summer beech trees flowered intensely through much of their range. In response to the abundance of beech seed, rats, mice and stoats will breed prolifically and by next summer their numbers will reach plague proportions in many forests. Unless the numbers of rats and stoats are controlled many native bird and bat species will suffer catastrophic declines and may disappear from some forests. In response to this threat the Department of Conservation is planning a large pest control programme for this coming winter, spring and summer – the 'Battle for our Birds'. The main tool will be aerially applied 1080, but traps and poisons in bait stations will also be used. In this talk I will describe beech forests, the nature of beech mast, the relationship between beech mast and rodent and mustelid plagues, the effect of these plagues on native wildlife, and the tools we might use to protect native wildlife.

Camera traps for monitoring pest animals

Al Glen, Landcare Research

Al works in the Wildlife Ecology & Management Team at Landcare Research where he studies the ecological impacts of invasive species. Much of his work has focused on introduced predators in Australia and New Zealand.

Monitoring pest animal abundance is important to tell us (1) where and when control is needed, and (2) whether control is working. However, pest animals can be difficult to detect, especially when they are in low numbers. Camera traps can detect rare and cryptic animals but until recently they have been used mainly for large species. We ran captive trials and field trials using camera traps to detect stoats (*Mustela erminea*), feral cats (*Felis catus*) and hedgehogs (*Erinaceus europaeus*). Camera traps detected all three of these species in captivity and in the wild. Cameras with a white flash produce clearer photographs but may be more likely to frighten target animals. In field trials, capture rates of cats and hedgehogs were higher with cameras than with kill traps. Comparisons for stoats were inconclusive due to a low number of detections.

Camera-trapping as a method to monitor feral pigs at low density in the Waitakere Ranges

Robert Vennell, Auckland University
Mark Mitchell & Cheryl Krull

Robert Vennell is a Undergraduate student at the University of Auckland, completing a Bachelor of Science in Ecology. Robert conducted this research as part of a summer scholarship programme supervised by Dr. Cheryl Krull of the University of Auckland and Mark Mitchell of Auckland Council Biosecurity.

Camera-trapping is a technique that has been used to survey a range of large cryptic animals in challenging environments. We assessed whether camera-trapping was a viable method for monitoring feral pigs (*Sus scrofa*) in a temperate rainforest ecosystem and tested the use of a lure. Camera trapping trials were conducted in the Waitakere Ranges and the number of observations of pigs and non-target mammals were standardized against the number of trapping nights (multiplied by 100) to calculate a trapping rate per 100 nights for each species. We trialled a strawberry scented lure and compared horizontal and vertical camera setups in order to determine the most effective trapping procedure.

On vertically-oriented cameras feral pigs were recorded with a trapping rate of 0.4 pigs per 100 nights with no feral pigs recorded on horizontal cameras within the study period. Vertical cameras were shown to have increased observations of possums and rats (P-value <0.001) and fewer trapping nights lost as a result of setup failure, camera malfunction, theft or interference by possums when compared with horizontal cameras. No significant difference in the number of observations of any species was recorded between lure and non-lure sites. The results of the study may be of value to regional councils, researchers and other organisations seeking to design camera-trapping trials for monitoring and pest control.

Anticoagulant residues in the environment: monitoring update from Southland

Penny Fisher, Landcare Research, Lincoln
Andy Hicks, HBRC

Penny is a Research Priority Leader in the Wildlife Ecology and Management team of Landcare Research, based at Lincoln. Her background is in pest animal management and research in Australia and New Zealand, with particular focus on the use of vertebrate pesticides, their fate in the environment and their effects on animals.

The anticoagulant vertebrate toxic agents (VTA) play an important role in pest management, particularly in rodent control. There are relatively few regulatory restrictions on their use in NZ for both household rodent control and ground-based field management of rodents and possums. There is increasing evidence that these uses are resulting in exposure of some terrestrial wildlife to anticoagulants through a number of pathways. Here

we report on recent monitoring undertaken in Southland waterways that show anticoagulant residues are also occurring in aquatic sediment and freshwater fish. The potential transfer pathways and possible effects will be discussed.

The potential of using thermal imaging for surveying animal populations.

Bruce Warburton, Landcare Research
Ivor Yockney

Bruce Warburton is a senior scientist and programme leader with Landcare Research, based at Lincoln, and his research is focussed on developing improved methods and strategies for managing vertebrate pests in New Zealand.

Thermal imaging technology has developed rapidly over the last 5-10 years and both increased sensitivity and miniaturisation offer the potential to use this technology for monitoring vertebrate pests. In this paper we will provide a review of the current technology and provide some examples of images and discuss what the technology might be used for.

Concurrent 1 - Marine, Pathways & Responses

On Farm Biosecurity: responsibilities for managing pest spread

Laurence Smith, Environment Canterbury
Jenna Taylor

Laurence has been involved full time in pest management (control, compliance and enforcement) for 34 years within the Canterbury region in a number of different capacities, and is currently the Principal Biosecurity Advisor. His primary role is to ensure the biosecurity team delivers on their responsibilities in relation to the Regional Pest Management Strategy. He is one of a team working on the review of Canterbury's RPMS. At a regional level many authorities have been attempting to manage pests that have already become relatively widespread instead of working at the front end of regional biosecurity identifying potential threats, pathways, new incursions and attempting to eradicate new pests. Future management of pest spread is vital and provides opportunities for effectiveness and efficiency. This approach will rely heavily on land owners and industry taking responsibility for pathway management.

This presentation is on the responsibilities for managing on-farm biosecurity, how important educating land owners and industry about pest pathways is, and the difficulties faced by biosecurity practitioners in practicing what they preach. Using Chilean needle grass as an example, this presentation is given by both Laurence and Jenna Taylor, Chilean needle grass coordinator, who works to raise the profile of this grass. Chilean needle grass is an example of a pest that is extremely difficult to detect, moved by human activities, and has numerous vectors and pathways. Chilean needle grass currently occurs over approximately 3500 hectares in NZ but has the potential to infest up to 15 million hectares.

This project is partnered by Environment Canterbury, Marlborough District Council, Hawkes Bay Regional Council and the Ministry for Primary Industries.

Radicalising DOC's island biosecurity arrangements

Euan Kennedy, Department of Conservation
Keith Broome

Euan Kennedy and Keith Broome work as Threats Advisors in DOC's Science and Capability team (Euan in Christchurch and Keith in Hamilton). Both have worked extensively in specialist conservation fields. Euan's experience relates mainly to threatened species of all taxa, but especially insular endemic birds such as the Chatham Island black robin. He is currently co-ordinating DOC's programme to improve its biosecurity practices nationally. Keith instigated the project in his role as a founding member of DOC's Island Eradication Advisory Group (IEAG). He is widely acknowledged internationally as a pioneer and leader in the exacting field of island eradications.

New Zealand has invested millions of dollars in ridding our offshore islands of pest plants and animals. More such ambitious projects are planned. Our eradication successes are widely and rightly acclaimed, yet they are the easier part of the biosecurity equation. Quarantine and surveillance (detecting pests leaking past quarantine defences) are the hard-working, largely unsung heroes of efforts to protect our pest-free investments in perpetuity. DOC has launched a concerted 12-point action plan designed to lift the profile and priority of quarantine work internally, improve practices, strengthen capacity and normalise biosecurity culture within the organisation. The plan's actions aim for a more coherent, collegial approach to quarantine, locating ownership of the work as close as possible to its expert base at the frontline. Surveillance regimes require critical rethinks too, and much innovation to give better assurances of detecting pest organisms at very low densities. The advocacy challenges (changing the behaviour of island visitors) are formidable yet offer scope for creative solutions to rival those of DOC's eradication pioneers. This presentation outlines the plan, discusses its domestic imperatives and explores opportunities to lift public consciousness too.

An assessment of risk pathways from commercial businesses to pest-free islands of the Hauraki Gulf

Shanti Morgan, Unitec
Andrew Marshall, Jeff Cook, Nick Waipara, Darren Ward, Alice McNatty, Nigel Adams, Mel Galbraith, Diane Fraser

Shanti Morgan and Andrew Marshall are currently studying in their third year of the Bachelor of Applied Science majoring in Biodiversity Management in the Natural Sciences Department, Unitec. Both students have been awarded summer studentships with Auckland Council by Nick Waipara and Jeff Cook. Supervised by Senior Lecturer Diane Fraser and supported by other senior staff in Unitec, Shanti is collaborating with Darren Ward and Alice McNatty to implement a risk assessment model to commercial businesses in the Rodney district as part-fulfillment of her required negotiated study research project for completion of her degree.

The offshore islands of the Hauraki Gulf provide a unique biological ecosystem for New Zealand's endemic and endangered flora and fauna and have been identified as areas of national significance for protection under the Hauraki Gulf Marine Park Act 2000. The rainbow skink (*Lampropholis delicata*) and the Argentine ant (*Linepithema humile*) are established invasive species with economical, social and ecological impacts. Both *L.delicata* and *L.humile* are known to extend their invasive range via human mediated dispersal, particularly by the transportation of materials such as soil and building materials. Commercial businesses in the Rodney district were identified for their potential high risk of distribution of these materials. An assessment was then conducted to evaluate the potential risk of these businesses as invasion pathways for both *L. delicata* and *L. humile* specifically to the islands in the Hauraki Gulf. An existing property risk scoring system for Argentine ants was adapted to include rainbow skinks. Each 'high risk' business was visited and a survey conducted which included information on the storage and distribution of materials and products; packaging requirements; site hygiene;

suitable habitat for *L.humile* and *L.delicata*; the destination of the materials/goods; and the presence/absence of both of these invasive species. This resulted in a Property Risk Score which was used to evaluate the level and nature of the risk posed by commercial properties in the Rodney district as pathways of spread of *L. humile* and *L. delicata* to the islands of the Hauraki Gulf. These results will be used to target collaboration with high risk commercial businesses for the protection of the pest-free islands in the Hauraki Gulf.

Distribution of Argentine ant and rainbow skink in selected locations in the Rodney district, Auckland.

Andrew Marshall, Unitec
Shanti Morgan, Jeff Cook, Nick Waipara, Glenn Aguilar, Mel Galbraith, Diane Fraser

Andrew Marshall and Shanti Morgan are currently studying in their third year of the Bachelor of Applied Science majoring in Biodiversity Management in the Natural Sciences Department, Unitec. Both students have been awarded summer studentships with Auckland Council by Nick Waipara and Jeff Cook. Andrew is supervised by Senior Lecturer Dr Diane Fraser and supported by Dr Glenn Aguilar and Mel Galbraith at Unitec.

The Argentine ant (*Linepithema humile*) and rainbow skink (*Lampropholis delicata*) are invasive species within New Zealand. *L. humile* was first recorded in New Zealand in Auckland in 1990 and is known to have significant environmental impact, while *L. delicata*, which has been in New Zealand since the 1960s has been implicated in potentially outcompeting the native copper skink (*Oligosoma aeneum*). Where these species have the potential to cause most damage are New Zealand's offshore islands, such as those in the Hauraki Gulf, where endemic species largely extinct from the mainland are still present or have been reintroduced. Businesses such as landscape supply yards, nurseries and builders' merchants have been identified as having a 'high risk' of transporting these invasive specie s due to the distribution and movement of products such as of soil, aggregates, building materials and horticultural supplies. The scope of this study was to identify the presence/absence of *L. humile* and *L. delicata* in such 'high-risk' businesses in the Rodney district, particularly those with supply chain links to the islands in the Hauraki Gulf. Many 'high-risk' commercial businesses in the Rodney district were visited and hand searches conducted for the presence/absence of *L. humile* and *L. delicata*. Search time varied depending on the size and complexity of the survey site, but usually took between 10 and 15 minutes. Presence/absence of both species were recorded and samples taken of ants initially identified as *L. humile* for microscopic verification of identification. Geographic Information Systems (GIS) software was used to map the distribution of *L. humile* and *L. delicata* in 'high-risk' commercial business in the Rodney district. The results of this study will be used by Auckland Council to support the regional pest management plan for the control of the spread of these species and specifically for the protection of the islands in the Hauraki Gulf.

Domestic transfer of marine pests; approaches for managing this increasingly important pathway.

Irene Middleton, Northland Regional Council

Irene Middleton is an Aquatic Biosecurity officer at Northland Regional Council, dealing with both freshwater and marine biosecurity. She has a background in Marine Science and has been at NRC for over a year.

Northland receives over 1500 visiting recreational vessels annually; and although Northland has two customs clearance ports the vast majority of these vessels are of a domestic origin. Traditionally marine biosecurity has been heavily focussed on international vessels and the ballast water from large commercial vessels, however recently recreational vessels are increasingly being linked with the introduction and spread of some high profile pest species.

As more marine pests are becoming established in NZ the risk of domestic transfer increases and the need for innovation and adaptive management of this pathway becomes essential. Northland Regional Council has been developing proactive and reactive tools to deal with the domestic spread of marine pests and will discuss a number of case studies and developments within the region over the past year.

Managing domestic marine biosecurity pathways – what are New Zealand's options?

Rose Bird, Ministry for Primary Industries

Rose works as an Adviser in the MPI Long-Term Incursion Management Team based in Wellington. The team has a responsibility to provide leadership and coordination of the pest management part of the biosecurity system and much of Rose's work has involved coordination of national partnership programmes that manage the spread of pests throughout the country. Rose comes from a training in ecology and marine conservation.

MPI commissioned NIWA and Cawthorn to create two reports to summarise the operational tools and legislative options available to MPI and Regional Councils to manage biosecurity risks in domestic marine pathways. These reports were presented to stakeholders in November 2013, and next planning steps are being taken to produce an overarching strategy setting out the actions that can be taken to stop the spread of marine pests through improved pathways management. This strategy would provide a framework for action and allow stakeholders to collectively understand where to invest our efforts in the future to achieve the greatest risk reduction for our shared investment. This talk will review the reports and progress made.

Concurrent 2 - Weeds

Let others do the walking

Thomas Paul, Scion

Thomas Paul is a Scientist with Scion with interests in wilding conifers, their ecology and management

Weed and pest managers use lot of their time to collect field data, enter such data into databases and analyse it. The now widespread use of smartphones with their capability of data and location recording provides managers and scientists with new faster ways to gather and use information and can also involve the public in this process. Such data collection frameworks are widely applicable and can allow for two way communication between field and office. We demonstrate their utility for wilding conifer management and as a opportunity to recruit citizen scientists to contribute data through their mobile phone.

Not easy, but achievable! A holistic approach to demonstrating cause and effect in weed biocontrol

Ronny Groenteman, Landcare Research
Simon Fowler, Jon Sullivan, Yvonne Buckley

Ronny works at Landcare Research as part of the biocontrol group. She works on target and non-target effects in weed biocontrol, and is now also establishing new work on biocontrol of environmentally invasive invertebrates.

Demonstrating a cause and effect relationship between the action of biocontrol agents and the decrease in weed populations is crucial if we were to provide strong scientific evidence of biocontrol effectiveness. Yet establishing the relationship is no simple undertaking. Using St. John's wort as a case study, our approach was based on insecticide exclusion of the biocontrol agents. We recorded all factors we believed could affect the population dynamics of the weed in the presence and absence of the biocontrol agents, St. John's wort beetles (*Chrysolina* species), and analysed plant performance. In a long-term field experiment we included such factors as competition from other plants, herbivory by invertebrates other than the biocontrol agents, sporadic disease outbreaks, and the effect of the insecticide on plant growth. Analysis of the first three years of data provides strong support for the biocontrol agents as the dominant factor affecting important elements in the life cycle of St. John's wort. The next phase will include population model, which will link the individual elements to St. John's wort population growth rate. The model will reveal whether beetle damage to the life stages attacked can indeed lead to population decline. While the process is intensive, we propose that the approach presented in this case study be adopted as a framework to provide robust scientific evidence for effectiveness in flagship classical biocontrol programmes.

Innovation vs. Invasion: Innovative Techniques to Assist the Eradication of Weed Populations.

Brad Chandler, Ministry for Primary Industries
Jack Beveridge, Tim Gilbertson

After completing his BSc in Biology at Canterbury University in 2006, Brad completed his MSc in Ecology where he investigated the effect of tree canopy gaps and red deer on the establishment and spread of invasive plants in New Zealand native beech forest. Brad worked for the Department of Conservation carrying out deer control and research then began work for the Ministry for Primary Industries (MAF at the time) as a plant imports standards adviser. Since September 2012 he has been in the Plants and Environment response team as a senior adviser responding to post border incursions of organisms that may impact on the health of New Zealand's plants or environment.

The successful eradication of weed species is often a challenging prospect especially when they are widely distributed by birds, grow in difficult terrain and are hidden from view. Initial results may be encouraging, but achieving eradication relies on removing that last 1% of the population. Historically eradication attempts have relied on more traditional techniques such as unassisted ground searching which can become less effective when controlling a widely distributed yet sparse population. Thus more innovative approaches are required. We discuss innovative techniques to assist weed eradications and use white bryony (*Bryonia cretica* subsp. *dioica*) in New Zealand as an example. As the population has decreased significantly since work began in 2007, innovative techniques aimed at achieving eradication have been researched. Abseiling has been used successfully to control 4km of previously unmanaged cliff face; making eradication now possible. Cost efficiency of abseiling is being improved by developing digital recognition software, to target abseiling efforts by analyzing high resolution GPS-referenced images taken from an unmanned aerial vehicle. Initial findings indicate a high success rate of locating inconspicuous plants with the assistance of a detector dog. The use of a hovercraft or jet boat to monitor terrain only accessible by water is also being investigated. These innovative techniques have the potential to increase the likelihood of success and efficiency of other weed eradications and broaden the way we approach future eradication attempts.

WRASP: A spatial weed risk assessment tool

Josef Beautrais, AgResearch
Dr Darren Kriticos

Josef Beautrais is a Systems Modeller at AgResearch, working in the Soils, Land-use and Global Change team. Research interests include geospatial analysis, predictive modelling of invasive species, agricultural systems simulation, and modelling land-use change.

The number and diversity of introduced plants, coupled with limited weed management budgets requires biosecurity managers to employ a system akin to triage. To help identify appropriate targets for management attention, an analytical protocol and spreadsheet tool has been developed for post-border weed risk management (PBWRM), and published as an Australian and New Zealand standard. It is an important and widely-used tool. The PBWRM tool utilises a framework that ignores spatial variation in risk factors within the geographical area of concern of the risk assessor. However, invasive plants vary in risk factors such as invasiveness, potential impacts, and feasibility of control across space. Logically, the assessment of weed risks should also be spatially explicit in order to best underst and risks and to target management concern. In order to use the current PBWRM, the risk assessor has to firstly define their area of concern and then make subjective judgements that distil the spatial variation within that area into a single answer to each of the questions in the tool. At the national level, this method is wasteful, requiring each regional council to repeat an analysis, tailoring it to their own environmental conditions, or perhaps worse simply applying the results of analyses conducted in different jurisdictions without considering the different environmental conditions. To address these concerns we took the PBRWM logic and spatialised it, to allow weed managers to assess weed risks and management across geographical space. We illustrate this new spatial system using a case study of *Senecio glastifolius* in New Zealand, comparing the results of a spatial and an aspatial analysis. The spatial view of risks revealed locations of higher and lower risk and suitability for management attention that were hidden by blanket, aspatial weed risk scores of the current PBWRM system. The national level risk was also significantly higher when considered in the light of the results from the spatial tool. Answering the risk factor questions using the spatial system involved far less subjectivity, and hence the resulting risks and management classifications are likely more robust and usable to regional councils and the National Government. The spatial tool, WRASP, is presently being packaged for general use, and will shortly become available for testing by regional councils.

Searching for biocontrol agents for pampas

Lynley Hayes, Landcare Research
Gary Houliston, Dagmar Goeke, Stanley Bellgard, Chantal Probst

Lynley Hayes is a former President of the NZBI and a life member. Lynley is a Science Team Leader with Landcare Research based at Lincoln. Lynley has been involved in the development of weed biocontrol programmes for more than two decades.

After surveys of pampas (*Cortaderia selloana* and *C. jubata*) in New Zealand found few natural enemies attacking these plants, stakeholders concerned about these weeds decided that potential biocontrol agents in the native range should be investigated. Any biocontrol agents would need to be highly host specific to avoid unwanted attack on native toe-toe (*Austraderia* species). In 2010 a multi-agency group, the National Pampas Biocontrol Initiative, formed and was successful in gaining funds from the Sustainable Farming Fund to allow a 3-year biocontrol project to begin in 2011. The first task was to identify where in South America to look for potential biocontrol agents. *C. jubata* was reported to be native to Argentina, Bolivia, Ecuador and Peru, with *C. selloana* native to Brazil, Argentina, Uruguay and Chile. However, it quickly became apparent that the taxonomy of Cortaderia is complex with many issues needing to be resolved. Genetic studies then allowed us to quickly match New Zealand *C. jubata* with material in southern Ecuador. Surveys in southern Ecuador found only one potential biocontrol agent for *C. jubata*, a black smut (*Ustilago* sp.) that damages the flowerheads which is

being studied further. Finding a match for *C. selloana* proved much more difficult, but genetic studies eventually pinpointed sites in central Chile, and surveys are now underway there. Genetic studies of pampas in New Zealand identified limited sites of Argentinean-like Cortaderia which has been recommended for eradication. In addition to classical biocontrol investigations we are also exploring whether the utility of synthetic and organic herbicides can be increased through co-formulation with a plant pathogen (*Nigrospora oryzae*) recovered from pampas in New Zealand. This could potentially a llow the rates of herbicides used, and non-target damage, to be reduced, and initial results are promising.

Concurrent 2 - Vertebrates

Field trial results of novel, resetting possum control devices

Lee Shapiro, Connovation Ltd
Helen Blackie, Brent Barrett, Duncan MacMorran, Shane Inder

Lee manages the research and development portfolio at Connovation Ltd as well as co-leading the MBIE funded possum research program at Lincoln University. Most of his work involves the research, development and registration of new toxins and delivery systems like PAPP for stoat and feral cat control, sodium nitrite baits for possum and pig control and zinc phosphide in resetting systems to control possums. Lee is currently completing his PhD on the utility of sodium nitrite as a pesticide.

A resetting, long-life possum specific control tool has recently been developed and trialled in collaboration with Connovation Ltd. This device has the capacity to dispense a measured dose of toxin to over 100 possums before it requires any servicing. The device only needs annual servicing and incorporates a long-life attractant. Field trials have demonstrated considerable success with this new tool, with population reductions of over 90% achieved and proven continued control during the reinvasion phase. This presentation will demonstrate field trial results and discuss the optimal use of these new long-life tools in a range of situations.

Bite Me! - Possum interaction rates with chew cards

Samantha Brown, Landcare Research
Bruce Warburton

Sam is a research technician in the Wildlife Ecology and Management team at Landcare Research, based in Lincoln. Her current work includes investigating encounter and interaction rates of possums with control and monitoring devices and bait additives to improve welfare outcomes of currently available VTAs.

All possum control and monitoring devices require animals to encounter and interact with them in order for them to kill, capture or detect the animals. In the field we know when we have detected an animal, but often we do not know how frequently an individual might visit a device but avoid detection. Chew cards are increasingly being used to monitor possum populations at low densities, providing a low cost, easy to use monitoring tool available to both professional pest controllers and community conservation groups. In this preliminary study we have taken RFID technology previously developed for use with leg hold traps and created electronic chew cards. This has enabled us to investigate possum encounter and interaction rates with chew cards. Possums fitted with active RFID (radio frequency identification) collars were detected by an RFID scanner and PIR (passive infrared) movement sensor at 12m, 3m and as they triggered electronic chew cards. Behaviour around the card was observed using motion activated trail cameras. The study was conducted on farm land in Kaikoura which

has been subject to infrequent, low intensity possum control. Initial results suggest that up to 80% of encounters with chew cards will result in possums chewing the card. Further work to better understand possum behaviour when encountering and interacting with detection and trapping devices will improve our ability to more cost-effectively control our invasive mammals.

Novel lures to increase possum detections and reduce rat interference at Chew Cards.

Jared Waters
Nigel Adams, Diane Fraser, Jamie MacKay

Jared Waters has recently completed a Bachelor of Applied Science majoring in biodiversity management in the Department of Natural Sciences, Unitec, Auckland. As part-fulfillment of this degree, Jared collaborated with Dr Jamie MacKay of Connovations Ltd in this research project. Jared was supervised at Unitec by Associate Professor Nigel Adams and supported by Dr Diane Fraser.

Brushtail possums (Trichosurus vulpecula) are a major pest species in New Zealand, affecting the environment and the economy. Approximately $100 million dollars is spent every year on research, monitoring and control in an effort to reduce their impacts. Different olfactory and visual lures are often used to increase kill rates during control operations and increase the precision of pre- and post- control monitoring. However, rats often interfere with lures, toxins and monitoring devices, reducing their effectiveness. The aim of this study was to determine if a combined olfactory and visual lure, Lure it Spray and Blaze (LISB®, Connovation Ltd) was a more effective lure than 5:1 flour/icing sugar (FIS) for detecting possums using Chew Cards and to test whether it reduces rat interference . The study used 154 alternately lured Chew Card sites set in a 50m x 50m grid over approximately 60 hectares of regenerating kauri/podocarp/broadleaf forest near Goldie Bush, Waitakere. Teeth impressions on Chew Cards were identified to determine which species had caused the interference. There was significantly more possum interference at LISB lured Chew Card sites (51.85%) compared to FIS lured Chew Card sites (32.88%) ($X^2=5.64$, d.f=1, P=0.02). There was also significantly less rat interference at LISB lured Chew Card sites (28.4%) than FIS lured Chew Card sites (46.58%) ($X^2=5.44$, d.f=1, P=0.02). The results show that Lure it Spray & Blaze has the potential to increase detection rates during surveillance while also reducing rat interference rates thus increasing the accuracy and precision of possum surveillance operations.

Developing a bird repellent to protect kea at aerial 1080 cereal operations

Michelle Crowell, Department of Conservation
J Reardon, P van Klink, T Belton, M Martini, L Booth, P Cowan, I Westbrooke, E Moltchanova and A Fairweather

Michelle Crowell is Technical Advisor (Systems Development) for Threats in DOC's Science and Capability Group. Her work supports better management of risk when using vertebrate pesticides, through research, systems development, and working with regulatory agencies. She manages the kea repellent development project. Michelle chairs the DOC Pesticides Advisory Group and is part of the development team behind the DOC Animal Pests SOPs, Animal Pests Framework and associated training.

DOC has been working with the Kea Conservation Trust, TBfree New Zealand Ltd and Landcare Research over a number of years to develop a repellent to prevent kea deaths during aerial 1080 operations. We will present results from trials since last year's NETS conference. The first field study using bird repellent in an aerial 1080 operation near Arthur's Pass in August 2013 resulted in five confirmed kea deaths out of 34 birds likely to have been exposed to toxic baits. Repellent concentration was less than the target concentration at the field study,

so more work was completed on bait stability. A pest efficacy trial compared two different repellent treatments with the standard 1080 cereal treatment, at an aerial 1080 operation near Haast in November 2013. Repellents were at the target con centrations for this trial. There was no significant difference in the proportional reduction of possums between treatments. Standard 1080 was more effective at reducing the rat tracking index than the repellent treatments, and the least effective rat control occurring at the blocks the 'combined' repellent treatment. Trial results were reviewed in March to decide on the next steps in the project.

Using wireless networks for remotely monitoring traps

Bruce Warburton, Landcare Research
C. Jones

Bruce Warburton is a senior scientist and programme leader with Landcare Research, based at Lincoln, and his research is focussed on developing improved methods and strategies for managing vertebrate pests in New Zealand.

Using large-scale trap networks have the potential to effectively maintain pests at low densities, however checking traps, most of which are empty, imposes a high cost on such a trapping programme. If traps can be remotely monitored using a wireless sensor network, then costs could be significantly reduced. In this paper we explore the potential savings that could be achieved, constraints on the system, and whether there is currently available technology that can be used in the field.

Concurrent 2 - Marine, Pathways & Responses

Detecting marine invaders in the 21st century; New Zealand's marine surveillance programs

Tim Riding, Ministry for Primary Industries
Brendan Gould, Graeme Inglis, Don Morrisey, and Serena Wilkens

Tim has worked for the Ministry for Primary Industries since 2012, managing MPI's national marine port surveillance programs, and investigating detections of new-to-NZ, or potentially invasive marine organisms that arrive in New Zealand. Prior to this he worked for Environment Southland, managing both terrestrial and marine pests issues for the region, including the successful Fiordland Undaria Response program. He has a keen interest in both terrestrial and marine biodiversity enhancement programs, both for work and play. He holds an MSc (Hons) degree in Marine Science, a BSc (Zoology) and is a boat skipper and diver.

New Zealand relies heavily on international shipping to facilitate trade with the rest of the world. Visitations of vessels to New Zealand continue to rise, with the concomitant risk of marine non-indigenous species (NIS) being transported to New Zealand attached to vessel hulls, or carried within ballast water. Measures have been developed to reduce the risk of marine NIS arriving in New Zealand, however, until these are established a considerable risk remains of ongoing invasion. To protect New Zealand's trade, industry, and unique marine environments, a number of surveillance mechanisms are in place to assist in the early detection of marine NIS.

The active surveillance system consists primarily of port surveillance in ports and marinas with a high marine NIS risk profile. Principally the biannual port surveillance targets a number of identified, significant threat species that have not yet been recorded in NZ. It also tracks marine NIS which have established, but are not widespread. Additionally, any new or emerging species that are showing invasive characteristics can be detected and identified. Species identification is managed by the Marine Invasives Taxonomic Service (MITS), a centralised facility which includes a network of national and international taxonomists who can identify most taxa rapidly. These surveillance systems are a key way the Ministry for Primary Industries supports regional involvement with marine pest management.

Pests and Pipes Are rats using the storm water network for transport?

Illona Keenan, Wellington City Council
Josie Broadbent, Victoria University

Illona Keenan is the Biosecurity Technical Advisor for Wellington City Council. Working within the Urban Ecology Team, Parks and Open Spaces, in the Parks Sport and Recreation business unit. She has been with the council for two years, managing contracts for both plant and animal pests over the 4,000ha reserve network and identified Key Native Ecosystems. This was the second year that a Summer Scholarship programme has been run in by Wellington City Council in conjunction with Victoria University of Wellington. The scholarship offers a student 400 hours of research work. Josie Broadbent's project was the first biosecurity themed summer scholarship. Josie is in her final year of a BSC at Victoria University majoring in physical geography and environmental studies.

The effectiveness of Wellington City Council's (WCC) poison baitstation layout is dependent on how pest species are entering council parks and reserves. There are currently c.1,300 points of access into the storm water network within WCC reserves. These access points include roadside grates, culverts, sumps and non-maintained pipes. It is important to understand if pests, particularly rats, are using these networks as points of entry.

This study aimed to test whether these access points would be significantly correlated with a higher presence of rats and other animal pests, using the assumption that rats have an average range of 50m.

Seven reserves were selected for a chew card study, each site having two to three 225m transects at 100m spacing. Each transect contained 10 chew cards at 25m intervals. The cards were collected after five fine nights during late January 2014.

Overall detection of rats was low in comparison to mice and possums. This may be due to seasonal population fluctuations and the presence of cats in urban areas. Detection rates of different species between chew cards less than 50m and greater than 50m away from storm water entry points were not significantly different. In many sites, storm water entry points are located along urban edges. Therefore, it is difficult to separate the effects of these variables.
Chew cards monitor presence/absence - they are not an indicator of population size as individuals may visit multiple chew cards over time.

Joint Agency Response to Mediterranean fanworm in the Coromandel

Anjali Pande, Ministry for Primary Industries
David Hodges, Fiona Bancroft, Jennie Brunton

Anjali Pande has a PHD in Marine Ecolgy and is currently working as a marine incursion investigator in the Animals and Marine Team in the biosecurity part of MPI.

The usual biosecurity process in New Zealand should be that central government remit is to investigate and if necessary respond to new pests/ diseases, and under the National Pest Management Strategy (NPMP) it lies in the regional council remit to respond to range expansions of pests into a new region. In order for this to occur, the pest should be specifically listed in the council's RPMP. It has occurred with some regularity that a specific pest is not listed in the NPMP and in addition there are few councils who have the resource and/or expertise to respond to Marine Pests, which can make this a challenging task.

The Mediterranean fanworm (*Sabella spallanzanii*) is an unwanted organism and is established in New Zealand in the Auckland region, and more and more instances of this fanworm appearing outside of Auckland region are occurring. Recently a barge infested with high densities of this fanworm was found in the Coromandel Harbour where to date it had not been seen before. The Waikato Regional Council and MPI launched a joint-agency response to the appearance of this pest in a new region. Although not the only instance of a joint agency response, this is a nice example of how agencies can work together and use expertise from both agencies to jointly address a biosecurity risk to New Zealand's marine space.

Exotic bird incursion response operation

Art Polkanov, Department of Conservation
Mark Mitchell

Art is a professional wildlife biologist with strong educational background, vast research and managerial experience and international exposure. He is currently a biosecurity specialist with DOC (North Head Field Base).

Many bird species have proven to be excellent colonisers. Feral exotic populations have become established in urban areas around the world as a result of accidental escapes or intentional releases. Potential for the spread of exotic species should not be underestimated as well as significant negative consequences for native biodiversity and economy of New Zealand. A summary of the successfully completed and current incursion response operations in Auckland region since 2000 are presented with special emphasis to the recovery methods, engagement of the general public and media relations.

Development of a Fiordland Marine Pathways Plan

Derek Richards, Environment Southland

Derek is part of the Biosecurity team at Environment Southland. His role is split evenly between pest animals and marine invasive organisms. Derek has a background in marine ecology and working with community groups. He is currently working closely with MPI and DOC in the development of a marine pest pathway plan for Fiordland.

Marine pests, introduced via human-mediated pathways, pose a major threat to the ecological state and quality of the Fiordland Marine Area. The detection of the invasive seaweed *Undaria pinnatifida* in Sunday Cove (Breaksea Sound) in 2010 triggered a partnership between Environment Southland, Ministry for Primary Industries, Department of Conservation and the Fiordland Marine Guardians to respond to the incursion. This program has been so effective that a similar approach is been used to developing a Fiordland Marine Pathways Plan.

In 2012 the Government implemented its marine biosecurity pathway policy by introducing Pathway Management Plans as an amendment to the Biosecurity Act 1993. Such plans are based on first identifying the pathways whereby pests are transported into an area. Then the task is to develop ways of ensuring that pests can no longer accesses those pathways. To prevent pathways such as vessels and fishing/recreational gear from transporting pests, visitors to Fiordland may be required to modify their behavior. It is therefore essential to get buy in from Fiordland's many users in order for the pathways plan to be effective. To this end, a large component of the development and implementation of the plan involves communication and consultation with the community. I will discuss the journey so far.

Day 2 Thursday 31 July

Taranaki - like no other

Developing the Taranaki Biodiversity Accord

Karen Schumacher, East Taranaki Environment Trust

Karen is Chairwoman of the East Taranaki Environment Trust which manages a significant kiwi protection project. She farms in partnership with her husband Bob involving dairy, beef and forestry interests. She has a passion for the environment, people and sustainable land use and has a successful background in landscape ecosystem projects. Karen is President of the New Zealand Red Devon Cattle Breeders Association, facilitates the Taranaki Bio-diversity Accord group, and has previously been a trustee on Taranaki Tree Trust, chairwoman of the Taranaki/Whanganui Conservation Board. She is a member of the Chartered Accountants Australia and New Zealand; and the New Zealand Institute of Directors.

In Taranaki there are many agencies, community groups and individuals that have an interest in biodiversity. Sometimes the interest is derived from a statutory function and responsibility, while for others it's a passion and we just want to do our bit. Until now, there has been no document that has attempted to set out agreed priorities and actions in order to coordinate and add value to our respective efforts. The Taranaki Biodiversity Forum Accord is an initiative where the signatories have agreed to work together to set out a strategic vision, outcomes, priorities and actions. This is a presentation about the journey.

Taranaki biodiversity plans: a site-led case study

Rob Corkill, Taranaki Regional Council

Tikorangi Whitehead KNE consists of three forest remnants totalling 11.7ha in size. The KNE lies on a dairy platform that has been owned by the Whitehead family since 1920. Neil and Jackie Whitehead are committed to maintaining and enhancing a sustainable ecosystem that they can share with their family and the wider community.

In September 2009 the site was approved by the Taranaki Regional Council as a Key Native Ecosystem and a Biodiversity Plan was developed. The Plan detailed objectives and management recommendations aimed at creating a sustainable ecosystem with a high level of land owner contribution. Neil and Jackie were up for the challenge, and Tikorangi Whitehead KNE is a tribute to their passion and hard work.

You can find out more at www.kererukeep.org.nz.

East Taranaki Environment Trust's "Purangi kiwi project"

Karen Schumacher

A project about the community – people and kiwi within our diverse bio-diversity.

This project which has grown from 192 hectares to 13,000 hectares in 10 years has become one of the two priority sites for the long term survival of the western brown kiwi. The project is about landscape ecosystem management, has an integrated pest management strategy, and recognises there is multiple use of the ecosystem in our area and that people are part of this. Then project includes public and private land and many landowners.

This is a success story with stage one of having 500 pair of kiwi within the project area reached. The kiwi are our indicator species, if they are doing well so are the many other native species.

Gunnera control on South Taranaki Cliffs

Jared Coombes, Department of Conservation

Jared Coombes is a Biodiversity Ranger for the Department of Conservation New Plymouth Office.

The New Plymouth Office of the Department of Conservation has had another successful year with their ongoing Gunnera tinctoria control program. This large leafed weed is shading out native species on cliff faces in South Taranaki, which is of particular concern to the rare herbfield species present. In 2013 Precision Helicopters developed a Helicopter mounted lance specifically for this project. This method is producing the most cost effective results to date. Large sections of cliff infestations are now being controlled rapidly.

Returning Tamanui – An Iwi led project to return Kokako to Taranaki,

Conrad O'Carroll- Ngati Tama - Tiaki te Mauri o Parininihi Trust

Conrad is part of the North Taranaki iwi of Ngati Tama with a background in pest control. He has worked on the returned lands of Ngati Tama to protect and restore the ecological values of these areas; this includes setting up and implementing pest control regimes, monitoring effectiveness of pest control and restoring species . His work involves working with Department of Conservation, Taranaki Regional Council and other conservation projects to ensure tasks are completed to best practice standards.

Ngati Tama, the Northern most of the eight Taranaki Iwi, are tangata whenua and kaitiaki of Paraninihi. Two thousand hectares of Parininihi (commonly known as Whitecliffs) have been identified in the Taranaki Biodiversity Strategy as one of four Iconic Key Native Ecosystems (KNE) projects in the region. These forests were the first to be returned to iwi ownership in Taranaki. They hold high cultural, historical and spiritual significance to Ngati Tama. The land contains one of the best examples of primary coastal podocarp hardwood forests on the West coast of the North Island and one of the few remaining areas where forest still runs unbroken to the sea. Parininihi is home to a number of rare and endangered plant species and threatened birds including Kiwi.

Tamanui was the last known pure bred Taranaki kokako, translated to Pukaha Mount Bruce in 1999. The Trust's vision is to return his descendants to the area. Ngati Tama have formed a partnership with the Department of Conservation and the Taranaki Regional Council to create a suitable safe habitat for them at Parininihi.

Technology - like no other

Drones and other technologies for field surveillance

Richard Parker, Scion Research

Richard works in the Rural Fire and the Harvesting Groups at Scion, the NZ Forest Research Institute. He specialises in Human Factors and Technology. Currently he is working on the development of robots for forestry and the measurement of rural firefighter workload and performance.

Rapid advances in technology have opened up new ways to observe the natural environment. There are two main components to surveillance - platforms and sensors. Platforms are needed to carry the sensors and include aerial and terrestrial drones and even animals themselves can carry sensors. The sensors that an observer can select from have also increased in number and type and have become smaller, cheaper, less power hungry and can measure more aspects of the environment. Imaginative combinations of platforms and sensors can be assembled to bring us a greater understanding of the environment.

Drone pest control: authorisation and opportunities in NZ

Hamish Kendal, Flightworks Ltd

Flightworks Ltd was formed by Hamish Kendal and Meg Graeme to complement their expertise in ecology and biosecurity through the development of drone applications.

Multi-rotor drones are nimble and accurate flying machines that provide safe access to difficult sites. They are able to deliver precise spray patterns to minimise spray volume and avoid sensitive areas. They also enable detailed aerial mapping and remote sensing from low elevation. It is a new tool that has multiple applications in environmental, agricultural and horticultural biosecurity. Hamish will give an overview of the potential applications of drones for biosecurity and the current Civil Aviation requirements. www.flightworks.co.nz

Aerial robotics capabilities for biosecurity

Background briefing for the following drone demonstration at New Plymouth Racecourse prior to fieldtrips.

Day 3 Friday 1 August

Concurrent - Insects

Response to Queensland Fruit Fly in Whangarei

Andrea Murray, Asure Quality

Andrea Murray graduated from Massey University with a Batchelor of Veterinary Science in 1992. Following graduation, Andrea joined MAF as a veterinary officer. While working on a wide range of issues, including animal welfare, Tb control and exotic diseases, Andrea stayed with the organisation through its various changes, from MAF Quality Management, to the SOE AgriQuality, followed by the merger with Asure to become AsureQuality in 2008. Andrea also completed the Master of Veterinary Public Health Management degree at the University of Sydney Faculty of Veterinary Science in 2006. Andrea is currently AsureQuality's Biosecurity Business Manager, delivering biosecurity operational surveillance, readiness and response services under contract to MPI. Managing the National Biosecurity Capability Network is a significant component of this work.

Queensland Fruit Fly was detected in Whangarei twice in 2014, in January and April. On both occasions MPI mounted biosecurity responses to protect New Zealand's horticultural industries from the effects of this pest. AsureQuality managed the operational response, deploying organisations from the National Biosecurity Capability Network to deliver surveillance, movement control, and logistics capability. The presentation describes what was learnt from previous responses, how the National Biosecurity Capability Network was deployed, and how these contributed to successful response outcomes.

Overview of Brown Marmoreted Stink Bug, a risk to New Zealand and what MPI is doing

Catherine Duthie, Ministry for Primary Industries
Rory Maclellan

Cath works in biosecurity risk assessment primarily assessing the risk of invasive organisms entering New Zealand on a range of imported items from fresh produce to sea containers; she also provides advice to other parts of MPI such as during preparedness and response situations. She has a background in insect ecology and a particular interest in the impact of invasive insect species on native ecosystems.

The Brown Marmorated Stink Bug (BMSB) is a temperate/subtropical species of stink bug native to China, Japan, Korea and Taiwan and has recently become a serious horticultural pest causing significant economic harm in the USA. (Pfeiffer, 2011). All BMSB life stages except eggs can be damaging to plants. The host range of this bug is wide, including many fruit trees, field crops and forest trees. It infests both cultivated and wild hosts, feeding damage to fruit can result in premature fruit drop and unmarketable fruit resulting in economic loss. Additionally BMSB is a significant public nuisance in its aggregation phase. It overwinters indoors as an adult throughout most of its range in large numbers in homes and commercial buildings which increases the likelihood of transportation on inanimat e objects. Since 2010, unusually warm early spring and summer seasons

have resulted in an increase in the number of generations and subsequently a higher than normal BMSB population in the United States. With no natural control mechanisms to keep populations in check, significant impacts to horticultural crops have occurred. Initial attempts to successfully control the population are proving unsuccessful. The pest's impact on integrated pest management systems is significant, as growers were forced to apply increasing amounts of insecticides.

The likelihood of entry into New Zealand is pathway-dependent and the pathways that pose the highest likelihood of entry are containers (and items within), and vehicles and machinery especially during the northern hemisphere fall/autumn (Sept-Jan) when aggregation takes place. Passengers visiting or returning to New Zealand are also seen as a pathway as BMSB could potentially hitchhike in travellers luggage or personal belongings sent via mail.

BMSB is a highly mobile pest persisting for most of the growing season, adults commonly migrate changing hosts to find the most desirable food sources. BMSB has been recorded from more than 300 different plant species belonging to 49 different families. Therefore, once BMSB has entered New Zealand it is likely that it will find a suitable host plant.

Even with control measures in place crop losses of up to 30% have been recorded in the eastern USA. Significant crop losses have been reported from pip-fruit and stone-fruit; and if harvested with grapes for winemaking *H. halys* has been reported to taint the wine.

In addition to the economic consequences of establishment BMSB is a significant public nuisance. During winter it aggregates in large numbers (sometimes thousands) and preferentially inhabits man-made structures. If disturbed it releases a foul and long-lasting odour.

An overview of the current BMSB situation and the science and strategies used by MPI to mitigate the risk of introduction to New Zealand will be discussed.

The Great White Butterfly, Nelson: Update on eradication of this threat to many endemic and commercial brassicas

Chris Green, Department of Conservation

Chris works in the Science and Capability Group of DOC as a Technical Advisor on threats (pests) based in Auckland and has a specialist background in entolomogy. Much of his work involves biosecurity and he has provided advice to MPI during a range of successful eradications. Chris has also worked on threatened insects and island restoration programmes.

The Great White Butterfly (*Pieris brassicae*) (GWB) was first found in Nelson on 14 May 2010 as caterpillars feeding on nasturtium. The property was 1.5km from the Port of Nelson where it was presumed to have entered the country.

The GWB lays eggs in clusters of 30 to over 100 on host plants and caterpillars feed gregariously with the possibility of complete defoliation before moving en masse to neighbouring host plants. Overseas records show that GWB caterpillars feed on a broad range of species but mostly within the cosmopolitan family Brassicaceae (cresses). As well as brassica species grown commercially as crops, including forage crops, there are 79 species of native cresses in New Zealand, 92% of which are endemic and 71% are classified as "Threatened" or "At Risk" with 18 species being "Nationally Critical". Many of our endemics are known hosts for the small white butterfly (*Pieris rapae*) and overseas records show an overlap in the host range between the two butterfly species. The arrival of the GWB represents a significant additional threat to many endemic cresses.

The Ministry for Primary Industries (MPI) initiated an incursion response to monitor the distribution of this new pest. By the end of 2011 GWB had been confirmed at 39 sites, all within 6 km of the Port but mostly within 2 km. By spring 2012 there were 96 confirmed sites, still all within 6km of the Port. In November 2012 the Department of Conservation (DOC) took over the response and initiated an eradication programme. During the 2012-2013 season GWB spread out to a maximum of 12 km from the Port with outliers at Glenduan in the north-east and Richmond in the south-west. However, by late autumn 2013 these outliers had been suppressed and the distribution reduced to about 7 km from the Port. By late summer 2014 that distribution had not expanded.

During the 2013-2014 season the emphasis has been on suppression and containment of the infestation. This involves reduction of the higher numbers in the core of the infestation nearer the Port as well as preventing expansion of the distribution beyond the 7 km boundary. Since September 2013 operational staff have included at least 5 team leaders with 25 or more casual staff in the field. Up until 20th January 2014 there had been over 30,000 inspections on more than 26,000 separate properties during the season. Teams are moving door to door through Nelson suburbs with repeat sweeps in many areas during each GWB generation.

A GWB phenology model shows that there appears to be 3 to 4 generations per year in Nelson. The model allows the opportunity to target particular life stages at certain times of the year. Adult emergence begins in late August to early September producing caterpillars through spring. A proportion of the following generation aestivates over summer which results in lower detection rates. This may explain a dramatic decrease in detections over January – February 2014. Or, is the programme succeeding? The presentation will provide an end-of-season update.

Aerial spot spraying: An additional tool for insect eradication response

Emmanuel Yamoah, Ministry for Primary Industries
Don Hammond, Tara Strand

Dr Emmanuel Yamoah works for the Ministry for Primary Industries as a Senior Adviser in the Response Group. He has been managing responses to pest and disease incursions relating to plants and the environment for the past 7 years. His background includes Agronomy, Agroforestry and Plant Pathology. He originally comes from Ghana and moved to New Zealand in 1997 with his family. His interests are soccer and gospel music.

A large population of eucalyptus leaf beetle (*Paropsisterna beata*) was detected on few eucalyptus trees at Whiteman's Valley, Upper Hutt in 2012. The beetle, which is endemic to Australia, feeds exclusively on eucalyptus trees and can pose a threat to the New Zealand forestry industry and amenity plantings if it becomes established.

The Ministry for Primary Industries (MPI) initiated a response to eradicate the population. The site of the incursion is surrounded by residential houses so the spot spraying technique, a more targeted method of insecticide application was used as part of the aerial spraying programme. MPI Operational Research, conducted by Scion and supported by their additional funding through the B3 collaborative, determined the suitability of spot spraying technique for controlling the beetles in an urban environment. The research showed that the spot spraying provided improved distribution of spray on leaves than that achieved by the conventional boom. This new technique uses a conventional boom with only two nozzles designed to deliver much higher flow rates and larger droplets mounted towards the end of one side of the boom. Thus allowing the pilot to see and control the insecticide application.

No eucalyptus leaf beetles were found in the area and its surrounding during surveillance in December 2013. Surveillance methods include tree inspections, light trapping and the use of sticky tapes. The use of the spot spraying technique is a good example of MPI partnering with research providers to provide innovative tools for protecting New Zealand's primary industries.

Mutinous scum on Norfuk Ailen! An update on the Argentine Ant management programme.

Paul Craddock, Flybusters

Dr Paul Craddock is the Operations Manager for Flybusters/Antiants, one of New Zealand's leading pest control companies. He has considerable experience in all aspects of ant control, from the day-to-day work of a domestic pest controller, right up to the large-scale eradication of ants and the science and research behind it all.

Norfolk Island (or as the locals call it: Norfuk Ailen) is a small island situated partway between Australia and New Zealand. In 2008 the local administration embarked on an ambitious plan to eradicate the invasive Argentine ant (*Linepithema humile*) from the island. This talk summarises the recent history of the programme as it moves to its final phases and highlights its successes and challenges. Lessons learnt for other ant eradication programmes will be offered.

Concurrent - Vertebrates

Rainbow skink invasion: The development of control and eradication protocols

Jacqui Wairepo, Massey University

Jacqui Wairepo is currently an MSc (Conservation Biology) student at the Albany Campus of Massey University, researching impact aspects of rainbow skinks, including control methodologies and risk to native skinks by way of disease vectoring. Additionally she has been employed for the last two years within the Auckland Council Biosecurity team to implement rainbow skink detection surveys across the Auckland region and Hauraki Gulf islands. Jacqui is currently running the rainbow skink detection and incursion response operation on Great Barrier Island.

Rainbow skinks (*Lampropholis delicata*) are the only exotic reptile to have successfully established in New Zealand. Typical invasive life history characteristics have justified the classification of this species as an 'Unwanted Organism', however to date no attempts to control their populations or spread have been made.

As rainbow skinks continue to increase in numbers and range throughout the warmer regions of New Zealand's North and South Islands, it is crucial that the risk of incursion to off-shore islands be minimized. The identification in May 2013 of a breeding rainbow skink population at Tryphena Wharf, Great Barrier Island has provided the opportunity to test the feasibility and practicality of manual trapping in the absence of alternative methodologies.

Surveys of numerous potential vector sites across the Auckland region between 2011-2013 have resulted in the identification of nurseries, marinas and building supply yards as providers of regular off-shore transport pathways to rainbow skinks. The development of a toxin to target this species in these mainland areas may provide an effective solution to this problem with little to no impact on native congeners, and reduce the frequency of inadvertent translocations. The toxicity of paracetamol (a lethal oral toxicant to some reptiles) to rainbow skinks will be trialled in May 2014.

This presentation will describe the adaptive methodology implemented on Great Barrier along with the experimental outcomes of the laboratory toxin trials. Implications for the future of rainbow skink control are discussed.

NAWAC and new animal welfare regulations

Kate Littin, Ministry for Primary Industries, Wellington
Penny Fisher

Kate is with the Animal Welfare team at the Ministry for Primary Industries. She has a particular interest in animal welfare relating to wildlife management and conservation, and provides support to the National Animal Welfare Advisory Committee's subcommittee on wild animals.

In 2012, proposals were consulted for amending the Animal Welfare Act 1999. One proposal is intended to clarify that acts of cruelty against animals in the wild are unacceptable under the law. Actions that are 'generally accepted practice' are defensible. What is 'generally accepted practice'? And what does the National Animal Welfare Advisory Committee have to do with it? This paper gives an update on progress with the Animal Welfare Amendment Bill, and on related work by the National Animal Welfare Advisory Committee. The Committee has a statutory role to encourage the development of best practice guidance for hunting and killing animals in the wild. It has developed guidance before ('Assessing the welfare performance of restraining and kill traps') and is considering how best to work with the National Pest Control Agencies and other interested parties to support a definition of 'generally accepted practice'. This and other initiatives relating to pest animal control and the welfare of animals in the wild will be discussed.

Goodnature Automatic Traps for Vertebrate Pest Control - field trials

Darren Peters, Department of Conservation
Karen and Robert Schumacher, Dan Baigent

Darren has worked in Conservation for 30 years. He began in endagered species management then shifted to animal pest control specialising in stoats, rats and possums, and now helps to develop new methods and tools for the future.

Goodnature humane automatic kill traps are being developed in New Zealand for use in animal pest control to protect nature conservation values. These traps are compressed carbon dioxide powered devices that humanely kill individual animals by striking their skulls producing instant irreversible unconsciousness. Each animal clears the trap by dropping down and away as the trap resets. The trap then automatically resets up to 24 times. The two models of traps commercially available, at this stage, are A12 automatic traps for common brushtail possums (*Trichosurus vulpecula*) and A24 automatic traps for ship rats (*Rattus rattus*). Both these species are significant animal pests in New Zealand contributing to the decline of biodiversity and extinction of native animal species. Large amounts of conservation effort and resources are targeted at the control of these two animal pests. Current best practise techniques e.g. single action possum and rat traps are proven to control and halt the effects of these two pests. However when new pest control tools are introduced to conservation management we must trial these tools for their effectiveness and efficacy. This paper discusses three successful trials using the automatic kill traps: two on possums and one on rats.

Rook trapping with call birds

Paul Quinn, Waikato Regional Council

Paul Quinn joined Waikato Regional Council from the Maungatautari Ecological Island Trust in April 2013. His main responsibilities are in managing large scale possum control projects. He joined the rook control team in August 2014. He does not claim to be a rook expert in any way shape or form.

After two decades of rook control, the Waikato Regional Council (WRC) has small, dispersed rook populations. The traditional controls of DRC1339 aerial and ground baiting operations, while successful in reducing populations, become expensive when dealing with small numbers of birds, geographically spread.

The council sought new control techniques, at a lower cost and non toxic, so they could be deployed in urban or peri urban areas, where some of the remnant rooks populations were found.

A common crow trap used in Europe and North America, had been trialled in NZ, but was unsuccessful. However, the trap had not been trialled with call birds.

This presentation examines the results of the councils' rook trapping program with the use of call birds

Observations on expectations, motivations, and barriers to successful landowner engagement in pest control in the Waikato Region.

Chris Monk, Waikato Regional Council

Chris has been a Biosecurity Officer (Animals) for Waikato Regional Council for the last three years. His role is mainly landowner consultation, for the Priority Possum control program, and has recently been intrigued with the social science side of pest control. Chris also did six years with the then Auckland Regional Council as a Park Ranger in the Hunuas and Tapapakanga Regional Park. He has had a wide range of other jobs and has been involved in most aspects and types of farming.

For a regional council, landowners can be a great asset or hindrance to the success of pest control. This presentation looks at what motivates landowners to become actively involved in conservation, from riparian plantings to trapping feral cats. The information presented is a culmination of over a thousand informal conversations, observations and interviews held over three years with landowners throughout the Waikato region.

It also explores the barriers that landowners feel restrict or stop them from becoming involved, and gaps in knowledge that exist for both landowners and the regional council.

This presentation seeks to illustrate that better engagement can minimise operational risk for pest control, improve education and support for landowners, and ultimately to help council fulfil its Regional Pest Management Strategy.

Concurrent - Aquatics

Like No Other: Weeds And Potential Threats From Watery Habitats In The United States

Kerry Bodmin, National Institute of Water and Atmosphere

Kerry Bodmin is a wetland ecologist at NIWA. She has been a part of the aquatic plants research team based in Hamilton for seven years, and has 15 years' experience in plant ecology, pest management and biosecurity.

Kerry has a wide range of biosecurity experience, from a new organism incursion response to long term pest management. Incursion response work has involved leading or advising MPI (formerly MAF) on research and control/eradication practices. She has been involved in response, control, monitoring and surveillance aspects of biosecurity operations, policies and management. Kerry's work has included ecological assessments; impacts related to human activities and selective weed control with minimal damage to native species. Long term pest management work has involved the development of weed strategies, improved control methods and practices and integrating weed control with ecological restoration work.

The NZBI professional development award, along with funding from NIWA, enabled me to visit and work with a range of people and organisations in the United States of America. This was an excellent opportunity to examine biosecurity risk species up close and personal; gain familiarity with these plants in their typical US habitats; discuss control tools and techniques; and learn about US community restoration programmes.

Highlights were: working with Dr Ken Krauss (USGS) in Louisiana wetlands; examining weed issues and management options in lakes with Dr Mark Sytsma (University of Portland, Oregon); and community programmes in the Chesapeake Bay area with Dr Christina Vieglais (Department of Agriculture, Maryland). The Chesapeake Bay visit included nursery grown plants for constructed wetlands, freshwater and tidal wetlands that feed into Chesapeake Bay and an opportunity to learn about their water catchment management programme that encourages locals undertake restoration activities, use different weed control options and participate in education programmes.

High priority plant threats included *Myriophyllum spicatum*, *Ludwigia peruviana* (and other Ludwigia species), *Trapa natans*, *Typha latifolia* (all Unwanted Organisms in NZ) and *Cabomba caroliniana* (sparingly naturalised in NZ). These species are all within the top 20 ranked threats identified by the Aquatic Weed Risk Assessment Model. Other potential weeds not present in New Zealand were *Hydrocotyle ranunculoides, Panicum repens, Eichhornia azurea, Sparganium erectum, Najas marina, N. guadalupensis, Typha domingensis* and *Stratiotes aloides*.

Turning the tide on a weed invader in Lakes Waikaremoana and Wanaka

Mary de Winton, National Institute of Water and Atmosphere
John Clayton

Mary de Winton is a scientist and Freshwater Ecologist at NIWA, Hamilton, with over 25 years' research experience on submerged vegetation management. During this time Mary has worked on (and in) over 155 New Zealand lakes. Research interests include the biosecurity management of invasive water weeds, the enhancement and restoration of native submerged plants, resource survey, management of aquatic plant data and its application to research questions, and the taxonomy of New Zealand charophytes (freshwater algae akin to seaweeds)

Nationally outstanding and iconic New Zealand lakes are not immune to biological pollution in the form of invasive freshwater organisms. The successful biosecurity response to such invaders can be challenging in aquatic environments where under-water pest detection is difficult, there is water-borne dispersal from established infestations, and a limited toolbox of in-lake control methods.

Both pristine Lake Waikaremoana and Lake Wanaka have been invaded by lagarosiphon (*Lagarosiphon major*), a submerged water weed capable of occupying and altering ecology and amenity at lake margins. Land Information New Zealand have co-ordinated a multi-agency management team providing significant funding towards a 10 year plan for lagarosiphon management at Lake Wanaka, which is now in its ninth year. Department of Conservation have led an eradication response for lagarosiphon at Lake Waikaremeoana since its second detection in 2012. Although the invasion time-frame and goals for lagarosiphon management at these lakes differ, management approaches have been similar and are proving highly successful.

Approaches include firstly, a strategic, lake-wide response that focuses management at priority sites where the greatest gain and progress towards goals can be made. Secondly, a tactical response is tailored to the characteristics of each site, the biomass of lagarosiphon present and site history of prior effectiveness of control methods. Applications of the herbicide diquat is used to reduce the initial biomass of large lagarosiphon beds. Suction dredging is applied to the remaining weed biomass, or selected areas where control via diquat proves difficult. Once weed bed removal is achieved, maintenance weed removal via hand weeding becomes feasible and can retain extensive shorelines free of re-invasion.

This paper outlines how such a management model is achieving measurable progress towards the goals of lagarosiphon containment, ecological and amenity protection in Lake Wanaka, and lagarosiphon eradication in Lake Waikaremoana.

Beauty or the beast: Cape pondweed in Waiwhetu Stream

Merilyn Merrett, The Open Polytechnic of New Zealand

Merilyn has been a senior lecturer in environment studies at the Open Polytechnic in Lower Hutt for seven years. Prior to that she was a plant ecologist at Landcare Research in Hamilton for 10 years and worked in many North Island terrestrial ecosystems including native forests, coastal, geothermal and central North Island tussocklands. During her time at Landcare Research she completed a PhD which focused on the reproductive biology of native shrubs.

In 2011 Merilyn was elected Chair of new community stream group whose aim is for Waiwhetu Stream to be a healthy functioning ecosystem. Although Merilyn hasn't done research in an aquatic environment before, the knowledge gained from her PhD research was used on investigating Cape pondweed to try to improve the amenity and ecological values of Waiwhetu Stream.

Cape pondweed (*Aponogeton distachyos*) is an endemic aquatic species of the Western Cape Province of South Africa that has been present in Waiwhetu Stream, Lower Hutt for about 100 years; in 2011, 4 km of the stream was infested with it.

Its presence in the stream has several negative impacts including slowing and altering flows, sediment capture and suspension, rubbish capture, and facilitation of surface algal blooms. Its leaves can cover the entire surface of the stream which is aesthetically displeasing, and unnatural in a New Zealand context.

Greater Wellington Regional Council has used various methods to control the plant including spraying with herbicides and, over recent years monthly stem cutting. These were management tools for controlling the weed primarily for improving stream flows rather than for ecological purposes.

Open Polytechnic supported research during 2011-12 into the reproductive biology of Cape pondweed showed it flowers almost all year, produces rather attractive, fragrant inflorescences, and can potentially produce an average 480 seeds per inflorescence. It is a tuberous plant and a trial removal of the tubers along a 30 m stretch of the stream led to the notion that permanent eradication could be achieved by manually digging out the plant with a garden fork.

An eradication strategy was developed and since July 2011 small groups of volunteers from the Open Polytechnic and the Friends of Waiwhetu Stream have been manually removing Cape pondweed weekly and fortnightly, beginning at the upstream extent of its infestation. The project is supported by Greater Wellington Regional Council, Hutt City Council and Open Polytechnic. By February, 2014 it has been removed from 90% (3.6 km) of the stream. To ensure total eradication, regular 'vagrant' patrols are conducted to remove any missed plants.

There have been several positive outcomes from the project including a significant increase in riffles, reduced surface algal blooms, visible stream bed, visibility of fish, vastly improved aesthetics and community engagement.

The success of the eradication programme is due to a combination of scientific research, volunteer commitment and support from councils.

Imazapyr - a new tool in the aquatic weed control toolbox

Paul Champion, National Institute of Water and Atmosphere

Paul Champion is a Principal Scientist at the National Institute of Water and Atmospheric Research (NIWA) in Hamilton, New Zealand, where he has been a part of the aquatic plant management research team since 1988, with over 30 years' experience in the field of plant ecology. His current research mostly concerns proactive management strategies for aquatic weeds including evaluating and managing introduction pathways both internationally and internally, working in conjunction with government policy and management agencies. Other research interests include optimising surveillance programmes and incursion response to new invasions, conservation of endangered habitats and plant species and restoration of habitats impacted by exotic weeds.

Imazapyr, sold under the proprietary name UniMaz, has recently been reassessed for use where control of problem weeds may lead to contamination of surface waters. This talk outlines several control trials where this herbicide is being evaluated in New Zealand for control of phragmites (*Phragmites australis*), Manchurian wild rice (*Zizania latifolia*) and alligator weed (*Alternanthera philoxeroides*) also discussing potential uses based on overseas research.

Pest fish eradication in Taranaki – a window of opportunity

Jenny Steven, Department of Conservation

Jenny works as a ranger at the Department of Conservation in Taranaki. She has been working in freshwater threats management focusing on eradication of pest fish from Taranaki. A recent move has seen her shift into the new Partnerships group of the Department. Jenny has experience in community-based conservation projects, particularly Taranaki Kiwi Trust, Parininihi and Rotokare. In previous times Jenny has worked on Raoul Island, PNA surveys in Canterbury, the Foundation for Research in environmental research investment. She recently completed a biomedical degree so understands something of molecular mechanism of toxins!

The Department of Conservation is working towards eradicating the pest fish *Gambusia affinis* from the three known sites in Taranaki. At present, this pest is in a lake and a pond near Waitara and one farm pond inland from Inglewood. Rotenone will be applied as a dilute slurry of cube root powder to kill the fish. Gambusia control has been put into the "lost cause" basket in many regions. In Taranaki we believe we still have an opportunity to prevent widespread establishment of this species. Rationale, DOC's approach and outcomes will be presented in this talk.