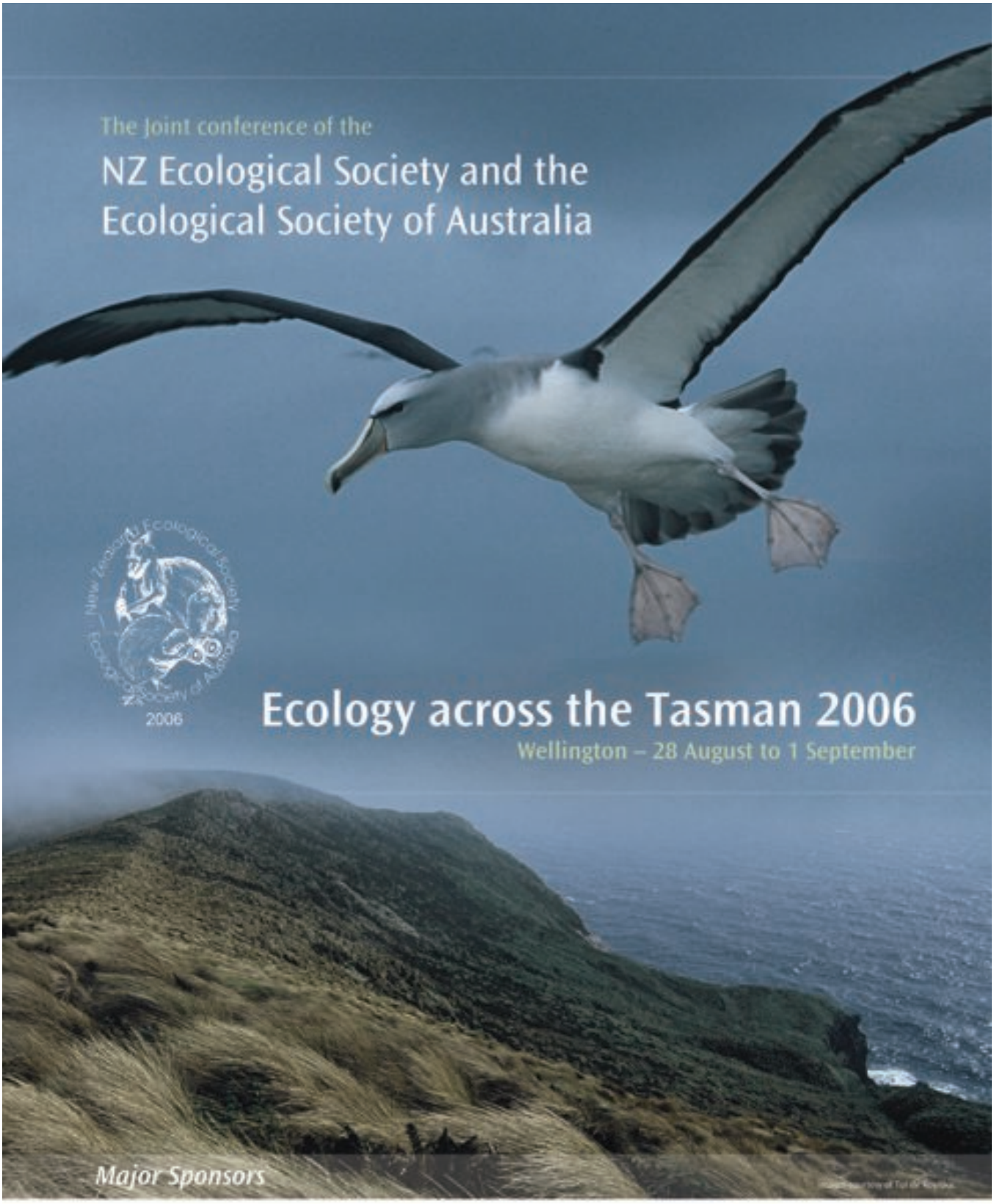

Victoria
UNIVERSITY OF WELLINGTON
Te Whare Wānanga
o te Ūpoko o te Ika a Māui

Landcare Research
Manaaki Whenua

Department of
Conservation
Te Papa Atawbai

Conference Overview

TIME	Mon 28th	Tues 29th	Wed 30th	Thurs 31st	Fri 1st
8.00 am	**Registration and coffee**	**Registration**		**Registration**	**Registration**
8.30 am to 10.30 am	**Conference opening** Concurrent sessions: Ecology across the Tasman Ecology across the Tasman Ecology across the Tasman	Concurrent sessions: 13 Modelling 14 Urban ecology 1 15 Matters of scale 16 Animal miscellany	Field trips	Concurrent sessions: 29 Animal pot-pourri 30 Restoration Australasia 1 31 Fragmentation 32 Fire	**9.00 am** Concurrent sessions: 45 Wetlands 46 Restoring Australasia 5 47 Conservation strategies 48 Wildlife disease ecology 1
10.30-11.00 am	**Morning tea**	**Morning tea**		**Morning tea**	**10.40 am Morning tea**
11.00 am to 12.40 pm	Concurrent sessions: 1 Historic Perspectives 2 Seed dispersal 3 Sampling efficiencies 4 Reptile ecology	Concurrent sessions: 17 Invasive plants 2 18 Urban ecology 2 19 Honeydew 20 Foraging ecology		Concurrent sessions: 33 Herbivory 1 34 Restoration Australasia 2 35 Valuations & judgements 36 Plants at high altitudes	Concurrent sessions: 49 Avian & Gold Medal 50 Restoring Australasia 6 51 In coastal waters 52 Wildlife disease ecology 2
12.40-1.40 pm	**Lunch**	**Lunch**		**Lunch**	12.30 pm **Closing & Awards**
1.40 pm to 3.40 pm	Concurrent sessions: 5 Invasive plants 1 6 Molecular applications 7 Ecology and Law 8 Marine community ecology	Concurrent sessions: 21 Invasive animals 22 Urban ecology 3 23 Botanical pot-pourri 24 Pollination 1		Concurrent sessions: 37 Agro-ecosystems 38 Restorating Australasia 3 39 Insects,plants,wood debris 40 Riverine ecology	**1.30 pm Lunch**
3.40-4.10 pm	**Afternoon tea**	**Afternoon tea**		**Afternoon tea**	
4.10 pm to Mon **5.50 pm** Tues **5.30 pm** Thur **5.30 pm**	Concurrent sessions: 9 Conservation miscellany 10 Spatial ecology 11 Ants at work 12 Agro-ecosystem resilience	Concurrent sessions: 25 Influences of heat 26 Urban ecology 4 27 Vegetation assessment 28 Pollination 2		Concurrent sessions: 41 Herbivory 2 42 Restoring Australasia 4 43 Conservation miscellany 2 44 Big botany	
Evening	**Posters and Pizza** 5.50 - 7.30 pm	**Maori feast** 5.45 - 9.00 pm	**The Dinner** 6.30pm - 12.30am	**NZES AGM** 5.30 - 6.30 pm	

Welcome!

Dear Delegates

The Organising Team welcomes you to wonderful, windy Wellington for Ecology across the Tasman 2006, being the 55th New Zealand Ecological Society annual conference, the 31st Ecological Society of Australia annual conference and the 3rd joint conference between our two societies.

We extend a warm welcome to our neighbours from across the ditch, to our fellow New Zealand ecologists, to students, and international visitors.

We have responded to your feedback at other conferences to bring you a topical, stimulating scientific programme, a diverse array of field trips, and lots of social events with plenty of opportunity to network, catch up with old friends, and meet new people.

Do make the most of what the conference, and Wellington, has to offer.

The organising team for Ecology across the Tasman 2006 comprised:

Clayson Howell	Department of Conservation
Kate McAlpine	Department of Conservation
Shona Pettigrew	Victoria University of Wellington
Ben Reddiex	Department of Conservation
Susan Timmins	Department of Conservation
Amanda Todd	Department of Conservation
Murray Williams	Victoria University of Wellington

They were ably assisted by:

Jonathan Anderson	Wellington City Council
Paul Blaschke	Blaschke & Rutherford
KC Burns	Victoria University of Wellington
Melanie Dixon	Greater Wellington
Stephen Fuller	Boffa Miskell
Kelly Hare	Victoria University of Wellington
Rod Hitchmough	Department of Conservation
Mary McIntyre	Otago University
Angela Moles	Victoria University of Wellington
John Sawyer	Department of Conservation
Rudi Schnitzler	Victoria University of Wellington

Susan Timmins
Chair Conference 2006 Organising Team

General Information

Registration Desk

The registration desk in the Maclaurin Foyer will be staffed on Sunday 4.00 pm to 6.00 pm, on Monday, Tuesday, and Thursday 8.00 am to 5.30 pm, and on Friday 8.00 am to 2.00 pm.

Registration desk phone numbers: 027 563 6556; fax (04) 463 6550.

Assistance during the conference

Go to the registration desk, or ask any member of the organising team (who will be wearing yellow name badges).

Conference Notice Board

The conference notice board, near the registration desk, will display notices, including the updated programme and floor maps, as well as messages and notices for delegates.

Email, Computers, Photocopying, and Faxes

All computers in the foyer areas are available for delegates for email and web access. Get a login access code from the registration desk.

Several computers have been put aside for word-processing and presentation formatting. Please contact the information desk if you wish to use one of these terminals.

For small amounts of photocopying and urgent faxes, see the registration desk.

Mobile Phones/Pagers

As a courtesy to others, please ensure that all mobile phones and pagers are turned off, or on silent mode, during sessions.

A public telephone is available in the Cotton Foyer; this is a card phone only. Cards can be purchased from Vic Books in the Student Union Building (see campus map at back of handbook).

Name Badges

Please wear your name badge at all times during the conference.

Conference t-shirts

Conference t-shirts are available for $20 at the registration desk. Numbers are limited, so buy early to avoid disappointment.

Parking

Parking is extremely limited around the university. There are free car parks on Kelburn Parade, but the maximum stay is two hours (and in some spots, only five minutes). The wider area surrounding the university is a coupon parking zone. Get your $4.00 parking coupon from Vic Books in the Student Union Building (see campus map). Check what type of zone you are parked in, and the maximum stay. And do not park in residents' parking zones. The presence of parking wardens is guaranteed!

Transport

Walking
There are several walking routes from downtown Wellington up to Victoria University. See Wellington City map for Allenby Terrace steps off Boulcott Street, and any roads that lead to The Terrace. From The Terrace, turn into Salamanca Road, this eventually meets Kelburn Parade, which is the main road through the university. Alternatively, take the first left off Salamanca Road (Mount Street), then veer right onto McKenzie Terrace, which is a steep walking path that goes up to the university.

Cable car
The cable car runs every 10 minutes from Chews Lane, off Lambton Quay. This takes you up to the university (penultimate stop) and to the Botanic Gardens (final stop).

Buses
Buses run down Kelburn Parade into town. Number 22 and 23 buses go through town to Courtenay Place via Lambton Quay, and number 18 buses go down Ghuznee Street to Taranaki Street, then south. These buses also travel in the opposite direction, taking you back up to the university. Number 17 buses also run (less frequently) between the university and Wellington railway station.

Taxis
The nearest taxi stand is the corner of Kelburn Pde and Salamanca Rd (see campus map). Or ring Wellington Combined Taxis (04) 384 4444.

If you are travelling in a large group, it is often cheaper to book a shuttle bus through Cooperative Shuttles on 387 8787.

When booking a taxi or shuttle, the street address for the conference venue is Maclaurin Building, Gate 6, Kelburn Parade.

Instructions for Oral Paper Presenters

- Presentations can be supported by overhead projector or PowerPoint only.
- PowerPoint presentations—please hand in your presentation on CD or memory stick to the registration desk at least one day preceding your presentation. We ask that your PowerPoint file name begin with your session number followed by your surname, e.g. 12Burns.ppt.
- Speaking time is 15 minutes. The Session Chairperson will warn you at 12 and 14 minutes, and stop you at 15 minutes.
- A 3-minute question period will follow each presentation. This is the audience's part of your presentation, so please allow it to happen.
- On the day of your presentation—please report to your presentation room 10 minutes prior to the commencement of the session in which your presentation is scheduled so that your Session Chairperson can acquaint you with the equipment and run over the timing procedure.
- If you are the presenting author, but not the first listed author for your paper, please alert the session chair so they can announce this when introducing you.

Instructions for Poster Paper Presenters

- Your poster paper has been allocated a number (see list of poster papers, last blue page in handbook).
- Please erect your poster onto a poster panel in the space bearing your number. The poster panels are located in the marquee.
- Your poster paper can be fixed with pins or with Velcro dots. Both pins and dots are available from the registration desk.
- The poster session on Monday evening, 5.50 pm – 7.30 pm in the Maclaurin Foyer and marquee, provides an opportunity for delegates to discuss posters with authors.

Please attend your poster at this time (it may have been moved to the Maclaurin Foyer for the poster session).
- Posters can remain erected in the marquee for the full duration of the conference. Please remove them by Friday 2.00 pm).

Instructions for Session Chairpersons

- Before proceeding to your session room, please check your watch against the clock at the registration desk. This will ensure all sessions run synchronously.
- Please be present in your session room 10 minutes prior to the commencement of your session. The Lecture Venue Assistant (in yellow t-shirt) will acquaint you and your speakers with the audiovisual and light controls, the microphone system and general room setup.
- Please ensure that all PowerPoint presentations are visible on the computer desktop and ready to go before the session begins.
- Please start sessions on time, even if people are still arriving.
- It is essential that sessions run precisely to the schedule indicated, given that there are four parallel sessions. Hence, you have the unenviable task of ensuring that speakers start and finish on time.
- Please keep speakers to time. Give them a warning at 12 and 14 minutes, AND STOP THEM AT 15 MINUTES.
- Ensure that question time does not extend beyond the allocated 3 minutes, even if there are questions still requiring responses.
- If a speaker finishes early, or if a talk is cancelled, do not advance the programme beyond the schedule. Use the time by inviting questions from the previous presentation/s.
- In addition to the speaker's time and question time, there are 2 minutes allowed for introductions and setting up the speaker.
- If the presenting author is not the first listed author on the paper abstract, please announce this when introducing the speaker.
- Please announce any housekeeping notices at the beginning and end of your session.
- We appreciate your crucial role in making the conference a success and appreciate your willingness to act as a Session Chair—thank you.

Awards

Student Awards

The New Zealand Ecological Society and Ecological Society of Australia will be offering six joint awards for the best student presentations:

- Best presentation by a student
- Highly commended presentation by a student
- Best poster by a student
- Highly commended poster by a student
- Marilyn Fox Award for best inaugural presentation (i.e. first presentation at a national or international conference)
- Society of Conservation Biology prize for best presentation on a conservation topic.

The ESA will also offer the following additional student prizes:
- Best presentation on the biology or cultivation of an Australian native plant, sponsored by Australian Flora Foundation
- Best poster on the biology or cultivation of an Australian native plant, sponsored by Australian Flora Foundation
- Best presentation on an ecological management or restoration topic, sponsored by Blackwell/EMR
- Best poster on an ecological management or restoration topic, sponsored by Blackwell/EMR.

To be eligible for any of these awards, students must:

- be presenting their paper or poster at the main conference
- be presenting on their student project
- be currently enrolled as a student, or have been enrolled within the last 12 months
- be a member of NZES or ESA
- have indicated their student status when registering for the conference (student talks are indicated by an asterisk on the programme).

Judges of student awards
The judging of student awards is organised by David Keith and Ruth Guthrie. Please see David or Ruth if you would like to volunteer to be a judge. Judges will meet in COLT118, initially at morning tea time on Monday, then again later in the week.

Student travel grants
Applications for NZES and ESA student travel grants are now closed. NZES grants are decided—and students are notified—prior to the conference. Successful students will be sent a cheque for NZ$250 as a contribution towards their expenses for attending the conference.

Other Awards

These will be presented at the conference dinner:

- NZES Best publication by a new researcher (NZES members only)
- NZES Te tohu taiao award for ecological excellence (NZES members only)
- NZES Ecology in Action Award (NZES members only)
- ESA Gold Medal Award (ESA members only)
- NZES Life Membership (NZES members only).

Food and Drink

Morning and afternoon tea and lunch

These will be served in the Maclaurin Foyer and marquee at the times indicated in the Conference Programme.

Food and drink for purchase

In addition, food and coffee can be purchased from Galleria café, upstairs in the Maclaurin Foyer, open from 8.00 am to 3.30 pm all week.

You can buy both food and alcohol at the Staff Club on the 2nd Floor of Rankine Brown Building (entrance is in the Library foyer). The Staff Club café is open Monday to Wednesday 08.00 am to 3.00 pm, and Thursday and Friday 08.00 am until late. The Staff Club bar is open Monday to Friday 12.00 pm to 2.00 pm, and Thursday and Friday 4.30 pm until late.

Social events

Welcome Function

Sunday 27 August, 5.30 pm – 7.30 pm in the Maclaurin Foyer at the conference venue.

This event is included in all full registration fees, and includes drinks, finger food, and a kapa haka group. People who have registered for this event have a blue dot on their name badge, and 3 drink vouchers. Additional drinks can be purchased from the bar.

Poster Session

Monday 28 August, 5.50 pm – 7.30 pm in the Maclaurin Foyer and marquee at the conference venue.

This event is included in all full registration fees and day registrations for Monday, and includes drinks and gourmet pizza. People who have registered for this event will have a red dot on their name badge, and 3 drink vouchers. Additional drinks can be purchased from the bar. If you haven't registered for this event, but would like to, please go to the registration desk by the end of lunchtime on Monday. We want to order enough pizza.

Maori Feast

Tuesday 23 August, 5.45 pm – 9.00 pm in the Mount St Bar & Café, in the Student Union Building on campus (see campus map).

This event costs $35.00, and is not included in the registration fee. This spectacular traditional M_ori feast will include hangi, seafood platters, dessert, and non-alcoholic drinks. Beer and wine can be purchased from the bar. People who have purchased a ticket have a green dot on their name badge. Tickets may still be available for purchase—please enquire at the registration desk by the end of lunchtime on Tuesday. The New Zealand Ecological Society's new website will be launched at this event. The M_ori feast is kindly sponsored by Blackwell Publishing.

Conference Dinner

Wednesday 24 August, 6.30 pm – 12.30 am at the Westpac Stadium.

This event costs $70/$60, and is not included in the registration fee. This main social event of the conference, not to be missed, includes free drinks for the first three hours, a sumptuous dinner, and fantastic live music. Additional drinks can be purchased from the bar. The Stadium is a 10 minute walk from the railway station, a cheap taxi ride (see Wellington City map), or you can drive, and park there for $4. Please look at the Stadium map for directions to the "Functions Centre" entrance. People who have paid for the dinner will have a yellow dot on their name badge. Spaces may still be available—please enquire at the registration desk by the end of lunchtime on Tuesday.

Thursday night

After the NZES AGM (sushi and OJ provided), you have a free night to explore Wellington's renowned cafe/theatre/live music culture. Other options include a night tour of Karori Wildlife Sanctuary (phone 920-2222) or a visit to Te Papa (open until 9.00 pm).

Field Trips

If you booked a field trip when you registered, you will find a ticket in your satchel. If you haven't booked, but would like to go on a field trip, check at the registration desk—there will be spaces available on some trips.

Most trips will depart by bus from, and return to, Platform 9 at the Railway Station (see Wellington City map). There are two exceptions: Matiu/Somes Island trip and Wellington City and Sea (see below for details). All trips will return in time for the conference dinner. Wellington weather can change very quickly—please bring a raincoat, warm clothes, and sturdy walking shoes for all trips. Lunch and drinks will be provided on all trips.

Wellington City and Sea

Sample the rich variety of habitats and restoration activities within half an hour's drive of (and right within) the city centre. We plan to visit the Town Belt, South Coast, forest remnants, and forest, stream, wetland and coastal restoration projects. Trip also includes short stops at Karori Wildlife Sanctuary and Otari-Wilton's Bush (see below). There will be commentary from city council staff and restoration project leaders. Not all driving: plenty of opportunity to stretch your legs.

Please gather at Platform 9 at the Railway Station by **8.30 am** for an 8.45 am departure. The trip will finish at 4.30 pm at Te Papa Museum (see Wellington City Map).

Wainuiomata Mainland Island

This is a rare opportunity to see the best example of unlogged lowland podocarp forest in the lower North Island. The area has been managed for water supply purposes for over 100 years. In 2002, Greater Wellington Regional Council decided to manage parts of the catchment as a 'mainland island', not as a visitor destination, but to improve the ecological health of the forest for its own sake. The mainland island is still in its early stages. A bait-station grid was set in place in early 2005, in time for 1080 operation of the whole water collection area the following August. Currently, rodents are controlled through the 100 m _ 150 m bait-station grid, and possums are trapped.

Please gather at Platform 9 at the Railway Station by **8.45 am**. The bus departs at 9.00 am, returning 5.00 pm.

Karori Wildlife Sanctuary (Full Day Tour & Dirty Hands Tour)

Karori Wildlife Sanctuary is a community conservation initiative that has driven the development of a 250 ha wildlife sanctuary as a safe haven for endangered native birds and other wildlife, located minutes from downtown Wellington. A predator-proof fence surrounds the Sanctuary, protecting the wildlife and ensuring the forest regenerates to its former glory. It provides habitat for at least 24 species of native birds, of which nearly half have been introduced since the fence was constructed and habitat restoration undertaken. Tuatara have also been reintroduced, and they are frequently seen. It is undoubtedly one of the country's flagship conservation projects.

1. Full Day Tour: You will spend all day at the Sanctuary. Experienced guides will lead tours on several of the Sanctuary tracks, and you will also have plenty of free time to explore at your own pace.

2. Dirty Hands Tour: A more active full-day trip involving supervised hands-on volunteer activities. Tools and gloves will be provided.

Please gather at Platform 9 at the Railway Station by **8.45 am**. The bus departs at 9:00 am, returning at 4.30 pm.

Karori Wildlife Sanctuary (Half Day Tour)

You will spend half a day at the Sanctuary. Experienced guides will explain the history of the Sanctuary and lead short tours, and you will also have free time to explore the lower part of the Sanctuary.

Please gather at Platform 9 at the Railway Station by **8.15 am**. The bus departs for the Sanctuary at 8.30 am. In the afternoon, this bus will be used for the Belmont Regional Park Half Day Tour. It will leave the Sanctuary at 12.00 pm sharp, go to Platform 9 at the Railway Station to drop off and pick up passengers, then go to Belmont Regional Park. It is possible to do both these half day trips.

Belmont Regional Park (Half Day Tour)

One of Wellington's largest and most diverse regional parks, only recently acquired in full public ownership. Belmont Regional Park lies between the Hutt Valley and the Porirua–Pauatahanui basin. It features a significant remnant of old-growth forest, and large areas of regenerating bush and stream environments. It has been extensively farmed for a long time and the transition from cattle to mixed-use farm park to public regional park offers interesting ecological and social challenges. The trip offers good walking, spectacular views, and plenty of ecological interest.

Please gather at Platform 9 at the Railway Station by **12.15 pm**. The bus departs at 12.30 pm, returning at 4.30 pm. This bus will be coming from Karori Wildlife Sanctuary. It will leave the Sanctuary at 12.00 pm sharp, come to Platform 9 at the Railway Station to drop off and pick up passengers, then go to Belmont Regional Park. It is possible to do both these half day trips.

Kapiti Island

Kapiti Island is managed by the Department of Conservation as a nature reserve. The island is now free of all mammalian pests and is a spectacular setting to view threatened birdlife. Getting there involves a 45 minute coach ride north from Wellington to the spectacular Kapiti coast, followed by a 15 minute boat trip. You will be on the island for five and a half hours—you will be met by the ranger and given a briefing on the island and then you will be free to explore at your own pace. The boat trip is weather dependant. If it is unsafe the boat will not run, and we will visit other attractions on the Kapiti Coast.

Please gather at Platform 9 at the Railway Station by **7.45 am**. The bus departs at 8.00 am, returning to Platform 9 at the Railway Station by 5.00 pm.

Threatened Plants Tour

Urban environments offer opportunities for threatened species recovery, both in terms of protecting wild sites as well as ex-situ management. Wellington is no exception. Threatened plant species are now being used in urban plantings as a stage in the recovery of species in the wild. This field trip will visit nationally and regionally threatened plant populations and areas being used for ex-situ management of threatened plants, such as Otari Native Botanic Garden. This 100 ha plant sanctuary and forest reserve is dedicated solely to native plants. The trip will also visit Wellington Botanical gardens and a number of traffic islands and urban planting sites throughout the city. The trip will focus on species recovery and monitoring of endangered plant life.

Please gather at Platform 9 at the Railway Station by **8.30 am**. The bus departs at 8.45 am, returning at 4.00 pm.

Matiu/Somes Island

There is something special about an island and Matiu/Somes Island is certainly special. Although it is set in Wellington Harbour close to the activity of the city, it is the genuine article—an ecologically separate place without invasive mammals. With a long history of Maori settlement, as a human and animal quarantine station, and wartime internment camp for enemy aliens; the island is now a scientific and historic reserve. The original coastal forest is being restored through hundreds of hours of effort by volunteer groups. Giant weta, tuatara, red-crowned parakeets and North Island robins have been returned to the ecosystem, and other animal reintroductions are planned. The fieldtrip features a late start, a short 15 minute ferry trip from the heart of the city, and an early return to the city. There will be short talks on the restoration projects and plenty of time to walk the gentle track network to the lighthouse and elsewhere on the island. This trip is weather dependant. If it is unsafe, the ferry will not run, and we will go to Karori Wildlife Sanctuary instead.

Please gather at Dominion Post Ferry Terminal (near number 19 on the Wellington City map) at **9.45 am**. The commuter ferry we are catching will depart at 10.00 am sharp. It will leave the island at 3.30 pm, back at the ferry terminal by 3.45 pm.

Visitor Information

Galleries/Museums

Museum of New Zealand Te Papa Tongarewa, known as Te Papa, is in a striking location on the waterfront (off Cable Street), and the interior spaces and great exhibitions make it well worth a visit. It has free admission, with ticketed (paid) entry to some exhibits. For more information about current exhibitions and opening hours, phone 381 7000.

Wellington City Gallery, located in the Civic Centre, has notable national and international exhibitions (phone 801 3952).

Out and About

The historic Wellington Cable Car runs every 10 minutes from 7:00 am to 10:00 pm weekdays (9:00 am to 10:00 pm weekends). It travels between the shopping district of Lambton Quay and the Wellington Botanical Gardens, offering panoramic views of the Wellington harbour.

Wellington City Heritage Trails. Brochures for these walks can be obtained from the Visitor Information Centre, Civic Square.

Karori Wildlife Sanctuary. An inner city bird sanctuary with beautiful walks, including night walks to hear (and sometimes see) kiwi and see glow worms. See information under Field Trips in this handbook, or phone 920 2222.

Otari-Wilton's Bush. This is the only public botanic garden in New Zealand dedicated solely to native plants. It is classified as a Garden of National Significance by the Royal New Zealand Institute of Horticulture. This unique plant sanctuary and forest reserve consists of 100 hectares of native forest and five hectares of plant collections. Some of Wellington's oldest trees are here, including an 800-year old rimu. Entry is free.

Wellington Natural Encounters and Eco Tours. These offer tours to view New Zealand fur seals on Wellington's south coast as well as bird tours of the Kapiti coast and Kapiti Island.

For south coast seals phone 0274 534 880 or freephone 0800 7325 27, or email safari@sealcoast.com, www.sealcoast.com.

For bird tours phone 905 9055 or 021 122 0939, or email rosettahouse@paradise.net.nz, www.rosetta.co.nz.

Eating Out

Wellington has masses of cafes and restaurants to cater for every taste. Walk down from the university and try Willis Street, Cuba Street or Courtney Place (see Wellington City map). A sample of the huge range available:

Astoria, 159 Lambton Quay, phone 473 8500

Astoria is a large European style café on Lambton Quay. Opening out onto Midland Park, Astoria is the perfect place to sit outside and enjoy the sun. Open Monday to Thursday 7am - 7.30pm, Friday 7am - 8.30pm, Saturday and Sunday 9am to 4pm.

Chow, 45 Tory St, phone 382 8585 or 11 Woodward St, phone 473 4474

Modern Asian cuisine served in stylish surroundings. They do not take bookings, but have a large bar area with an extensive cocktail and wine list. The Woodward Street eatery is also a cocktail bar, and serves a wide range of noodles, salads, deserts, sake and tea.

Flying Burrito Brothers, 176-182 Cuba Street, phone 385 8811

This funky Mexican-style restaurant has tasty large-plated meals, and an excellent range of Tequila and imported beers. They do not take bookings, but the bar is a vibrant place to pass the time. Open 6 nights a week till late.

Kopi, 103 Willis Street, phone 499 5570

Centrally located and affordable, the menu includes all the old favourites (satay, rendang, curries, laksa and roti chenai) as well as lesser-known dishes. Open 7 days for lunch and dinner, 10am till late.

Leuven Belgian Beer Café, 135 Featherston Street, phone 499 2939

Home to the Stella Artois Brewery, this popular restaurant and bar is an authentic 1930's Belgian Beer café, with European beers on tap. Open Monday to Friday 7am till late, Saturday and Sunday 9am till late.

Lido Café, 81-85 Victoria Street, phone 499 6666

One of the more established inner city cafés located opposite Civic Centre. This Wellington favourite has great coffee, a good range of wine, and affordable café-style food. Open for breakfast, lunch and dinner 7 days a week.

Olive Café, 170-172 Cuba Street, phone 802 5266

Well known for their great coffee and Pacific-rim cuisine. Located in upper Cuba Street, Olive has a spacious courtyard and relaxed dining area. Open early till late, 7 days and 5 nights a week.

Please note: smoking is prohibited in all New Zealand hospitality venues, including bars, restaurants, cafes, and casinos. If you smoke, please remember to smoke outside.

Health and Safety

General Emergency

For fire, ambulance or police, dial 1 for an outside line, then 111.

Fire

If you discover a fire or hear continuous ringing of the fire alarm, leave the building immediately and assemble in the Maclaurin car park (beside the marquee).

Earthquake

In an earthquake, please remain in the building. Move away from any windows, or equipment that may fall, and take immediate shelter under, or close by, solid furniture such as tables or desks. If no furniture is available, drop to your knees, with your back to windows, clasp both hands firmly behind your head and bury your head. Most importantly, keep calm.

Evacuation

The continuous sounding of an alarm will indicate that the building is to be evacuated. When the alarm is activated, all magnetically locked doors will be released, making emergency escape routes available for use. Leave the building immediately using the nearest stairway or exit. Please assemble in the Maclaurin car park (beside the marquee).

Doctors and Pharmacies

City Medical Centre
Level 1, 10 Brandon Street, phone 471 2161
8am – 6pm weekdays

After Hours Medical Centre
17 Adelaide Road, Newtown, phone 384 4944
8am – 11pm weekdays
8am – 11pm weekends

Sunley Chemist
74 - 82 Lambton Quay, phone 472 0293
7.30am – 6pm weekdays

Urgent Pharmacy
17 Adelaide Road, Newtown, phone 385 8810
5pm – 11pm weekdays
8am – 11pm weekends

New Zealand Ecological Society (Inc.)

P.O. Box 25178
Christchurch
New Zealand

Notice of 54th AGM

Thursday 31 August 2006
at 5.30 pm

Venue at conference – Maclaurin Lecture Theatre 103

Come along and have your say about the running of your Society, including election of officers for 2007. There are two council positions up for election.

Agenda for NZ Ecological Society AGM

1. **Apologies**

2. **Minutes of last AGM**

3. **Matters arising**

4. **Annual reports**

   - **President**
   - **Treasurer**
   - **Webmaster**

5. **Election of Officers**

6. **Motions**

   1. NZES Newsletter
   Motion: That the NZES newsletter move to a completely electronic publication; except for those members who do not have access to the internet.
   Moved: Peter Bellingham, Seconded: John Sawyer.

   2. Society subscription rates increase
   Motion: That Waged society subscription rate increases by $5.00, and the Overseas Waged subscription rate increase by $10.00. Local unwaged rates will remain the same. The Society rules state that the council has the power to set the membership fees, but the council felt it prudent to put this to the society for ratification.
   Moved: John Sawyer, Seconded: Rachel Keedwell.

7. **General Business**

New Zealand Ecological Society
MEMBERSHIP APPLICATION

Please complete all sections and email or post to the address below

A PERSONAL DETAILS

Circle title: Prof Dr Mr Mrs Ms Miss	**Last name:**	**First name(s):**
Mailing address:		
Email:		
Phone bus.:	**Fax bus.:**	**Phone private:**

B MEMBERSHIP DETAILS

Occupation/expertise:

C TYPES OF MEMBERSHIP AND SUBSCRIPTION RATES (2005)

(please tick the class for which you qualify)

Open to any person interested in ecology, including botanists, zoologists, soil scientists, conservation managers, teachers, students, amateurs and professionals

Full	Receive journal and newsletter	$75.00* p.a.
Unwaged member	Is available only on application to Council for full-time students, unwaged or retired persons. Unwaged members may receive the journal but must specifically request it.	$45.00* p.a.
Joint	Joint members get one copy of the journal and newsletter to one address	$75.00* p.a.
Overseas full	Receive journal and newsletter	$95.00* p.a.
Overseas unwaged	Is available only on application to Council for full-time students, unwaged or retired persons. Unwaged members may receive the journal but must specifically request it.	$65.00* p.a.
School	Educational institutions may receive the newsletter at the cost of production to stay in touch with Society activities by application to Council	$12.00 p.a.

* There is a $10 rebate for members who renew before 15 February each year and for new members

Make cheques payable to: NZ Ecological Society
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☐ Tick if you wish to make a donation to the Kauri Fund (see NZ Ecological Society website for details)

☐ Tick if you don't have an email address to receive the newsletter (which is sent out electronically)

Signature/email address of applicant: _____ Date: _____

NZES National Secretariat, PO Box 25 178, Christchurch. Tel: (03) 318 1056 Fax: (03) 318 1061
Email: nzecosoc@paradise.net.nz Website: www.nzes.org.nz/

ECOLOGICAL SOCIETY OF AUSTRALIA

The Ecological Society of Australia is a professional organisation established to promote ecological research and communication. The Society's constitutional objectives are:

- To promote the scientific study of all organisms in relation to their environment.
- To promote the application of ecological principles in the development, use and conservation of Australia's natural resources.
- To advise governmental and other agencies in matters where the application of ecological principles may be of assistance.
- To foster the reservation of natural areas for scientific and recreational purposes and seek to ensure that such areas are soundly managed.

The Ecological Society provides the following membership benefits:

- *Austral Ecology*, a bi-monthly journal of international standing
- The ESA *Bulletin*, a newsletter for members.
- An electronic mail discussion list for rapid communications, exchange of views, and advertising jobs or grant application deadlines.
- Online membership database @ **www.ecolsoc.org.au**
- Annual symposia and open forums, workshops and meetings.
- Links with international ecological bodies, including INTECOL.

Category	Australian (incl. GST)	International (+ $10 post)
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**Please contact ESA if you feel that you are entitled to a reduced membership for reasons other than income*

Membership is for the calendar year, and includes *Austral Ecology* (6 issues/yr), the *Bulletin* (4 issues/yr) and reduced Conference registrations.
Membership applications must be supported by a Proposer and Seconder who are current members of the Society. Contact the Membership Manager if you need help identifying suitable nominators.
Payments can be made for 1, 2, or 3 years in advance.

Application Form

We, the following: **Proposer**: _____ **Seconder**: _____
being financial members of the Society, propose:

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Work telephone: (_____)_____ Home telephone: (_____)_____

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Institutional affiliation: _____ Nominee's formal qualifications:_____
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I accept nomination and undertake to abide by the rules of the Society, and to pay my annual subscription by the due date of January 1st each year.

Signature: _____ **Date:** _____

APPLICATION FOR CONCESSIONARY MEMBERSHIP

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Standard	$82.50	$85.00
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Landcare Research
Manaaki Whenua

Landcare Research is a leading-edge science provider that partners a range of New Zealand, Australian and international agencies to protect, enhance and restore the natural environment. With more than 300 science staff working in New Zealand and around the world, we provide a broadly-based capability that helps achieve biodiversity outcomes ranging from genes to entire ecosystems. Landcare Research delivers pragmatic science and operational tools that can be readily integrated to improve conservation management and policy development.

Our science staff is organized around research teams focused on:

- **Conserving biodiversity by reducing threats and risks to indigenous biota, and providing tools for informed reserve selection and design**

- **Understanding the processes that drive change in natural ecosystems in order to develop strategies that enhance their resilience to disturbance**

- **Understanding how invasive plants and animals (along with the diseases they carry) threaten the environment, agricultural productivity and social wellbeing**

- **Developing new tools for targeted invasive species management based on emerging technology, and improving the cost-effectiveness and humanness of existing tools**

- **Identifying important groups of organisms (plants, arthropods, fungi and bacteria), and understanding their phylogenic and phylogeographic relationships to better manage biodiversity assets and reduce biosecurity risks**

If you would like to know more about Landcare Research and what it can offer, take a look at www.landcareresearch.co.nz, or contact David Choquenot (General Manager, Biological Systems) on +64 9 5744129 or choquenotd@landcareresearch.co.nz.

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TE WHARE WĀNANGA O TE ŪPOKO O TE IKA A MĀUI
VICTORIA
UNIVERSITY OF WELLINGTON

School of Biological Sciences

www.vuw.ac.nz/sbs

Located on the University's original Kelburn campus, the School has an academic staff of about 40 who teach programmes that span the full range of contemporary biology, from biochemistry, molecular biology, genetics, and biomedical sciences to ecology, marine biology, molecular evolution, chemical genetics, systematics, conservation, ecological restoration and natural history. It offers a full range of undergraduate and postgraduate degrees and qualifications and presently supports about 120 postgraduate students.

Specialist Masters-level teaching programmes in ecological sciences include:

- **Master of Conservation Biology**, a 1-year professional degree taught half at Victoria University and half at the University of New South Wales in Sydney.
- **Master of Science in Ecological Restoration** taught in collaboration with Massey University and Karori Wildlife Sanctuary.
- **Master of Marine Conservation**, an 18-month programme covering New Zealand and tropical marine conservation practice and taught in conjunction with University of Queensland.
- **Master of Science in Ecology and Biodiversity**

The School hosts three applied research centres, and has strong links with the on-campus Malaghan Institute of Medical Research.

The Centre for Biodiscovery draws from natural products and synthetic chemistry research in the School of Chemistry and Physics, and mechanism of action studies and proteomics in the School of Biological Sciences. It has links to research in mathematics, computing science and behavioural psychology. (www.vuw.ac.nz/biodiscovery).

The Centre for Marine Environmental and Economic Research (CMEER) focuses on pure and applied research in marine biology, including aquaculture, fisheries, environmental impacts, coastal protection, biodiversity and conservation. It seeks to communicate research findings that will improve public awareness, practice and policy on marine-related issues (www.vuw.ac.nz/cmeer).

The Centre for Biodiversity and Restoration Ecology is the School's newest research institution. Its mission is to undertake research on biodiversity and restoration ecology, fostering international cooperation and exchange, to benefit the ecological and economic management of the natural resources of New Zealand and the wider Pacific region. It seeks to support the burgeoning public interest in restoring damaged and degraded ecosystems (www.vuw.ac.nz/biodiversity).

Email: biosci@vuw.ac.nz **Tel:** +64-4-463-5339
Physical Address: School of Biological Sciences, Level 5, New Kirk Building, Kelburn Parade, P.O. Box 600, Wellington 7010, New Zealand.

Conference Overview

TIME	Mon 28th	Tues 29th	Wed 30th	Thurs 31st	Fri 1st
8.00 am	**Registration and coffee**	**Registration**		**Registration**	**Registration**
8.30 am to 10.30 am	**Conference opening** Concurrent sessions: Ecology across the Tasman Ecology across the Tasman Ecology across the Tasman	Concurrent sessions: 13 Modelling 14 Urban ecology 1 15 Matters of scale 16 Animal miscellany	Field trips	Concurrent sessions: 29 Animal pot-pourri 30 Restoration Australasia 1 31 Fragmentation 32 Fire	**9.00 am** Concurrent sessions: 45 Wetlands 46 Restoring Australasia 5 47 Conservation strategies 48 Wildlife disease ecology 1
10.30-11.00 am	**Morning tea**	**Morning tea**		**Morning tea**	**10.40 am Morning tea**
11.00 am to 12.40 pm	Concurrent sessions: 1 Historic Perspectives 2 Seed dispersal 3 Sampling efficiencies 4 Reptile ecology	Concurrent sessions: 17 Invasive plants 2 18 Urban ecology 2 19 Honeydew 20 Foraging ecology		Concurrent sessions: 33 Herbivory 1 34 Restoration Australasia 2 35 Valuations & judgements 36 Plants at high altitudes	Concurrent sessions: 49 Avian & Gold Medal 50 Restoring Australasia 6 51 In coastal waters 52 Wildlife disease ecology 2
12.40-1.40 pm	**Lunch**	**Lunch**		**Lunch**	12.30 pm **Closing & Awards**
1.40 pm to 3.40 pm	Concurrent sessions: 5 Invasive plants 1 6 Molecular applications 7 Ecology and Law 8 Marine community ecology	Concurrent sessions: 21 Invasive animals 22 Urban ecology 3 23 Botanical pot-pourri 24 Pollination 1		Concurrent sessions: 37 Agro-ecosystems 38 Restorating Australasia 3 39 Insects,plants,wood debris 40 Riverine ecology	**1.30 pm Lunch**
3.40-4.10 pm	**Afternoon tea**	**Afternoon tea**		**Afternoon tea**	
4.10 pm to Mon **5.50 pm** Tues **5.30 pm** Thur **5.30 pm**	Concurrent sessions: 9 Conservation miscellany 10 Spatial ecology 11 Ants at work 12 Agro-ecosystem resilience	Concurrent sessions: 25 Influences of heat 26 Urban ecology 4 27 Vegetation assessment 28 Pollination 2		Concurrent sessions: 41 Herbivory 2 42 Restoring Australasia 4 43 Conservation miscellany 2 44 Big botany	
Evening	**Posters and Pizza** 5.50 - 7.30 pm	**Maori feast** 5.45 - 9.00 pm	**The Dinner** 6.30pm - 12.30am	**NZES AGM** 5.30 - 6.30 pm	

MONDAY 28 August

Time	Venue: MCLT 103	Venue: MCLT 101	Venue: MCLT 102	Venue: COLT 122
08.30	Conference Opening and Welcome			
				*Indicates student
09.15	Session 0.1 Ecology across the Tasman Chair: Peter Fairweather	Session 0.2 Ecology across the Tasman Chair: Susan Timmins	Session 0.3 Ecology across the Tasman Chair: Caroline Gross	
09.15	**Choquenot:** Landscape composition and plant-herbivore interaction: population regulation and competition between generalist herbivores.	**Sawyer: NZES Presidential Address:** Is it time to close the borders?	**Kelly:** Inbreeding: a handy backup on islands, or a pernicious drain?	
09.40	**Price:** Defining and quantifying structural gradients in Australian landscapes.	**Clarkson:** Indigenous biodiversity, restoration, and the perfect New Zealand city.	**Efford:** Rats, mice, and possums: comparative long-term dynamics in the Orongorongo Valley, New Zealand.	
10.05	**Dawes-Gromadzki:** Can soil macroinvertebrates reduce sediment export from grazing lands to the Great Barrier Reef Lagoon?	**Hobbs:** Setting and achieving effective and realistic restoration goals in a changing world.	**Turton:** Initial effects of Severe Tropical Cyclone "Larry" on forests in far north Queensland.	
10.30	Morning Tea			
11.00	Session 1: Historic Perspectives Chair: Matt McGlone	Session 2: Seed Dispersal Chair: Kevin Burns	Session 3: Sampling efficiencies Chair: Philip Seddon	Session 4: Reptile Ecology Chair: Michael Bull
11.00	**Fromont:** Long-term vegetation-climate dynamics of the late Pliocene and early Quaternary in Auckland: evidence from the Patiki-2 pollen record.	**Lamont:** Plant species distribution over the landscape and potential long-distance seed dispersal by emus and kangaroos.	***Sheffield:** Remote sensing of vegetation: effective ground measurements.	***Hoare:** Behavioural plasticity in habitat use enables large, nocturnal geckos *Hoplodactylus duvaucelii*, to persist following invasion by kiore, *Rattus exulans*.
11.20	**Wood:** In the heart of a New Zealand desert: reconstructing the late Holocene, semi-arid ecosystem of the Cromwell Gorge, Central Otago, South Island, New Zealand.	**Anderson:** A moving feast: the influence of landscape context on bird-mediated seed rain into conservation areas.	***Garrard:** Modelling plant detectability using failure time analysis: implications for threatened species management.	***McKenzie:** Can adult tuatara (Reptilia) survive on the New Zealand mainland in the presence of mice.
11.40	***Curran:** Trait comparisons within rainforest pairs across high and low rainfall habitats confirm the derivation of a dry rainforest flora.	***Wotton:** Where do all the seeds go? Estimating dispersal distances from pigeon movements and seed retention times.	**Wintle**: Efficient monitoring and better environmental outcomes using Bayesian decision theory.	**Hoehn:** The tails of two geckos: does dispersal prevent extinction in recently fragmented populations?
12.00	***Martin:** Storms, trees, and forest dynamics: a history of extreme wind events reconstructed using tree rings, North Island, New Zealand.	***O'Connor:** How effective are tui as seed dispersers?	***Ensbey:** Detectability and abundance estimation: assessing a mixture model by simulation.	***Moore:** The social mating system of tuatara (*Sphenodon punctatus*).
12.20	**McGlone:** Early Holocene warmth in New Zealand as an analogue for greenhouse warming.	**Burns:** Seed dispersal by weta.	**Seddon**: Not seen, or not there? Accounting for incomplete detectability in estimating patch occupancy of endangered New Zealand skinks.	**Bull:** Monogamous lizard pairing not the result o partner shortage.
12.40	Lunch			

Time	Venue: MCLT 103	Venue: MCLT 101	Venue: MCLT 102	Venue: COLT 122
1.40	**Session 5: Invasive plants 1** **Chair: Jon Sullivan**	**Session 6: Molecular applications** **Chair: Mohammad Fatemi**	**Session 7: Ecology and Law** **Chair: Paul Beverley**	**Session 8: Marine community ecology** **Chair: Jeffrey Shima**
1.40	**Schallenberg:** *Didymosphenia geminata* and New Zealand lotic food webs.	**Baling:** New Zeland fairy tern: endemic or common? A study using mitochondrial DNA.	**Beverley:** Overview of ecology and the law.	**Fairweather**: Evidence for wasp-waist dynamics in food webs from two Australian rocky seashores
2.00	**Vieglais**: Managing the emergent bioinvasion of *Didymosphenia geminata*, a Northern Hemisphere alga threatening the freshwaters of New Zealand.	***Sugimoto:** Molecular analysis of Amur leopard using faecal samples.	**Preston:** Sentencing for threatened species offences.	**Turner:** Small-scale structure of canopy dominated macroalgal systems on the temperate reefs of South Australia.
2.20	***Harris:** The influence of introduction history variables on the distribution and abundance of exotic vines and scrambers in Australia.	***Nelson:** The impact of reproductive divergence and clonality on the genetic diversity of the threatened species *Grevillea rhizomatosa* Olde and Marriot (Proteaceae).	**Lang:** The ecological objectives of area-based protection tools in New Zealand's marine law - a place for biodiversity.	**Moore:** Negative effects of biodiversity on epiphyte biomass in a mixed species artificial-seagrass assemblage.
2.40	***Brandes:** *Tropaeolum speciosum*: a super weed?		**Mooney:** Recovery planning – is it working?	***Hidas:** Patterns of abundance, recruitment and fecundity for an intertidal barnacle approaching its range limit on the southeast coast of Australia.
3.00	**Sullivan:** Kiwifruit and palms (Warning: parental supervision required).	**Fatemi:** High level of genetic diversity among disjunct populations of the wind pollinated shrub: *Bertya ingramii* (Euphorbiaceae).	**Sharpe:** The challenges of using systematic concepts in regulation.	***Geange:** The effects of community assembly on recruitment success in a guild of coral reef fish.
3.20			**Bekessy:** A legal challenge to forestry in Tasmania – the use of a population model for the wedge-tailed eagle.	**Shima:**. Demographic connectivity in marine metapopulations
3.40	**Afternoon Tea**			
4.10	**Session 9: Conservation miscellany** **Chair: George Gibbs**	**Session 10: Spatial ecology** **Chair: Alison Matthews**	**Session 11: Ants at work** **Chair: Kirsti Abbott**	**Session 12: Agro-ecosystem resilience** **Chair: Alan House**
4.10	***Traill:** Emergent rules for species conservation – more than just the minimum.	***Ikeda:** Analysis of the movement of loggerhead sea turtles off coasts of Japan.	***Ward:** Coexistence, community structure and the distribution of exotic ants in New Zealand.	**Miller:** An introduction to a symposium on resilience in Australian and New Zealand agro-ecosystems.
4.30	***Whitehead:** The future of whio in Fiordland National Park: is linear stoat trapping sufficient to ensure persistence?	***Auge:** Out of the blue: insights into the New Zealand sea lion terrestrial spatial ecology.	***McNatty:** Interspecific dynamics between land hermit crabs (*Coenobita* spp.) and the invasive yellow crazy ant (*Anoplolepis gracilipes*) on Tokelau.	**Fletcher:** Mathematical tools to operationalise resilience.
4.50	**Holmes:** Management in the face of extinction: the Grand and Otago Skink recovery programme.	**Ellis:** Koala ecology: "known knowns, known unknowns or unknown unknowns?"	**Lester:** Where do our invasive pests come from? Inferring the introduction pathway of Argentine ants (*Linepithema humile*) using mitochondrial DNA.	**Dodd:** Clover root weevil – a case study in agro-ecosystem resilience.
5.10	**Gibbs:** Upwardly mobile weta population seeks most desirable location on a restoration island.	***Lollback:** Ecology of the uncommon and threatened black-chinned honeyeater (*Melithreptus gularis*).	**Hartley:** Argentine ants in New Zealand: temperature limitations at national and microclimatic scales.	**Wedderburn:** A socio-ecological system approach to incorporating biodiversity in landscape change.
5.30		**Matthews:** Roost selection by Gould's long-eared bat *Nyctophilus gouldi* in woodchipped forests of south-eastern Australia.	**Parr:** Habitat-contingent promotion of competitive dominance.	**Burns:** Resilience of forest remnants in New Zealand agro-ecosystems – reservoirs of life or the living dead?
5.50-7.30	**Posters and Pizza: Poster paper session in main foyer**			

TUESDAY 29 August

Time	Venue: MCLT 103	Venue: MCLT 101	Venue: MCLT 102	Venue: COLT 122
8.30	**Session 13: Modelling** **Chair: Peter Williams**	**Session 14: Urban ecology 1** **Chair: Paul Blaschke**	**Session 15: Matters of scale** **Chair: Stephen Hartley**	**Session 16: Animal miscellany** **Chair: Kerryn Parry-Jones**
8.30	**Allen:** Modelling vegetation responses to deer removal at sites with brushtail possum control.	**Clarkson:** Indigenous biodiversity, restoration, and the perfect New Zealand city.	**Nipperess:** Congruence of different operational approaches to circumscribing "units of biodiversity": the influence of spatial scale.	
8.50	**Forsyth:** Predicting the long-term consequences of introduced rodents and red deer in mixed New Zealand forest.	**McDonnell:** A review of existing ecological studies of urban/rural gradients and an alternative approach comparing Melbourne and Auckland.	***Hasenbank:** Egg laying on patchy resources and the importance of spatial scale.	***Valentine:** Mechanisms influencing weed avoidance by native lizards.
9.10	***Ashcroft:** Incorporating source-sink and fragmentation effects into niche-based vegetation models.	**Beaty:** Examining linkages between urban spatial patterns and ecological and social processes in Sydney, Australia.	**Minor:** Is small-scale diversity of soil mites related to land use type?	***Dudaniec:** Impacts of the introduced ectoparasitic fly *Philornis downsi* on Darwin's finches in the Galapagos Islands.
9.30	**North:** Modelling wilding conifer spread and control.	***Lechner:** Population viability analysis of the southern brown bandicoot in the Greater Melbourne Area.	***Mokany:** The consequences of clumpyness: effects of spatial aggregation on competition and ecosystem processes.	***Godfrey:** Host-parasite ecology of the tuatara (*Sphenodon punctatus*).
9.50	**Williams:** Modelling the spread of hawthorn in montane Canterbury.	***Parsons:** The effect of suburbanisation on a small insectivorous Australian bird: the superb fairy-wren (*Malurus cyaneus*).	**Perry:** How from where? Pattern and process in high-diversity shrubland communities in south-western Australia.	***McEntee:** Using artificial eggs to identify predators in ground-nesting banded dotterel (*Charadrius bicinctus*) colonies.
10.10		***Schnitzler:** Area & isolation effect on parasitoid diversity in urban native forest fragments of different size and isolation.	**Searle:** Pattern and process in grazed semiarid rangelands.	**Parry-Jones:** Diverse weights and diverse measures: Glitches in ageing juvenile grey-headed flying foxes *Pteropus poliocephalus*.
10.30	**Morning Tea**			
11.00	**Session 17: Invasive plants (2)** **Chair: Kate McAlpine**	**Session 18: Urban ecology 2** **Chair: Shona Myers**	**Session 19: Honeydew** **Chair: Roger Duncan**	**Session 20: Foraging ecology** **Chair: Ben Reddiex**
11.00	***Warner:** Ecology of *Lilium formosanum* and implications for management.	**Williams:** 160 years of vegetation change in Melbourne's south eastern suburbs.	**James:** A dynamical systems approach to modelling honeydew beetles.	***Barrit:** Combining random search and deterministic attraction in simulations of animal foraging behaviour.
11.20	***Sims:** Do they exist? Evidence for the presence/absence of biological control agents released for the control of groundsel bush (*Baccharis halimifolia*).	**Stewart:** Variation in the community structure of urban woodlands, Christchurch, New Zealand.	**Lach:** Invasive ant meets invasive scales: Consequences for a native host tree.	***Whitehead:** Home-range and vegetation use by adult female kakapo (*Strigops habroptilus*) on Whenua Hou (Codfish Island): correlations with breeding success?
11.40	***Williams:** Impact of *Pinus radiata* invasion in Australian Eucalypt woodland.	***MacKay:** Factors in the success of restored urban forest patches.	**Abbot:** On a sugar high: honeydew helps a crazy ant dominate an island ecosystem.	***Erwin:** Day-to-day variation in sea-surface temperature negatively impacts pelagic tern foraging across the Great Barrier Reef.
12.00	***Baker:** Intrusive impacts of radiata pine (*Pinus radiata*) on surrounding native vegetation.	**Miskelly:** Managing New Zealand cities for indigenous landbirds.	***Luxton:** Is the sooty beech scale insect dispersal-limited?	***Geurts:** The foraging and breeding ecology of the North Island blue penguin (*Eudyptula minor iredalei*).
12.20		**Kearney:** Human population spread and the implications for conservation in Australia's biodiversity hotspots.	**Duncan:** Miniature farmers on a massive scale: Do scale insects regulate beech forest productivity?	***Barea:** Temporal variation in resource abundance modulates timing of breeding in a Southern Hemisphere mistletoe specialist.
12.40	**Lunch**			

Time	Venue: MCLT 103	Venue: MCLT 101	Venue: MCLT 102	Venue: COLT 122
1.40	**Session 21: Invasive animals** **Chair: Doug Eckery**	**Session 22: Urban ecology 3** **Chair: Glen Stewart**	**Session 23: Botanical pot-pourri** **Chair: Clayson Howell**	**Session 24: Pollination 1** **Chair: Alastair Robertson**
1.40	***Jones:** What makes seabirds defenceless to invasive rats? Analysis of seabird characteristics affecting vulnerability.	**Vale:** What can ecologists bring to urban design? A designer's view.	**Godfree:** Born to be wild?: Predicting enemy release and niche expansion of non-target clover populations following release of genetically modified virus-resistant host genotypes.	***Davila:** A conceptual model for understanding generalised plant-pollinator systems.
2.00	***Fordham:** Feral pig predation threatens the indigenous harvest and local persistence of snake-necked turtles in northern Australia.	**van Roon:** Ecological health: Key driver of Low Impact Urban Design and Development (LIUDD).	***Price:** Dynamics of the shrub-herb balance in species-rich woodlands: cause and consequences of encroachment by *Leptospermum scoparium*.	**Newstrom:** How generalised are pollination systems in New Zealand.
2.20	***Loo:** Spread of an invasive freshwater snail: new methods to analyze historical data.	**Ignatieva:** What can ecologists bring to urban design? A landscape architect's view.	**Juergens:** Do carnivorous plants produce leaf volatiles to attract prey?	**Merrett:** The efficacy of wind pollination in a forest understory shrub in New Zealand.
2.40	***Longson:** Understanding evolutionary changes in invasive species: density effects in the Australian cane toad.	**Meurk:** Urban design for interaction between natural character, wildlife and social knowledge.	**Liu:** Characterizing the spatial distributions of two saltmarsh plant species.	***Simpson:** Do patch characteristics influence floral visitation and plant reproduction? A comparative study of three species in northern NSW, Australia.
3.00	**Wittmer:** Using elasticity values from matrix models to develop management strategies for fluctuating populations of stoats in New Zealand.	***Aryal:** A new approach for mapping vegetation communities in urban areas.	**Schooler:** Introduced aquatic weeds reduce the diversity of wetland plant and moth communities	***Young:** The costs and benefits of being big: mast seeding and insect pollination in *Aciphylla* (Apiaceae).
3.20	**Eckery:** Biological control of possums in New Zealand.	**Myers:** Biodiversity in Auckland: Can urban restoration projects really make a difference to biodiversity conservation?	**Clarkson:** Tracer stable isotopes show co-existing bog species have different nutritional niches.	**Robertson:** The good, the bad, and the ugly: disharmony in plant-pollinator relationships.
3.40	**Afternoon Tea**			
4.10	**Session 25: Influences of heat** **Chair: Ross Thompson**	**Session 26: Urban ecology 4** **Chair: Paul Blaschke**	**Session 27: Vegetation assessment** **Chair: Chris Bycroft**	**Session 28: Pollination 2** **Chair: Caroline Gross**
4.10	***Divljan:** Too hot to handle – effects of heat on grey-headed flying fox camps.	**Galbraith:** Waitemata Coastal Sanctuary Project - ecology informing management in an urban landscape.	***Boyd:** Assessing the quality of native vegetation in north-west Victoria.	***Beavon:** The curse of the brushtail possum: pollination and dispersal of banana passionfruit.
4.10	**Denyer: Round Table Discussion.** Communicating Science – priorities and options for NZES. **Venue:** CO118 **(4.10 pm – 5.30 pm)**			
4.30	***Warner:** The adaptive significance of temperature-dependent sex determination in a short-lived lizard.	**Turton:** Urban ecology issues in Queensland's wet tropics: opportunities and challenges in a World Heritage landscape.	***Gorrod:** Variation in field assessments of vegetation condition: Implications for biodiversity.	***Haddadchi:** Distyly and pollination of *Nymphoides montana* (Menyanthaceae).
4.50	**Refsnider:** Fidelity versus flexibility in nest site choice by female tuatara – implications for population persistence under global warming.	**Blaschke:** Urban ecology: Concluding symposium remarks and Discussion.	***Eilts:** Physiological responses of grass species as predictors of community success.	***Brookes:** No evidence for pollen and resource limitation in *Aciphylla squarrosa*.
5.10	**Thompson:** A tale of two stressors – biodiversity and ecosystem function relationships vary with ambient temperature.		**Bycroft:** An ecological assessment of geothermal habitats within the Taupo Volcanic Zone of the central North Island.	**Gross:** Inter-population variation in breeding systems and mechanisms of infertility in the threatened species *Grevillea rhizomatosa* (Proteaceae).
5.45- 9.00	**M_ori feast: Student Union Building**			

THURSDAY 31 August

Time	Venue: MCLT 103	Venue: MCLT 101	Venue: MCLT 102	Venue: COLT 122
8.30	**Session 29: Animal Pot-pourri** **Chair Laura Molles**	**Session 30: Restoring Australasia 1** **Chair: David Towns**	**Session 31: Fragmentation** **Chair: Susan Wiser**	**Session 32: Fire** **Chair: Barry Brook**
8.30	**Seddon:** Tracking feral and domestic cats using GPS collars: An assessment of accuracy, efficiency, costs, potential bias, and possible analyses.	**Standish:** Trans-Tasman old-field restoration.	***Elliott:** Life and love in a linear landscape: comparative analysis of reproductive and genetic function of fragmented Emu bush populations.	***Rumpff:** Climate, fire and treeline dynamics in the Australian Alps.
8.50	**Robinson:** A wallaby and kangaroo massacre paper.	**Rokich:** Concepts for improving success in ecological restoration.	***Pohlman:** Internal fragmentation in the rainforest: Edge effects of highways, powerlines and watercourses on tropical rainforest understorey microclimate and vegetation.	***Maher:** Fire, fragmentation and herbivory: impacts on vegetation dynamics of the sandplain heathlands in the Western Australian wheatbelt.
9.10	**Driscoll:** Mallee reptile responses to fire. A replicated natural experiment.	**Hobbs:** Setting and achieving effective and realistic restoration goals in a changing world.	***Hutchison:** The effects of landscape structure on exotic plant invasion into native forest fragments, West Coast, New Zealand.	**Cheal:** Vital attributes for fire management & research : a reassessment of Nobel & Slatyer 1981.
9.30	***Auman:** Supersize me:The health consequences of anthropogenic food on silver gulls (*Larus novaehollandiae*) from Tasmania.	**Atkinson:** Successes and unresolved questions with ecological restoration in New Zealand.	**Maron:** Roads, fire and noisy miners: determinants of woodland bird distribution in southern Queensland forests.	***Law:** Repeated low-intensity burns in coastal foothill sclerophyll forest, NSW: impacts on tree growith, mortality and diversity.
9.50	***Steer:** Seasonal variation in food hoarding of New Zealand robins (*Petroica australis*).	**Parkes:** Restoration of islands - advances and constraints in eradication of invasive species.	***Haslem:** Bird assemblages in agricultural land mosaics – do landscape properties and avian history traits affect community composition?	**Muller:** A new frequency analysis method for constructing fire histories from flowering events in Austral grasstrees (*Xanthorrhoea australis*) from southern Victoria.
10.10	**Molles:** He said, she said: duetting in North Island kokako.	**Holdaway:** A research-based restoration programme for the Norfolk Island biota	**Wiser:** Does surrounding vegetation influence species composition of habitat islands?	**Brook:** A rule of thumb for promoting bio-diversity in tropical savannas by controlling fire size.
10.30	**Morning Tea**			
11.00	**Session 33: Herbivory 1** **Chair: Richard Clayton**	**Session 34: Restoring Australasia 2** **Chair: Colin Miskelly**	**Session 35: Valuations and judgements** **Chair: Amy Fletcher**	**Session 36: Plants at high altitudes** **Chair: Janice Lord**
11.00	***Safarti:** Mast seeding and the role of diapause in a cecidomyiid pre-dispersal seed predator of native grasses (*Chionochloa* spp.).	**Bellingham:** Above- and below-ground impacts of introduced predators on seabird-dominated islands.	***Moore:** Alternative approaches to valuing the future.	***Venn:** Facilitation is an important plant-plant interaction at high altitudes in Victoria, Australia.
11.20	***Guthrie:** Community structure of herbivorous insect specialists in lowland Canterbury.	***Durrett:** Spatial patterns in soil nutrient availability driven by rats and seabirds on New Zealand's offshore islands.	**Prendergast:** *Kaitiakitanga* & conservation biocontrol - towards a collaborative approach to enhance ecosystem services in agro-ecosystems in New Zealand	***White:** The use of habitat models to predict distribution changes of alpine peatlands under climate change in the Victorian Alps.
11.40	***Roberts:** Explaining the boundaries between "marsupial lawns" and woody vegetation in lowland and alpine Tasmania.	***Russell:** Invasion ecology of rats on New Zealand islands.	**Fletcher:** Conserving genes – the biopolitics of ancient DNA and species recovery.	***Bischoff:** A fresh look at alpine plant breeding systems in New Zealand.
12.00	**Garine-Wichatitsky:** Introduced ungulates and native sclerophyll forests of New Caledonia: impacts and control impacts?	**Towns:** Effects of Pacific rats (*Rattus exulans*) on tuatara (*Sphenodon punctatus*) revealed by rat removal.		***Day:** Twenty years of change in South Island tussock grasslands.
12.20	**Clayton:** Changes in seedling communities following deer and rat eradication from Ulva Island, Rakiura National Park.	**Miskelly:** Restoring burrow-nesting seabirds to islands: translocation as a means to restore ecosystems.		**Lord:** *Thamnolia* lichens– alpine canaries for climate change?

12.40	Lunch			
1.40	**Session 37: Agro-ecosystems** **Chair: Iain Gordon**	**Session 38: Restoring Australasia 3** **Chair: Craig Gillies**	**Session 39: Insects, plants and woody debris** **Chair: Simon Grove**	**Session 40: Riverine ecology** **Chair: Melanie Bishop**
1.40	**King:** Functional diversity of Invertebrates in salinised agricultural landscapes.	**Burns:** Using "spillover" as a cost-effective management tool for species recovery over large areas.	***Affeld:** Living the high life: arthropod communities of epiphyte mats in the canopy of northern rata (*Metrosideros robusta*).	***Chatfield:** Creatures of habitat? What can predictive modelling tell us about the factors driving fish distribution?
2.00	***Attwood:** Arthropod assemblage responses to agricultural land use intensification.	**McIntosh-Ward:** A sustainable management model of eco-restoration?	***Gardner-Gee:** Distribution and abundance of giant scales (Hemiptera: Margarodidae) in Auckland forests.	**Perry:** Take me to the water: individual-based spatial modelling of fish population dynamics in intermittent streams in SE Australia.
2.20	**Le Brocque:** Trees in a grazing landscape: vegetation patterns in sheep-grazing agro-ecosystems in southern Queensland.	**Empson:** The challenges of ongoing exclusion of mammalian pests from Karori Wildlife Sanctuary, a fenced mainland island in New Zealand.	**Watts:** Rapid recovery of an insect-plant interaction following habitat loss and wetland restoration – conservation threats to the "world's thinnest caterpillar".	***Warner:** Patterns in slime: Linking biofilm assemblages and flow regimes on four coastal rivers, northern NSW.
2.40	***Collard:** Using the carbon management index to indicate ecosystem function in brigalow (*Acacia harpophylla*) agro-ecosystems of southeast Queensland, Australia.	**Ussher:** Managing wildlife and pests using incomplete exclusion fencing on a virtual island: Tawharanui Open Sanctuary, New Zealand.	***Harrison:** Saproxylic beetles associated with mature living *Eucalyptus obliqua* in southern Tasmania.	**Casanova:** Charophytes as indicators of catchment health.
3.00		**Stilbery:** Pukaha - restoration of a New Zealand forest reserve without predator fencing.	***Hopkins:** Wood-inhabiting fungi in *Eucalyptus obliqua* logs: examining the effect of log size and forest type on fungal community composition.	**Bishop:** Response of communities to sustained nutrient input: first evidence of ratio-dependence in an estuarine system.
3.20	**Gordon:** On the edge of the abyss – rangeland deterioration and recovery on Australia's eastern catchments.	**Gillies:** "Mainland islands" ten years on.	**Grove:** Accommodating coarse woody debris dynamics into native forest harvest scheduling.	
3.40	Afternoon Tea			
4.10	**Session 41: Herbivory 2** **Chair: Clare McArthur**	**Session 42: Restoring Australasia 4** **Chair: Miriam Goosem**	**Session 43: Conservation miscellany** **Chair: Rod Hitchmough**	**Session 44: Big botany** **Chair: Angela Moles**
4.10	**Lee:** Mites, plants, and leaf domatia: lessons from *Coprosma* in New Zealand.	***Villa Castillo:** Restoration treatments in *Eucalyptus* plantations infested by introduced *Paspalum* for the development of native forests in an Australian National Park.	***Miller:** Value of microsatellite markers in the conservation of two rare *Cyclodina* skinks.	**Buckley:** Temporal dynamics of abundance-occupancy relationships.
4.30	***Sinclair:** Australian leaf miners and their prevalence within the Myrtaceae.	***Kyle:** Functional traits associated with persistence in a degraded riparian system.	***Coombes:** Post-release survival of captive-bred malleefowl in western NSW.	***Holdaway:** Mast-seeding – effects of productivity at various spatial scales.
4.50	**McArthur:** Plant poisons and predators: the dilemma for foraging herbivores and its influence on quitting patches.	**Goosem:** Habitat quality assessment of remnant riparian rainforest on tropical coastal lowlands: demonstration of restoration priorities for local government.	***Catedral:** Hatching asynchrony, nestling growth and sex ratios of a translocated population of red-crowned parakeets.	**Moles:** Latitude and seed production.
5.30 - 6.30	NZES - Annual General Meeting			

FRIDAY 1 September

Time	Venue: MCLT 103	Venue: MCLT 101	Venue: MCLT 102	Venue: COLT 122
9.00	**Session 45: Wetlands** **Chair: Gillian Rapson**	**Session 46: Restoring Australasia 5** **Chair: Michael Parsons**	**Session 47: Conservation strategies** **Chair: David Keith**	**Session 48: Wildlife disease ecology 1** **Chair: Rosemary Barraclough**
9.00	**Sullivan:** Bringing back the saltmarsh: Restoration at the former Naval Stores, Parramatta River.	**Janssen:** Indigenous afforestation can restore bush vitality long-term.	**Walker:** Assessment of risk of biodiversity loss in New Zealand, and its application to Land Tenure Review	**Skerratt:** Development of an ecological model for *Chytridiomycosis*.
9.20	**Maseyk:** Wetland ecology across a region - Wetland restoration in the Manawatu-Wanganui region.	**Muller:** Decadal change in an urban mistletoe population.	**Langford:** A framework for generalized evaluation of reserve selection algorithms.	***Kriger:** Climate, morphology, and *Chytridiomycosis*.
9.40	**Rapson:** Ephemeral ecosystems – categorisation and conservation.	**Wardle:** Making a point with *Spinifex*: Size isn't everything, but is it better than percentage cover?	**Gordon:** Assessing reserve design strategies with real-world complications.	**Alley:** Emerging bacterial diseases in New Zealand wildlife.
10.00	**tba**	***Cieraad:** Implications of plant-plant interactions and other plant traits on rehabilitation for New Zealand drylands.	***Mize:** Implementing "gifts & gains' "The Fiordland Guardians" approach to marine protection.	***Middleton:** Salmonella carriage in wild and domestic populations of geckos and skinks in New Zealand.
10.20	**tba**	**Parsons:** Disentangling competition, herbivory, and seasonal effects on young plants in newly restored communities.	**Keith:** Can protocols for Red-listing threatened species forecast extinction?	**Barraclough:** Malarial parasites in New Zealand: Prevalence in native and introduced birds, parasite invasiveness, and host specificity.
10.40	**Morning Tea**			
11.10	**Session 49: Avian studies & Gold Medal** **Chair: Murray Williams**	**Session 50: Restoring Australasia 6** **Chair: Avi Holzapfel**	**Session 51: In coastal waters** **Chair: Grant Hamilton**	**Session 52: Wildlife disease 2** **Chair: Rosemary Barraclough**
11.10	**Robertson:** What's the story kakerori? – conserving a Cook Islands endemic flycatcher	***Orscheg:** Soil seed-banks in a regenerated forest community.	**Pile:** Surfs up: Cascading effect of wave energy on herbivory.	**Gartrell:** The prevalence of psittacine circovirus (beak and feather disease virus) in wild populations of exotic parrots in New Zealand.
11.30	**Powlesland:** Some aspects of kereru ecology in urban-rural landscapes	**Krauss:** Rapid genetic identification of local provenance seed collection zones for restoration.	***Verges:** Effects of gender and life history stage on herbivore responses to a chemically defended red alga.	**Skerratt:** Improving the management of sarcoptic mange in wombat populations.
11.50	**Ecological Society of Australia** **Chair: Peter Fairweather** **Gold Medal Award winner address.**	**Holzapfel:** Seeding a future: Experimental sowing of *Dactylanthus taylorii* (Balanophoraceae), a threatened New Zealand parasitic flowering plant.	**Macaya:** Can *Glossophora kunthii* and *Macrocystis integrifolia* (Phaeophyceae) respond with inducible defenses after manipulation of amphipod grazing?	**McCallum:** A parasitic clonally reproducing mammal? Tasmanian Devil facial tumour disease.
12.10		**tba**	**Hamilton:** Integrating information sources into statistical analysis – widening the Bayesian Net for (the marine cyanobacterium) *Lyngbya majuscule*.	**McInnes:** The Department of Conservation contingency plan for protection of threatened species from avian influenza (bird flu)
12.30	**CLOSING REMARKS, AWARDS and PRIZES**			
1.30	**Lunch**			

Poster Paper Programme

The poster session is on Monday 5.30 – 7.30 pm. Presenters of poster papers are asked to attend their posters throughout this period.

Poster No.	Presenter (* = student)	Title
1	***Turner**	Density of the invasive weed, bridal creeper (*Asparagus asparagoides*) did not influence post-fire successional response of a mallee ecosystem
2	**Grice**	Can the impacts of para grass (*Urochloa mutica*) be managed?
3	**Simmons**	Characterisation of serrated tussock infestations in native pastures
4	***Warnock**	What ecological and environmental conditions facilitate the establishment and persistence of the weed *Lachnagrostis filiformis* in western Victorian lakes
5	**Gosper**	Approaches to selecting replacements for invasive plants for use by frugivorous birds
6	***Scott**	What is the potential of the persistent soil seed bank in the recovery of native Australian grassland?
7	**Ladley**	Feast or famine: New Zealand datasets for mast seeding data
8	**Wearing**	Spatial patterns of recruitment in relict populations of Halocarpus biformis (pink pine) near Dunedin, New Zealand
9	***Dinsdale**	Modelling population genetics of Silverleaf Whitefly (*Bemisia tabaci* biotype B) at different spatial scales
10	***Keble-Williams**	Regional Variation in Herbivory and Insect Herbivores on *Nothofagus cunninghamii* in Tasmania
11	***Kachly**	Monitoring coastal sand dune vegetation communities for conservation
12	**Baars**	Pollination in home gardens
13	**Curran**	Plant functional traits explain interspecific differences in cyclone damage to trees of an endangered rainforest community in north Queensland
14	***Orscheg**	Creating islands of green, not just another drain in our landscape
15	**Peltzer**	Pre-emptive removals reveal the above- and belowground impacts of plants in primary succession
16	**Buxton**	Montane outcrop vegetation of Banks Peninsula, South Island, New Zealand
17	***Lockett**	Lichens of Tiritiri Matangi, Hauraki Gulf, New Zeland. A pilot study
18	**Grove**	Giant velvet worms and Tasmanian forestry: can they co-exist?
19	**Grove**	Talking rot!
20	**Grove**	The Warra log decay project: saproxylic beetles from the first 3-year sampling cycle
21	***Kahui-McConnell**	Ngati Whatua o Orakei Papakainga - establishing cultural and environmental linkages to inform ecological management

22	**Wehi**	Nature' s bounty: Maori plant harvesting in the western Waikato region of New Zealand
23	**Sam**	The use of native floral resources to enhance conservation biocontrol
24	***Rigold**	Greening the City: Creating an ecological network to enhance Auckland's native biodiversity
25		
26	**North**	Awarua wetlands, Southland, viewed through time series of satellite images
27	**Maseyk**	Linking vision with implementation - determining priorities for wetland protection in the Manawatu-Wanganui region
28	**Ridler**	Implementing the vision: Success in wetland protection across the Manawatu-Wanganui region
29	**McNeill**	Estimating carbon in regenerating forests using radar imagery - a critical review
30	***Campbell**	Climate change and disease: bleaching and bacterial infection of a marine alga
31	***Geange**	The effects of competitive interactions on community structure in a guild of coral reef fish
32	**McArthur**	Waves and wind: parallel abiotic influences on autotrophs and their consumers?
33	**Ball**	What has become of the Te Paki Mecodema?
34	***Burns**	Arthropod assemblages of mistletoe: composition and spatial turnover
35	**Wood**	Diet of moa at Daley's Flat, Dart River Valley, western Otago :preliminary results from a study of coprolites
36	**Meurk**	Relative abundance estimates of tomtits (*Petroica macrocephala*) using line transect distance sampling
37	***Seabrook-Davison**	How New Zealand deals with the recovery of threatened species
38	**Molles**	Calling all kokako: an update on the-use of acoustic anchors in a mainland translocation
39	**Miskelly**	Campbell Island snipe (*Coenocorypha* undescribed sp.) recolonise subantarctic Campbell Island following rat eradication
40	***Matsuura**	Bird assemblages in different land cover types of Leyte, The Philippines: The role and conservation value of small-scale forestry
41	**House**	Is brigalow regrowth vegetation good habitat for ants?
42	**Stringer**	Fighting fire with fire: Use of ant pheromones I detection and control of exotic ants
43	**Andrews**	Ultrastructure of the feeding and excreting equipment of sooty-beach scale insects (*Ultracoelostoma assimile*)
44	***Redpath**	Demography and ecology of flood damaged tawa (Beilschmiedia tawa) inTurakina Valley, Rangitikei, New Zealand
45	**Orwin**	Drivers of soil microbial stability

Ecology Across the Tasman
2006 Wellington – 28 August to 1 September

ABSTRACTS

The joint conference of the
NZ Ecological Society and the Ecological Society of Australia

On a sugar high: Honeydew helps a crazy ant dominate an island ecosystem

Presentation Type: Oral

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Outside their native ranges, the most notorious invasive ant species form facultative mutualisms with honeydew-producing insects. Excretory honeydew from sap-sucking insects is a key dietary component for many ant species; ants are key drivers of scale insect populations, and conversely, scale insects may be key drivers of population growth in ants. On Christmas Island, the invasive yellow crazy ant, Anoplolepis gracilipes, forms high-density supercolonies associated with 15 of the 16 scale insect species present on the island. The densities of adult scale insects in supercolonies were over 12 times higher than in ant-free forest, and from the canopy, continuous input of juveniles provided recruitment of scale insects to vegetation below. At these densities scale insects produced so much honeydew that what was not collected by ants accumulated and aided in the growth of sooty mould on understorey and canopy vegetation. The fortuitous relationship between yellow crazy ants and honeydew-producing scale insects on Christmas Island forms the basis for a strong positive feedback loop, amplifying populations and resultant impacts of both, and the likely explanation for the success of this numerically dominant and damaging ant.

Living the high life: Arthropod communities of epiphyte mats in the canopy of northern rata (Metrosideros robusta)

Presentation Type: Oral

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Epiphytes have been strongly linked to high arthropod diversity in forest canopies. They provide diverse microhabitats that influence the overall composition of arthropod communities and the distribution of different arthropod species in the canopy. There has been increasing interest in determining to what extent the species- and functional composition of epiphyte and arthropod communities influence the dynamics of forest ecosystems, but much remains poorly understood. In this study we investigated the role of mat forming epiphyte communities as determinants of canopy arthropod species richness and community composition. The study was carried out over a one-year period in the temperate rainforest of Punakaiki and Karamea on the South Island's West Coast. While the total epiphyte biomass was similar at the two sites the composition of the epiphyte communities differed significantly. Only 53 of the total 160 plant species were shared by both sites. Mean plant species

richness per tree was significantly higher at Punakaiki (22 spp.) than at Karamea (12 spp.), but the species were less evenly distributed than in Karamea as reflected by Simpson evenness measure (0.27 and 0.39 respectively, $p<0.05$). Arthropod diversity and community composition are discussed in relation to their epiphytic host communities, abiotic conditions and the forest ecosystem processes different functional groups are involved in.

Modelling vegetation responses to deer removal at sites with brushtail possum control

Presentation Type: Oral

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Peter Bellingham
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Forested sites on public conservation lands have been prioritised for herbivore control using national plans since 1993 (possums) and 1995 (goats). Deer populations have been suppressed by recreational and commercial harvesters operating at sites of their own choosing.Tthere has been little integration of pest management in relation to canopy protection - canopies may show better condition thanks to possum control but recruitment of future canopy populations may be at risk from predation by deer, if informal harvesting has been light. How to integrate any future deer and possum control is complicated by the strong likelihood of different responses to deer suppression between sites. This means that at the scale of a management unit (2,000 to 10,000 ha), forests cannot be considered replicates for an experiment to study how plant populations respond to deer control. We are using an adaptive management approach to learn what forests do when both possums and deer are removed. This approach places a focus on developing models to support limited experimentation. The models link local and science knowledge, and a wider group of stakeholders is involved in deciding what to measure. We are working in this way at four sites and will describe our deer-forest-people model.

Emerging bacterial diseases in New Zealand wildlife

Presentation Type: Oral

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It is likely that human activity is responsible for the emergence of several bacterial diseases in New Zealand wildlife in recent years. Human induced changes in habitat, the manipulation of threatened species and tourism all provide opportunities for the introduction of new strains of organism and increased transmission of existing strains. Two new strains of Salmonella Typhimurium which have caused disease outbreaks recently were both seen in the Northern hemisphere before their occurence in New Zealand. The first cases of DT160 were seen in humans 6 months before the 2000 disease outbreak. Transmission was associated with the winter feeding of birds at grain silos and suburban garden feeding stations. The first cases of DT195 infection in humans in New Zealand occurred 2-3 years before the recent outbreak of disease in hihi(stitchbirds) on Tiritiri matangi. Sewerage outflow was a suspected source of bacteria but there was no evidence that feeding stations were involved in transmission. The stresses induced by translocation were likely to be initiators of Erysipelas infection in juvenile kakapo. The birds had exposure to the organsim through foraging in marginal habitat occupied by seabirds. The possibility that the Klebsiella infections seen in sealion pups on subantartic islands are also of human origin also needs investigation.

A moving feast: The influence of landscape context on bird-mediated seed rain into conservation areas

Presentation Type: Oral

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To assess the influence of surrounding land on bird-mediated weed invasion to an area, we compared the seed influx from starling flocks arriving to roost on two New Zealand islands, both similar distances from the nearest seed source but differing in proximity to weed infestation. Seed collection trays on both islands received significantly higher seed rain at starling roost sites than at control sites. Seed influx at the roost sites was also higher over the winter, when starlings flock to roost on the islands, than during the summer when they disperse to breed. Identification of seeds showed that composition of the seed rain at roost sites varied significantly between the islands. The seed rain on the island adjacent to weed-controlled land (Tiritiri Matangi) was dominated by native plant species, while on the island adjacent to land lacking weed control (Motuihe) adventive species dominated.
The importance of landscape context in determining the direction of development of an area, and the implications of this for the selection and management of conservation areas are considered.

Ultrastructure of the feeding and excreting equipment of sooty-beech scale insects (Ultracoelostoma assimile)

Presentation Type: Poster

Neil Andrews
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Roger Dungan *
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Despite the demonstrated importance of sooty beech scale insects in the ecology of New Zealand Nothofagus forests, little is known about the insects' basic biology. The insects' face considerable challenges to feeding and excreting, as they must insert their mouthparts a considerable distance into woody tree tissue. They also produce spectacular anal tubes, through which they excrete droplets of sugar-rich honeydew. Using a range of microscopy methods, we present some preliminary images of the ultrastructure of the insects' feeding and excreting apparatus.

A new approach for mapping vegetation communities in urban areas

Presentation Type: Oral

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Ecologists and urban planners require updated knowledge on the type and the distribution of vegetation communities within cities. Manual photo-interpretation of aerial photographs is efficient, but is time consuming. Image segmentation and object-oriented classifications provide a tool to automatically delineate and label vegetation units. These techniques were tested with a very high-resolution multispectral Ikonos image to produce fine scale maps of vegetation communities in Dunedin (New Zealand). The Ikonos image was first semi-automatically segmented into 4 strata: industrial/commercial (with amenity pastures and tree groups), residential (with amenity pastures and private gardens), vegetation (with other vegetation classes), and water. A hierarchical network of image objects was built to extract vegetation patches of various sizes such as small private gardens and larger exotic plantations. Thirteen variables were used to classify the image objects, including mean object spectral value, object spectral standard deviation, object compactness. The original classification scheme included 18 vegetation categories, of which eleven were successfully discriminated (overall classification accuracy = 81%, kappa coefficient = 0.78): forests, exotic plantations, tree groups, exotic scrubs, mixed scrubs, native scrubs, pastures grasslands, amenity grasslands, dune grasslands, rough grasslands, private gardens. Some classes of ecological interest characterized by various canopy densities could not be discriminated (e.g. low and high density gardens, shrublands and scrubs). Vegetation patches smaller than 0.05 ha were efficiently extracted. The method and the data generated have potential applications in urban ecology studies, including urban wildlife habitat use, urban planning for enhancing wildlife and native vegetation, conservation of green corridors.

Incorporating source-sink and fragmentation effects into niche-based vegetation models

Presentation Type: Oral

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Static-equilibrium models are commonly used to explain or predict the distribution of vegetation. These usually assume that the vegetation at each location is determined solely by environmental conditions at that site (environmental niche model), and not by dispersal or other spatial processes. Contextual indices, such as the amount of rainforest within 500m, have recently been used to incorporate spatial factors into fauna models. It was hypothesised that using contextual indices in vegetation models instead of raw predictors would produce similar improvements because they produce effects which are consistent with source-sink and fragmentation theories. Eight species and seven predictors were used to produce 56 univariate models. The use of contextual indices increased the average deviance explained by the models from 13% to 20%. Multivariate models for each species also showed significant statistical improvements and produced more ecologically realistic results. For example, only the multivariate model for Eucalyptus cypellocarpa that included contextual indices confidently and successfully predicted a large patch outside the original study area where the species would be found. The optimal radius for contextual indices varied widely between species according to ecological differences. Less common species and poor colonisers were typically clustered in large patches, and had the largest improvements.

Successes and unresolved questions with ecological restoration in New Zealand

Presentation Type: Oral

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In New Zealand, offshore islands (those within 50 km of the mainland) have provided the majority of sites where restoration projects have had greatest success. Species that have benefited include forest birds, seabirds, a sphenodont reptile (tuatara), skinks, geckos and a large orthopterous insect (giant weta). Progress with the design of excluder fences has made it possible to restore some plant-animal communities on the mainland. Times required to achieve effective restoration of particular animal or plant species can often be measured in years although restoring some woody plants may require centuries. In any case it is considered that appropriate human intervention will accelerate the restoration process relative to that obtained under natural conditions. A challenging question is whether it is practical, or even desirable, to replace an extinct species with a related living species capable of functioning in a similar ecological role.

Arthropod assemblage responses to agricultural land use intensification

Presentation Type: Oral

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Agricultural expansion and intensification is a major threat to biodiversity globally, yet agricultural landscapes often support complex and dynamic biological communities within a diverse array of land uses. To examine the relative biodiversity value of land uses ranging from low to high intensification, we compared arthropod abundance, richness and community composition among sites in cropland, pasture and native woodland on nine southern Queensland properties. Overall abundance of arthropods was significantly greater at cropping/pasture interfaces than in woodland or cropping sites, but order level richness did not differ between land uses. Some taxa displayed different responses to land use type, with mites more abundant in woodland than cropland, and collembola displaying greater abundance in pasture. Ant morphospecies richness was significantly greater in woodland than more intensive land uses, although total abundance was highest in pasture. Abundance of opportunistic ant taxa increased with land use intensity.
From these results, it appears that even small and degraded woodland remnants, such as those studied, may play an important role in maintaining arthropod diversity in agricultural landscapes.

Out of the blue: Insights into the New Zealand sea lion terrestrial spatial ecology.

Presentation Type: Oral

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The New Zealand sea lion, Phocarctos hookeri, is a threatened species with only three breeding colonies, all on New Zealand's sub-Antarctic islands. These colonies are under the pressure of disease outbreak, natural catastrophes and bycatch in squid fishery. The recent start of a recolonisation process on mainland New Zealand is a sign of hope because if several new colonies establish the species will be removed from its current vulnerable status.
The terrestrial spatial ecology of Phocarctos hookeri has never been quantitatively investigated. Considering the recolonisation process, this is significant missing information which may prove to be primordial as

conservation managers will have to deal with interactions between humans, infrastructures and sea lions in the vastly more populated New Zealand mainland area.
This paper thus aims to give the first insight into a quantitative study of terrestrial movements of female Phocarctos hookeri. The study was based at Enderby Island, Auckland Islands. Description and quantification of movements (i.e. distance and timing) as well as a simple spatio-temporal model of the spatial ecology of females at breeding beaches are the outputs of this paper.

'Supersize Me': The health consequences of anthropogenic food on Silver Gulls (Larus novaehollandiae) from Tasmania

Presentation Type: Oral

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Urban populations of several gull species worldwide are perceived to be increasing dramatically, presumably as a result of greater access to anthropogenic food obtained in urbanized environments. Foraging at tips and restaurants may induce a health cost in urbanised birds and the 'benefits' of eating anthropogenic food should be questioned; the physiological health effects of 'garbivory' on wild birds are yet to be tested.

This research investigated the potential adverse effects of an anthropogenic diet on the health of Silver Gulls (Larus novaehollandiae) by comparing birds breeding at a remote, non-urbanised site (Furneaux Island Group, Bass Strait) with those at an urban (Hobart) colony in Tasmania. Body condition (measured by an index), blood biochemistry (HDL and total cholesterol, triglycerides, glucose, calcium, sodium, potassium and corticosterone) and stable-isotopes (13C/12C and 15N/14N) were compared between the two populations.

Urban gulls were of higher body condition and more massive than structurally identical non-urban gulls. The urban gulls had greater levels of HDL cholesterol and glucose in their blood. Analyses of blood stable-isotopes suggested that non-urbanised gulls tended to eat at a higher trophic level and from a more marine origin, while urban gulls ate at a lower trophic level and from a more freshwater origin. Further research should centre on the effects of these health parameters on the longevity and reproductive success of native bird populations.

Pollination in home gardens

Presentation Type: Poster

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Two gardens were developed in Lincoln, Canterbury, to determine the relative visitation rates of native and exotic insects to vegetable and herb plants commonly grown in home gardens and to see how the surrounding vegetation affects visitor profiles for these plants. The Landcare Research garden has a variety of native plants nearby, whereas the Biological Husbandry Unit is surrounded by mainly exotic plants. Sampling at both sites was conducted at 9am, 11am, 1pm and 3pm for 20 'good' days when insect activity was high. Different crop plants had distinct visitor profiles. These profiles were similar for both sites, despite the difference in surrounding vegetation. Captured visiting insects, along with photographic data show pollen being carried by most of the insect visitors, although large, hairy insects such as honeybees Apis mellifera, bumblebees Bombus spp. and drone flies Eristalis tenax carry more pollen. These results indicate that maintaining a variety of insect visitors in home gardens is important as most of them can potentially transfer pollen, and some, like the native hoverflies, also have larvae that predate on aphids.

Intrusive impacts of radiata pine (Pinus radiata D. Don) on surrounding native vegetation

Presentation Type: Oral

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Globally, radiata pine (Pinus radiata D. Don) is the most widely planted exotic conifer, frequently grown in large plantations for use in the timber and manufacturing industries. Radiata pine plantations are recurrently found in close proximity to natural, remnant vegetation, and in particular, are often situated next to areas set aside for conservation of biodiversity. In this study, we demonstrate the intrusive impacts of radiata pine beyond the confine of plantations into surrounding remnant vegetation. We examined the penetration of pine litter (needles, cones, twigs and seeds) and pine wildings from plantations into surrounding woodland vegetation, in south-eastern Australia. Not unexpectedly, significantly higher quantities of pine litter and pine wildings were found at all sites adjacent to plantations, compared with reference sites located away from plantations. At replicate sites adjacent to plantations, pine litter decreased significantly and in a consistent manner with increasing distance from plantations. Alarmingly, species richness of native plants declined with increasing quantities of pine litter, and at the same time, richness of exotic plant species increased with increasing pine litter. These correlative patterns suggest a potentially critical link between the intrusive impacts of pine litter, loss of native biodiversity and facilitation of exotic species invasion.

New Zeland fairy tern: endemic or common? A study using mitochondrial DNA

Presentation Type: Oral

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New Zealand fairy tern (Sterna neries davisae) is one of the rarest native bird species, with an estimated population size of only 30 individuals. Nationally listed as 'Acutely Threatened - Nationally Critical', the Department of Conservation Recovery Plan for this species has been implemented since 1997. This Plan is now under re-assessment and several issues have been raised including particular concerns about the level of endemism and genetic relatedness of the New Zealand fairy tern population to the larger breeding populations in Australia and New Caledonia. We sequenced the NADH subunit 2 (ND2) region of the mitochondrial DNA, with samples collected from New Zealand, New Caledonia and Australia. The results show that fairy tern populations in all three locations are genetically distinct, with very restricted gene flow. The single fairy tern mitochondrial DNA haplotype found in New Zealand is not found elsewhere, indicating that the continuation of the Recovery Plan to conserve and expand this distinct population is warranted. The primary result of this study is also consistent with previous research that found morphological and behavioural differences between the main breeding populations.

What has become of the Te Paki Mecodema?

Presentation Type: Poster

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Mecodema is an endemic genus of ground beetle (Coleoptera: Carabidae). The 58 species and six subspecies range from Northland to Southland and from lowland to alpine habitats. Many are threatened, including Mecodema "Te Paki", which is listed as Nationally Critical. There have been seven confirmed sightings (a total of nine beetles) of Mecodema "Te Paki" since 1957 in the Te Paki Ecological District, and only two sightings (a total of three beetles) since 1978. There is an urgent need to determine what, if any, management steps are required to protect the species. Therefore, our aim was to design and carry out a study using pitfall trapping to investigate the distribution and conservation status of Mecodema "Te Paki". It was considered necessary to use two separate strategies, a non-random approach to target likely sites of occupation, and a random approach to investigate the status of the species over a wider geographical area. All sites included in the non-random study were situated within small stock-fenced snail (Placostylus ambagiosus) plots enclosing higher quality vegetation. 10m x 10m grids of six to eight pitfall traps were placed within four fenced areas across the Te Paki district. Also, identical grids of pitfall traps were placed outside each fenced plot as controls. To avoid beetle and snail mortality, live capture traps were used.

In the random study, the aims were to determine both distribution and habitat use. Therefore, the Te Paki area was stratified into three separate habitats, regenerating native forest, kanuka/manuka-dominant scrub, and pine (Pinus radiata) forest. 10m x 10m grids of eight pitfall traps were placed at three random points within each habitat type. In this study, the probability of detecting Mecodema "Te Paki" was considered low, thus the traps were left "set" continuously with preservative added, and checked monthly. These studies have only just commenced so no beetles have yet been trapped. After 12 months, the traps will be moved to new random locations across Te Paki to increase the area and number of sites surveyed.

Temporal variation in resource abundance modulates timing of breeding in a Southern Hemisphere mistletoe specialist.

Presentation Type: Oral

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Temporal variation in the onset of breeding in relation to fluctuating resources has been described for a number of taxa inhabiting a range of systems. This correlation between the onset of breeding activity and resource levels suggests a matching of life history stages and resource abundance. However, most of this work has been conducted in northern hemisphere zones where abiotic cues tend to be regular and reliable predictors of future resource levels. This study is part of ongoing research in an Australian semi-arid environment. I compare data for two seasons on the timing of painted honeyeater Grantiella picta breeding in relation to temporal variation in the abundance of it's main food resource, mistletoe fruit The arrival and departure of the breeding population coincided with the peak in mistletoe fruiting in both years. The timing of life history stages followed the progression of fruiting phenology and was closely matched to resource levels despite a temporal shift in their availability between years. As such, painted honeyeaters appear similar to northern hemisphere seasonally breeding passerines that use photic cues in timing the overall breeding season and incorporate information from the local environment to modulate the initiation of life history stages.

Malarial parasites in New Zealand: Prevalence in native and introduced birds, parasite invasiveness, and host specificity.

Presentation Type: Oral

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The avian intra-cellular blood parasite genera Plasmodium, Haemoproteus, and Leucocytozoon (sometimes collectively referred to as malarial parasites) are common worldwide. However, although these parasites can be non-pathogenic, species from each of these genera have been identified as responsible for wild and domestic bird mortality via individual and/or cross-infections; the most famous example of this being the invasive Plasmodium contributing to the decimation of native Hawaiian bird populations. New Zealand's avifauna is highly endemic and potentially vulnerable to a similar invasion event. Baseline information is essential to aid detection and identification of potentially virulent

introduced parasite species. Furthermore it is important to understand native parasite/bird dynamics to address how conservation issues and management may be altering these. Yet, despite recent interest in these issues comparatively little is known about prevalence, endemism, and the impact of malarial parasites present within this country. This research indicates that the prevalence of these parasite genera within New Zealand is low in comparison to the Americas, Africa, and Europe. Prevalence is also significantly higher within invasive birds than in native New Zealand species. These data also highlight the importance of parasite host-specificity on the invasive potential of malarial parasites in a highly endemic avifauna.

Combining random search and deterministic attraction in simulations of animal foraging behaviour.

Presentation Type: Oral

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Consider the flight of a gravid cabbage white butterfly (Pieris rapae). Like most herbivorous insects searching for host plants it may appear to be bumbling around at random, but at some level the movement also exhibits purposeful attraction toward host plants. We used spatially explicit simulation models to investigate the range of behaviours and outcomes that are possible given the opposing tendencies of random foraging and deterministic attraction. Our conceptual models were developed further to provide a more realistic description of flight behaviour, with the aim of recreating the results of multi-scale field experiments.

Examining linkages between urban spatial patterns and ecological and social processes in Sydney, Australia

Presentation Type: Oral

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In this presentation, we provide an overview and results from a multidisciplinary research project focused on understanding linkages between urban landscape heterogeneity and two important components of the urban ecosystem: Human health and urban biodiversity. This project has three major components. First, urban patch characteristics (e.g., urban form, land use connectivity, intensity and heterogeneity) were identified and mapped using a novel classification system based on combination of environmental and social characteristics identified from socioeconomic and biophysical datasets and high-resolution satellite imagery. Second, linkages among urban patterns and the ecological characteristics of urban remnant native vegetation, managed greenspace, and selected fauna were then assessed based on variation in the abundance, composition, and distribution of selected avifauna and flora identified from field survey data and high-resolution satellite imagery. Third, spatial variability in patterns of human health, as measured though human physical activity (an

indicator of risk for a range of diseases and other medical problems) was assessed with a physical activity questionnaire and structured observation of neighbourhoods, urban parks, and recreational areas. Results from the first two components of this work and the implications of these findings for urban design and sustainable urban development will be discussed.

The curse of the brushtail possum: Pollination and dispersal of banana passionfruit

Presentation Type: Oral

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Banana passionfruit (Passiflora mollissima) is a weedy vine that continues to spread across New Zealand, particularly in coastal regions. Severe infestations may result in the death of mature trees or stands of vegetation. Consequently, it may threaten the integrity of our native bush. I have investigated the reproduction and dispersal of banana passionfruit in the Marlborough Sounds. My results show that flowers are self-compatible and do not suffer inbreeding depression when germinated, although significantly less fruit are produced in the absence of pollinators. Therefore, one seed could potentially result in the establishment of banana passionfruit infestations in a new area. In addition, I have found no evidence for dispersal of seeds by native birds. However, there is strong evidence that introduced mammals such as possums and pigs readily eat the fruit and subsequently disperse seeds. Over 2500 intact seeds were removed from 1500 grams of feral pig droppings and promptly germinated when sown the field and glasshouses. Similarly, possums target the fruit, often peeling them, separating seeds and leaving them in distinctive piles. They even destroy chicken wire cages to acquire fruit inside. Therefore, it appears that introduced mammals play a major role in the dispersal of this noxious weed.

A socio-ecological system approach to incorporating biodiversity in landscape change

Presentation Type: Oral

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This paper explores the role of agriculture policy in the decline of indigenous biodiversity by tracking the socio-ecological transformation that occurred with white settlement in New Zealand and Gippsland South Eastern Australia over the last century. This transformation has resulted in a predominantly production dominated landscape. Our analysis highlights the social, technological and economic mechanisms and looks to the future policy instruments that attempt to redress the balance within production dominated landscapes.
The major drivers identified related to the pursuit of national and local economic and social well being. The transformation process created cultural and ecological values not widely questioned until the early 1990s. Progress in achieving biodiversity goals on agriculture land may be linked in the shorter term not to international trade issues but to local communities and urban dwellers through regional planning.
We make the case that building awareness of ecosystem dynamics through

understanding historical processes enables contemporary players to locate desired outcomes-in this case the creation of a landscape mosaic that incorporates diverse production, conservation and tourist values-as part of an ecosystem management approach that will contribute to the resilience of the new social-ecological system. The capacity to manage multiple drivers as part of interlinked or complex ecosystems highlights the need for strong communities able to imagine and sustain the desired socio-ecological state and contribute to evolving resilience.

A legal challenge to forestry in Tasmania: the use of a population model for the wedge-tailed eagle

Presentation Type: Oral

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A legal challenge is currently playing out in the Federal Court of Australia with major ramifications for the country's regional forest agreements. The case has been put that forestry in Tasmania is in breach of the Environmental Protection and Biodiversity Conservation Act (1999) because activities are likely to significantly impact on several listed species, including the Tasmanian wedge-tailed eagle (Aquila audax fleayi). This paper describes the population model for the Bass District in Northeast Tasmania used as evidence in the court case and outlines several challenges to using model results in a legal context. The modelled impacts of timber production include disturbance of nest sites, poisoning from 1080, increased rate of unnatural mortality due to improved access to sites, reduction in suitable habitat and reduction in the future availability of nest trees. Additionally, the model includes mortality from other human activities, including persecution by shooting, poisoning and trapping, road accidents and electrocutions. Five alternative scenarios are modelled prescribing different levels of harvesting and plantation conversion. If current forestry practices continue, in the presence of current rates of unnatural mortality, the model predicts almost certain extinction in the region modelled.

Above and below ground impacts of introduced predators on seabird dominated islands

Presentation Type: Oral

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Despite international interest in the ecology of invasive organisms, much remains unknown about how they affect ecosystem functioning. We investigated alien organism effects in ecosystems on islands off the coast of northern New Zealand. On these islands, seabirds are major ecosystem drivers through their burrowing activity and transporting of nutrients from the sea to land. Invasive predators (ship and Norway rats) have been introduced to some of these islands but not others; when present these rats devastate seabird populations through consuming eggs and chicks. We found by comparing rat-free and rat-invaded islands that rats substantially reduced forest soil fertility through disrupting sea-to-land nutrient transport by seabirds. This in turn led to cascading effects through multiple trophic levels of the soil food web, and ecosystem processes driven by the soil biota such as soil respiration and litter decomposition. We also found important aboveground effects of rats; generally rats reduced plant nutrient concentrations through reducing soil fertility, but they also promoted tree biomass and seedling density through reducing disturbance by seabirds. Our results demonstrate that invasions by rats (and their removal of seabirds) act as major ecosystem drivers by exerting wide-ranging effects both above and below ground, via multiple pathways.

Overview of Ecology and the Law

Presentation Type: Oral

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One important aspect of environmental law is the protection of biodiversity. As a result international instruments and domestic legislation contain a variety of references to ecological concepts.

This paper presents an overview of ecology and the law, and sets the context for other papers in the Symposium. There will be a focus on examples of how the law approaches ecological concepts, and of some of the difficulties that arise this context. There will also be references made to New Zealand case law which highlights some of these difficulties.

A fresh look at alpine plant breeding systems in New Zealand

Presentation Type: Oral

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Breeding systems of plants in the New Zealand alpine zone are thought to be dominated by autogamy (e.g., self-pollination). The flowers of most New Zealand alpines are not very showy and therefore pollination is considered to be of minor importance. There is, however, very little data to confirm these assumptions that have been the common consensus for many years. If mainly self-compatible and autonomously selfing species (i.e., self-pollinating without the need for pollen vectors) comprise the New Zealand alpine flora, how do these plants maintain the genetic diversity that allows them to cope with a harsh and challenging environment? In a worldwide context it has been demonstrated that alpine plants favour outcrossing as a breeding system and will prioritize cross-pollination over carbon gain and growth. Here we provide data on breeding systems of seven species of a high alpine community in southern New Zealand. There is evidence that insect pollination may be of much greater importance for successful plant reproduction in alpine environments than previously thought.

Response of communities to sustained nutrient input: First evidence of ratio-dependence in an estuarine system

Presentation Type: Oral

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Resource- and ratio-dependent models of predator-prey relationships provide divergent predictions as to the sustained ecological effects of bottom-up forcing. While resource-dependent models, which consider only instantaneous prey density in modelling predator responses, predict community responses that are dependent on the number of trophic levels in a system, ratio-dependent models, which consider the number of prey per consumer, predict proportional increase in each level irrespective of chain-length. Our study, which sampled phytoplankton, macroinvertebrates, invertebrate-feeding fishes and piscivorous fishes into a tidal creek subject to over 20 years of sewage-discharge, provides the first empirical discrimination between the two models in an estuarine system with four trophic levels. Increased abundance of phytoplankton at the disturbed site was counter to the predictions of resource-dependent models, which posit a reduction in the first trophic level in response to enrichment. By contrast, the proportionality of increases in abundances of

each of the four trophic groups to nitrogen loading provided strong support for ratio-dependency. This first evidence of ratio-dependence in an estuarine system not only demonstrates applicability of ecological theory, but has implications for management. Although large nutrient inputs frequently induce mortality of invertebrates and fish, smaller inputs may infact enhance biomass of all trophic levels.

Assessing the Quality of Native Vegetation in North West Victoria

Presentation Type: Oral

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The importance of protecting and conserving biodiversity is reflected in legislation and policy at all levels of government. Implementing strategies to achieve biodiversity conservation requires effective, accurate and reliable tools, in particular a vegetation condition assessment tool. Such tools are being developed for identifying conservation priorities, monitoring rehabilitation programs, assessing development applications, managing conservation incentive programs, educating landholders, and state-of-the-environment reporting. In Victoria, government agencies currently use the Habitat Hectares method to evaluate vegetation condition, however the efficacy of this method for all vegetation types has not yet been established. The aim of this project was to refine an assessment tool for the Mallee-type vegetation of North West Victoria. Vegetation condition was determined using a range of assessment tools and basic ecological survey techniques at 32 sites across North West Victoria. Comparison of the data collected by different methods suggests that while the Habitat Hectares method was useful in indicating vegetation condition, other methods were more accurate. Here we present a new method for measuring vegetation condition in the Mallee that was developed based on these analyses.

Tropaeolum speciosum: A super weed?

Presentation Type: Oral

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Tropaeolum speciosum, the Chilean flame creeper, was introduced to New Zealand in 1958 and has spread widely over the North, South and Stewart Islands. It is now recognised as an environmental weed by the Department of Conservation. All control methods to reduce the vine's destructive impacts on forest ecosystems have failed. These failures may derive from the lack of scientific knowledge.

This first ecological study of T. speciosum is based on growth, reproduction and stress tolerance. Special focus on below-ground growth observed in a rhizotron, re-sprout from rhizomes under several environmental conditions, different aspects of the breeding system and the dependency on light where measured.
Results show extremely fast growth in shoot-length and resprouting from rhizomes in spring. In the self-compatible flowers, herkogamy and protandry inhibit self-pollination while birds alone undertake crossing between flowers. Under different light levels T. speciosum can respond differently in growth.
The results of this study contribute understanding of its life cycle and knowledge of its spread, persistence and ability to evolve. This can lead to better targeted and more effective weed control as well as a better understanding of the problem of invasive exotic plants in general.

A rule of thumb for promoting biodiversity in tropical savannas by controlling fire size

Presentation Type: Oral

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A key theme in tropical savanna ecology is the interaction of grasses and woody components of the vegetation with landscape fire. The vegetation of this biome is both highly flammable and demographically advantaged by fire, creating a meta-stable situation in which slight changes in fire frequency or fuel type can result in substantial changes in ecosystem structure. Indeed, a grass-fire cycle can be initiated by invasive flammable grasses (exotic or native), and some species may be adapted to promote fire as a mechanism of interspecific competition. We have developed a spatially-explicit model for the annual grass Sarga, underpinned by demographic and biogeographic data, to explain the paradox of its persistence in frequently burnt areas. We relate the area of landscape unburnt for > 5 years to the frequency and size of fires, to develop a robust rule of thumb on fire size that is both easy for managers to implement and promotes the persistence of fire-sensitive vegetation and fauna dependent on a heterogeneous mix of recently-burnt and long-unburnt habitat.

No evidence for pollen and resource limitation in Aciphylla squarrosa

Presentation Type: Oral

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We investigated the interaction of resources and pollen on fruitset by experimentally manipulating Aciphylla squarrosa, a long-lived, masting herb. To investigate the interaction between pollinator attraction and resource availability we removed flowers. To test if resources limit fruitset, we increased resources by adding fertiliser and removing competitors, and decreased resources by removing foliage. To ascertain whether pollen limitation was evident we added supplemental pollen to the above experiments. Reducing floral display decreased fruitset, suggesting that display size is a reflection of an optimal investment between attraction and fecundity. Resource reduction decreased fruitset, but fertilisation or flower removal did not increase fruitset, suggesting resources did not limit reproduction. Supplemental pollination did not increase fruitset suggesting pollen limitation is not occurring. While we found simultaneous pollen and resource limitation did not occur within a season, this is possibly mitigated by life history patterns including mast seeding and a storage taproot. Multiple year studies are required to further examine simultaneous resource and pollen limitation.

Temporal dynamics of abundance-occupancy relationships

Presentation Type: Oral

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Abundance-occupancy relationships (AOR's) - where locally abundant species tend to be found in many sites, whereas locally rare species tend to be more narrowly distributed - are one of ecology's most ubiquitous and oldest macroecological patterns. Several causal mechanisms have been proposed to explain this pattern and are well understood theoretically. However, there is little consensus on the factors important in generating and maintaining the relationship in natural systems. Recent work has suggested that a better understanding of the causes of interspecific AOR's will come from examining temporal changes in the occupancy and abundance of individual species (intraspecific AOR's). In this study, we examine the dynamics of inter- and intra-specific AOR's for vascular plants in South Island tussock grasslands. A set of 142 permanently-marked transects, encompassing nearly 400 species, was measured in the 1980's and again in the 1990's. These data show that, surprisingly, despite the substantial turnover in species on these transects (a decline in total species richness and 891 colonisations and 1207 local extinctions across transects between the two measurements), the general form of the interspecific AOR for these plant communities has not changed temporally. Here, we show

how individual species' dynamics over time may influence the interspecific AOR.

Monogamous lizard pairing not the result of partner shortage

Presentation Type: Oral

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The Australian sleepy lizard, Tiliqua rugosa, maintains monogamous partnerships for 6-8 weeks each spring, up to the time of mating. The lizards also show long-term pair fidelity, with records of pairs reforming each year for over 20 years. We manipulated sex ratios, to determine whether monogamous behaviour of females within a season results from a need to guarantee a partner. We observed pairing behaviour in an experimental population over two years. In the second spring we reduced the number of adult females, leading to an excess of males. We compared female behaviour with an adjacent un-manipulated population over the same period. We expected females to be less monogamous, after the experimental manipulation, with more potential male partners available. But we did not detect any change in female behaviour. We used the same manipulation to test whether fidelity across years resulted from a shortage of suitable alternative partners. We expected, but did not find, that females offered an excess of males would be less likely to choose the same partner in successive years. We concluded that monogamous behaviour in female sleepy lizards, both within and across seasons, results from factors other than shortage of alternative options.

Seed dispersal by weta

Presentation Type: Oral

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Weta are giant, flightless grasshoppers that are endemic to New Zealand, which in the absence of native mammals, are thought to perform similar ecological functions. As such, they might be expected to be important seeds dispersers. However, insects are not known to consume fleshy fruits and disperse seeds after gut passage. We conducted a series of observations and experiments to test whether weta form mutualistic partnerships with fleshy-fruited plants as seed dispersers, similar to small mammals elsewhere in the world. Results showed that weta are indeed effective seeds dispersers, providing a remarkable example of ecological convergence between unrelated organisms.

Using "spillover" as a cost-effective management tool for species recovery over large areas

Presentation Type: Oral

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Threatened species management on the NZ mainland has often focussed on single species in relatively small reserves. Increasingly, however, projects are aiming to restore much larger areas and multiple species. Natural dispersal into surrounding habitat from intensively managed sites has often been labelled as an undesirable "leakage". Implications of this concept are that intensively managed areas need to increase in size so that most dispersal is contained within the management area. Such large management units would be very expensive.. Here it is argued that this same dispersal may be a desirable "spillover" effect of management, allowing increased efficiency of threatened species management over large areas. A population model developed for a 4000ha stoat treatment area to benefit North Island brown kiwi in the Northern Te Urewera Ecosystem Restoration Project (NTUERP) is presented as an example of this approach. The model indicates a realistic expectation that this treatment may sustain moderate kiwi densities over 25,000ha. There is therefore potential to repopulate very large areas at a fraction of the cost of treating the whole area.

Arthropod assemblages of mistletoe: composition and spatial turnover

Presentation Type: Poster

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To optimally conserve invertebrate communities, we need to quantify their diversity and spatial turnover in species composition. Invertebrates make up 47% of the estimated 0.5 million species of eukaryote organisms in Australia (Nielsen 1999) and play critical functional roles e.g. in pollination and nutrient cycling. Recent studies suggest that invertebrates have a higher spatial turnover than vertebrates or plants, and that mapped environmental or vegetation classes are inadequate surrogates for conserving invertebrate diversity.

The spatial turnover of arboreal arthropod fauna has not been well studied. Hence, mistletoe clumps are an ideal habitat component on which to undertake this research. Mistletoe clumps are a well-defined substrate and occur frequently across the landscape.. This research is being conducted in the south-west slopes of New South Wales, Australia, where box mistletoe (Amyema miquelii) is widespread and abundant in patches of remnant eucalypt woodlands.

The diversity and spatial turnover in species composition of the arthropod assemblages will be presented, along with an assessment of the influence of host eucalypt species, and a comparison between assemblages on mistletoe and eucalypts.

Resilience of forest remnants in New Zealand agroecosystems: Reservoirs of life or the living dead?

Presentation Type: Oral

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Small forest stands dominated by native conifers are a characteristic feature of lowland New Zealand agroecosystems and are often the only vestiges of native biodiversity that remain in these landscapes. Analysis of the age-structures of these stands suggest that most arose as a consequence of land development for agriculture in the late 19th century, so they are all similar in stage of stand development. They are generally considered to be separate from the production systems on farms (often dairy), and to be more of a cost than a benefit. As a result they are often neglected, and many are being progressively degraded by anthropic disturbance. We examine the resilience of these stands to a range of potential future perturbations, using a socio-ecological framework. Continuation of the current trends will lead to a continued slow decline to collapse, and eventual elimination of these stands. This will be exacerbated by storms, floods and other natural disasters. However, under a range of other scenarios, these stands offer opportunities for farm diversification, and provision of ecosystem services. This should increase the perceived value of the stands and the likelihood of management to maintain and improve their condition and extent, with new stands established, in order to maintain their persistence in the landscape.

Montane outcrop vegetation of Banks Peninsula, South Island, New Zealand

Presentation Type: Poster

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Species composition patterns and vegetation-environment relationships were quantified for montane volcanic outcrops on Banks Peninsula. The flora of these visually obvious habitat islands comprises 346 species including 82 exotic species and 40 regionally rare species. We used TWINSPAN to classify the vegetation on 153 outcrop faces distributed across 39 outcrop systems into seven community types. The primary factors distinguishing vegetation types separate three outcrop communities that tend to face north, have shallower slopes, and more fertile soils from four communities occurring on steeper slopes with other aspects and less fertile soils. The first three communities occur on outcrops primarily bordered by grasslands and support more exotic species; the latter four communities are more likely to be bordered by forest or taller shrublands. Secondary factors that distinguish communities are altitude, outcrop size, soil depth and shading. We describe the vegetation of these seven communities that ranges from stunted trees and taller statured species such as Podocarpus hallii and Phormium cookianum through more shrubby species such as Heliohebe lavaudiana and Hebe strictissima, through more typical native woodland and grassland species such as Polystichum vestitum and Rytidosperma

corinum through to exotic pasture of clovers and exotic grasses.

An ecological assessment of geothermal habitats within the Taupo Volcanic Zone of the Central North Island

Presentation Type: Oral

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Geothermal vegetation occupies habitat that has been determined by past and present inputs of the Earth's interior heat. Almost all of the geothermal vegetation in New Zealand occurs in the Central North Island (CNI) within the Waikato and Bay of Plenty Regions and is associated with the Taupo Volcanic Zone. Few studies of geothermal vegetation were undertaken prior to exploitation of geothermal energy and other land development (e.g. pastoral, forestry and urban) of geothermal sites in the CNI. Between 2003 and 2005 we identified, mapped and classified all known areas of geothermally-influenced terrestrial vegetation and emergent wetland vegetation in the CNI. In total, c.580 ha and c.290 ha of geothermal habitat was mapped in the Waikato and Bay of Plenty Region respectively. The vegetation types at each site were classified into major vegetation types - indicating current extent of each type for each site, and for the CNI as a whole. The current extent of key vegetation types (e.g. vegetation dominated by prostrate kanuka, an endemic species to geothermal sites) and their conservation requirements are discussed. This study provides a useful baseline to monitor ongoing change to the extent and quality of geothermal vegetation in the CNI.

Climate change and disease: Bleaching and bacterial infection of a marine alga

Presentation Type: Poster

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Climate change has been associated with an increase in frequency of disease in many habitats. In marine environments, diseases have often been linked to mass mortalities of important habitat-forming organisms, including corals, seagrasses and macroalgae. We have observed an abundant red alga Delisea pulchra to bleach during the summer when water temperatures are elevated. D. pulchra defends itself from bacteria and other epibiota by producing halogenated furanones, which inhibit

bacterial settlement and biofilm formation. Levels of furanones produced by D. pulchra are known to vary with UV and temperature. The bacterium Ruegeria strain R11 has been isolated from the surface of D. pulchra and is closely related to known red algal pathogens. Case et al. (in review) demonstrated that when furanone production is compromised Ruegeria strain R11 cells are able to colonise the surface of the alga and at higher temperatures become virulent, invade the thallus and cause bleaching. The purpose of this work is to further investigate the relationship between chemical defenses, environmental stress, bacterial infection and in situ bleaching of this alga. We will implement a long-term monitoring program of bleaching and presence/absence of Ruegeria strain R11 on D. pulchra at three sites (warm, mild and cold temperate) and at deep and shallow locations within these sites. Laboratory inoculation experiments will test the hypothesis that furanone levels, temperature and UV-radiation mediate bacterial infection and bleaching in D. pulchra.

Charophytes as indicators of catchment health

Presentation Type: Oral

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The occurrence of charophytes (macroscopic algae in family Characeae) can be an indicator of catchment biodiversity, resilience and response to change. A seed bank and vegetation survey of two catchments in South Australia (Tookayerta Creek and Angas River) was undertaken to determine the distribution and abundance of submerged plants in those habitats. The historical occurrence of submerged plant was also determined. These data were were compared for the two catchments. In general, in the Tookayerta creek catchment, the vegetation is not resilient to drought or increased salinity. Although the overall diversity of charophytes in the Tookayerta catchment is apparently stable, the extent of available habitat has decreased markedly over the last 20 years. In the Angas River catchment the current vegetation is largely resilient to drought and fluctuations in salinity. The paucity of historical data on the submerged vegetation of the Angas catchment prevents any assessment of overall change. However, it is apparent that wetlands at the mouth of the Angas River (and the shores of Lake Alexandrina) contain more salinity-tolerant species than were recorded there in 1848. It is vital for future assessments that voucher specimens be deposited in herbaria. Documentation of charophyte tolerances and distribution in relation to environmental variables can be a valuable tool for assessment of catchment health.

Restoring the botany wetlands, Sydney: Moving beyond the rhetoric

Presentation Type: Oral

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By implementing a multi-faceted Plan of Management, in partnership with government agencies and private stakeholders, Sydney Water has restored the ecological diversity of Botany Wetlands, an environmental and historical icon of Sydney. Evidence of ecosystem recovery in the previously degraded Wetlands is shown by:

* Decreased cover of weeds and invasive trees and increased cover of native vegetation,
* Enhanced water regimes and flow through the system,
* Increased biodiversity- six frog species now inhabit the Wetlands; only one was present a decade ago,
* Decline in occurrences of toxic blue-green algal blooms,
* Significant improvement in water clarity, which has increased 4-fold, and
* Large reductions in European Carp infestations, contributing to improved water quality.

The ecological restoration of the Botany Wetlands is an example of integrating strong action to alleviate negative influences of urbanisation on ecosystems, and successfully focusing nature's own healing processes to incrementally repair ecosystems.

The programme's accomplishments emphasize the need for developing a whole-of-government approach, and partnerships with stakeholders, to provide sustainable outcomes, which benefit the community and the environment. The knowledge gained through the work gives confidence that the same integrated approach can be applied to restore ecosystems under similar pressure elsewhere

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Creatures of Habitat? What can predictive modelling tell us about the factors driving fish distribution?

Presentation Type: Oral

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Ecological studies of marine fish distribution have tended to focus on how assemblage or community structure varies over different environmental gradients. However, there has been little work done to determine whether single species responses could provide greater insight into the factors influencing distribution. Predictive modelling techniques were used to investigate the functional relationships that influence the spatial distribution of fish species in the Recherche Archipelago, Western Australia, and to determine whether fish distribution can be linked to habitat. Generalised additive and generalised linear models revealed that response curves are not always unimodal and thus should not be assumed. The models also indicated that some species have a much stronger association with habitat than other species in the same assemblage suggesting that more information about the ecological factors driving distribution could be revealed from the study of single species responses rather than assemblage/community structure. For those species with poor habitat association, other factors appear to be influencing their distribution and further research is required to identify what they are.

Vital attributes for fire management and research: A reassessment of Nobel & Slatyer 1980

Presentation Type: Oral

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Noble & Slatyer 1981 was a seminal paper in ecologically-oriented fire management in Australia. It listed basic attributes of plant species that both stream conservative fire management and imply a local burning régime. This approach is increasingly at the basis of applied fire régimes (eg. the Victorian and Western Australian approaches).
However, our understanding of plant ecology in relation to fires has advanced in the last 20 odd years and a reassessment of the underlying ecology and Noble & Slatyer's contingent categorizations has been undertaken across the Victorian Flora.
A modified set of Vital Attributes has been developed and is here presented. New category states and new scoring systems are proposed. Frequent misunderstandings and ambiguities are corrected.
The modified Vital Attributes dataset has been incorporated into the basic botanical database used in Victoria and is now a major driver of applied fire régimes. However, the data are decidedly incomplete and many category states were assigned with scant research backing. Further research is urgently required, particularly in the rôle of the soil seed bank and germination inhibitors/promoters.

Is the sooty beech scale insect dispersal-limited?

Presentation Type: Oral

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The sooty beech scale insect (Ultracoelostoma spp.) sucks sap from up to one million ha of beech (Nothofagus) forests in New Zealand. Enigmatically, the densities of the insects varies greatly among trees within the same stand. We investigated whether this variation could be explained by limited spatial dispersal of the insects, resulting in some trees going uncolonised for long periods by chance. We measured the spatial distribution of insects at a local scale on 764 neighbouring trees in seven plots at Mt Richardson (Canterbury). Spatial analysis of insect density on trunks showed no significant overall contagion.. Dispersal data showed considerable insect aggregation within trees, but also abundant inter-tree dispersal by wind and crawling. However, the two largest plots did show spatial patterns consistent with subplot-level environmental heterogeneity, suggesting environmental factors may affect individual trees' suitability for infestation.

Landscape composition and plant-herbivore interaction: Population regulation and competition between generalist herbivores

Presentation Type: Oral

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Theoretical and empirical models of plant-herbivore interaction have focused on the efficiency with which edible plant biomass can be consumed by herbivores (the functional response which determines foraging efficiency), and turned into units of herbivore increase (the numerical response which determines demographic efficiency). Foraging and demographic efficiency determine the reciprocal influence plants and herbivores exert over each other's abundance, and hence the persistence of a plant-herbivore system in the face of density-independent perturbation or competition. Because landscape composition determines the spatial distribution of factors that influence foraging and demographic efficiency, it also determines herbivore population persistence and competitive ability. In this paper, a common plant-herbivore model is modified so that the influence of landscape composition on herbivore foraging and demographic efficiency can be explored. The model is used to simulate the influence landscape composition has on the distribution and abundance of a generalist herbivore and consequent competition with other herbivores. The model provides a mechanistic link between concepts of population regulation, source-sink dynamics and competition in fluctuating environments.

Implications of plant-plant interactions and other plant traits on rehabilitation for New Zealand drylands

Presentation Type: Oral

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New Zealand dryland ecosystems, located in the rain shadow region east of the Main Divide, have been highly modified since the arrival of humans. Seedling establishment appears to be a crucial step in the rehabilitation of woody dominance in those threatened ecosystems. Plant-plant interaction is a major determinant of regeneration of woody species in drylands. Neighbouring nurse plants may facilitate woody establishment, but competition with the same neighbouring plants may overpower the positive interactions. The net effect of these opposing interaction mechanisms influences the community dynamics, and their balance shifts along stress and successional gradients. This shifting balance has key implications for rehabilitation. Other traits of the woody species present may also limit or enhance their regeneration potential in the drylands. These include seed production, palatability, pollination and dispersal methods, and tolerance to fire, cold and drought. Understanding the life history traits of woody species that may enhance their regeneration will be vital to the successful rehabilitation of New Zealand drylands.

Tracer stable isotopes show co-existing bog species have different nutritional niches

Presentation Type: Oral

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Natural 15N abundance studies in raised bogs showed co-existing Empodisma minus and Sporadanthus ferrugineus (both Restionaceae) were isotopically separated (mean shoot delta 15N = -0.42 per mil and -4.23 per mil respectively), suggesting different N sources and/or plant N demand. The root systems of the species are vertically displaced, with Empodisma forming a c. 50 mm thick surface layer of fine roots and root hairs above Sporadanthus rhizomes and roots that penetrate more deeply into the peat. We used tracer stable isotope techniques to investigate nutrient acquisition in these two species and hypothesized that Empodisma would access more atmospherically-derived nutrients than Sporadanthus. We added 1.6 millimoles of 15N (as 99 atom % 15N ammonium sulphate) per m2 of bog surface, followed by 34 mm of deionised water to distribute the 15N through the root/peat matrix. Approximately 80% of the tracer applied was recovered in peat cores, and of this, around 90% was recovered in the uppermost 50 mm, in the Empodisma root layer. We found that the majority of 15N added had been absorbed by plant roots.
Seven weeks after tracer application, young shoots of Empodisma were enriched with 15N (mean delta 15N = 7.21 per mil) whereas co-existing Sporadanthus shoots were not significantly enriched (mean delta 15N = -2.76 per mil). Our results showed the species acquire nutrients from different rooting zones, with Empodisma accessing nutrients at or near the surface from rainfall and Sporadanthus accessing nutrients from deeper peat layers. By having different nutritional niches, these two related species are able to co-exist and avoid competitive exclusion.

Indigenous biodiversity, restoration and the perfect New Zealand city

Presentation Type: Oral

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Most New Zealanders live in cities and urban dwelling shapes their perception of the natural environment. The restoration and reconstruction of urban ecosystems is seen as an increasingly important strategy to maintain and protect biodiversity as well as reconnecting people to the environment. The current upsurge of restoration activity in New Zealand suggests it is timely to evaluate efforts and the potential to successfully contribute to biodiversity goals.

New Zealand cities are highly variable in both landform and level of biodiversity resource. We have analysed differences in environmental parameters that exist between cities to determine the range of native ecosystems that are (or can potentially be) represented within the broader environmental profile of New Zealand. We have attempted to assess existing green space within cities, including matrices of remnants currently being restored and areas with degraded indigenous ecosystems. Using this information we have quantified where current urban restoration effort lies, and the restoration potential of New Zealand cities in the light of threatened species, biodiversity and the potential for ecosystem function. High levels of endemism, the sensitivity of species that have evolved without humans, and the invasion of exotic species all indicate the need for predominantly New Zealand derived solutions to restoration challenges.

Changes in seedling communities following deer and rat eradication from Ulva Island, Rakiura National Park

Presentation Type: Oral

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We tested whether seedling communities of Ulva Island had undergone any changes since the eradication of Norway rats and white-tailed deer there. Eight permanent plots, established there in 1991 prior to the rat eradication campaign, provided baseline data to compare the forest understorey before and after this experimental management. These plots were re-measured in the summer of 2003. Out of twenty-one woody plant or treefern species recorded in these plots, seedling densities of Coprosma colensoi, C. grandifolia, Dicksonia squarrosa, Pittosporum crassifolium and sapling densities of C. colensoi all increased significantly between 1991 and 2003. We believe that the removal of both rats and white-tailed deer (which had been controlled for several decades longer than rats on Ulva Island), were responsible for the observed increases in seedling density. The ongoing effects of this work will be discussed.

Using the Carbon Management Index to indicate ecosystem function in Brigalow (Acacia harpophylla) agro-ecosystems of southeast Queensland, Australia

Presentation Type: Oral

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Soil organic matter is an effective indicator of soil resource condition that reflects functional traits such as aggregation, infiltration and microbial activity and plays a critical role in sustaining production and ecosystem services in agricultural landscapes. Agricultural practices typically reduce soil carbon levels through the action of soil disturbance and consequent mineralization. In the Brigalow (Acacia harpophylla) landscape we studied, soil carbon levels in pellic vertisols were significantly lower in the agricultural matrix of cropping and grasslands than in remnant Brigalow vegetation. There was no detectable gradient of soil carbon across Brigalow/matrix boundaries. Uncultivated grasslands showed significantly higher carbon levels than currently and previously cultivated grasslands, with regenerating grasslands showing no significant recovery of soil carbon over 15 years. The carbon management index (CMI) was used to combine the active and passive components of soil carbon to provide a sensitive indicator of the rate of change of carbon dynamics in response to changes in land management at local-scales. A landscape CMI (CMIL) was developed, by aggregating soil carbon data using GIS-derived spatial data. The landscape CMI is proposed as a potentially useful tool for modelling soil carbon dynamics and ecosystem function in agro-ecosystems at a range of spatial scales.

The systematics and taxonomy of New Zealand cave weta (Rhaphidophoridae)

Presentation Type: Oral

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New Zealand cave weta (family Rhaphidophoridae) species are all endemic to the North or South Island or offshore islands of New Zealand. Due to the very diverse range of habitats occupied by cave weta and their highly variable morphology, there are many species still to be described, parts of their taxonomy are in disarray and there is little known on their ecology or behaviour. Gymnoplectron is possibly the best known genus of New Zealand cave weta, being often large and a common inhabitant of caves. DNA sequencing will be used to create a phylogeny of the cave weta genera which will be used to study relationships between genera and help resolve any taxonomic issues within the group. Population genetics will be used to study gene flow within and among populations of the species of Gymnoplectron that is found in the Waitomo caves. This method will help determine the scale of movement of animals going between caves (such as, through the bush), and to identify any possible barriers to gene flow (for example, migration). Information resulting from this study will be of systematic and conservation importance as it will provide the basis for interpretation of genetic structure across the genera.

Post-release survival of captive-bred malleefowl in western New South Wales

Presentation Type: Oral

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The malleefowl, Leipoa ocellata, is endemic to Australia and is the only arid-dwelling megapode in the world. Malleefowl populations have undergone serious declines as a result of habitat loss and predation by introduced predators. Since 1990 a successful captive breeding program has been supplying chicks for release into Nature Reserves in western NSW. However, early studies indicated that post-release survival of the captive-bred chicks was low, mainly as a result of predation by foxes. In addition movement patterns of sub-adults following release is poorly known, making selection of optimal release sites difficult. This study investigated the survivorship of captive-bred malleefowl following the introduction of aerial fox baiting. Data on mortality and movement patterns of 14 sub-adult birds were collected using radio telemetry from November 2005 to April 2006. Survivorship in the first four months following release was relatively high with only one mortality confirmed. The majority of birds dispersed from the release site. However, variation in movement patterns between individuals was high, with some individuals moving large distances each day and others remaining in the vicinity of the release site. The results of this study suggest that fox baiting has been successful in improving survivorship of released malleefowl.

Trait comparisons within rainforest pairs across high and low rainfall habitats confirm the derivation of a dry rainforest flora

Presentation Type: Oral

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The 'climatic sifting hypothesis' (CSH) proposed that following the onset of Tertiary aridity Australian rainforest species: 1) became extinct, 2) retreated to refugia or 3) evolved into dry-adapted species (the dry rainforest flora). We tested 3) by examining a corollary: that dry rainforest taxa are more drought-resistant than their mesic relatives.
Drought-resistance traits were measured in the field for 11 pairs of phylogenetically independent contrasts (PICs) of rainforest taxa from low or high rainfall habitats. In 10 of 11 PICs, the dry rainforest taxon had a suite of traits indicative of greater drought resistance than their relatives from mesic rainforests, providing support for the CSH. Differences in traits were not due to deep phylogenetic divergences, indicating multiple

independent evolution of drought-resistant traits due to convergence rather than retention through phylogenetic conservatism. Reduction in leaf size (width, length and area) was the most common trait shift between habitats, and there were differences in water use efficiency (determined by carbon isotope discrimination), specific leaf area and wood density. Wood traits (density and water storage capacity) were generally uncorrelated with leaf traits, suggesting alternative axes in drought-resistance traits relating either to plant hydraulic function or leaf structure and function.

Plant functional traits explain interspecific differences in cyclone damage to trees of an endangered rainforest community in north Queensland

Presentation Type: Poster

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Cyclones are important disturbance agents of tropical rainforests. Some studies have shown that certain plant functional traits are correlated with levels of cyclone damage sustained by rainforest trees. On 20 March 2006 severe tropical cyclone "Larry" crossed the north Queensland coast and proceeded inland across the Atherton Tablelands, impacting the critically endangered Mabi Type 5b rainforest. We investigated the effects of cyclone Larry on common tree species by categorizing trees as uprooted, snapped, limb damaged (light, moderate, severe) or upright and by estimating levels of defoliation. Damage was then related to functional traits. Species experienced different levels of damage. Tree size and the presence of buttresses were not related to damage levels. Wood density was significantly negatively correlated to proportion of trees with snapped stems and significantly correlated with the proportion of trees upright with no or light limb damage. Pioneer species were more damaged than non-pioneers. Leaf structure (specific leaf area - SLA), but not leaf size (area, length, width), was related to levels of defoliation. Traits related to low levels of cyclone resistance (low wood density, high SLA) are also those linked to rapid growth, so changes in floristic composition may only be short term.

A conceptual model for understanding generalised plant-pollinator systems

Presentation Type: Oral

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Pollination is a dynamic interaction, varying in the number and interdependence of participants and the strength of the interaction. Exclusivity of one plant species serviced by a single pollinator is rare. More commonly, pollinator assemblages consisting of a mixture of different pollinator types coupled with temporal variation in the assemblages of populations among years maintains generalisation at the population/local level. In addition, spatial variation in assemblages among populations maintains generalisation at the species level. Therefore, the role of variation in pollination is fundamental for understanding ecological dynamics of plant populations and is a major factor in the evolution and maintenance of generalised and specialised pollination systems. Using a model system, Trachymene incisa (Apiaceae), we investigated pollinator assemblages in a generalised pollination system and found that populations are not equally generalist. A conceptual model was developed to include the degree of ecological and functional specialisation of a plant species on pollinators and the variation encountered across different levels of plant organisation. This model describes the ecological or current state of plant species and their pollinators, as well as presenting the patterns of generalisation across a range of populations, which is critical for understanding the evolution and maintenance of the system.

Can soil macroinvertebrates reduce sediment export from grazing lands to the Great Barrier Reef Lagoon?

Presentation Type: Oral

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Declining soil health has become a critical issue within the Great Barrier Reef Lagoon (GBRL) catchments along north-east Queensland. Within the Upper Burdekin catchment, symptoms include increased soil compaction, reduced water infiltration and nutrient holding capacity, and increased sediment, nutrient and water run-off. Improving soil hydrological function

is critical to reducing such effects. Healthy soils have a good ability to capture and retain rainwater and nutrients. Soil macroinvertebrates such as termites play an important role in these processes in the semi-arid grazing lands of north Australia. However, soil macroinvertebrates activity and diversity varies greatly across these landscapes in association with patchiness in perennial vegetation. Cattle grazing can also have marked effects on vegetation patch structure and dynamics and consequently on the structure of soil macroinvertebrate assemblages. Understanding these functional relationships and the consequences for soil health is critical to sustainable pasture and livestock production and the quality of water in run-off entering the Great Barrier Reef Lagoon. We are investigating the functional role of invertebrates in soil eco-hydrological processes within a grazing experiment near Charters Towers, north Queensland. We present an overview of results that suggest heavy grazing intensity reduces macroinvertebrate activity, macropore density and the ability of these landscapes to capture rainwater, and describe the interactions with patch type.

Twenty years of change in South Island tussock grasslands

Presentation Type: Oral

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New Zealand's South Island tussock grasslands are highly modified and degraded. This has been shown to be largely due to the effects of agricultural development, introduced pests, and subsequent invasion by exotic weeds. Recently, many areas have been retired from grazing, which is likely to result in significant changes in the vegetation; however, what these changes will be is unclear. This research investigates changes in tussock grassland vascular plant communities since the 1980's in Otago and Canterbury. We use data collected from 90 permanently marked transects to assess spatial and temporal changes in plant species richness and composition. Previous research has shown that between the 1980's and the 1990's overall species richness on these transects had declined, whereas abundance of Chionochloa sp. (tall tussock) and Hieracium sp. (hawkweed) had increased. This research investigates the patterns in species richness and community structure in these transects over the last 20 years, and relates these patterns to environmental variables and the land management regime.

Introduced ungulates and native sclerophyll forests of New Caledonia: Impacts and control impacts

Presentation Type: Oral

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Native vegetation of New Caledonia evolved in the absence of terrestrial mammalian herbivores until the introduction of several species by Man (e.g. rats by Melanesians, domestic and wild ungulates by European). Sclerophyll forests represent one of the most threatened native ecosystems of New Caledonia, which have been drastically reduced in size by fires, habitat destruction (for cattle grazing) and impacts of introduced herbivores. This paper presents the results of several studies (browse surveys, rumen and faecal analysis, exclosures) on the impacts of introduced ungulates (mainly rusa deer Cervus timorensis) on remnant patches of sclerophyll forests.
The following impacts of have been identified: i) consumption of native plant species (including a least 17 endemic plant species listed on the IUCN redlist); ii) antler rubbing of deer males during the rut (more than 46 species of vines, shrubs and trees); iii) dissemination of introduced or invasive plants by endozoochory (5 species of graminoids identified so far). However, as suggested by ongoing exclosure experiments, the control of ungulate populations could also result in "cascading effects" with unexpected negative consequences for the conservation of sclerophyll forests, as they also play a positive role by controlling introduced invasive plants.

The ecology of micro-organisms in New Zealand's paradise shelduck

Presentation Type: Oral

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The paradise shelduck is one of the few New Zealand endemic species that has benefited from major anthropogenic modification of the landscape. As land was cleared for farming in New Zealand, the paradise shelducks' habitat range expanded and their distribution increased. Paradise ducks are now found all over farm land in New Zealand, often sharing the same paddocks as livestock. Since they are so widespread, conspicuous and form large flocks on paddocks they are often considered to contribute to the spread of pathogenic organisms to livestock. Unfortunately there are no studies which address the ecology of micro-organisms in relation to the paradise shelducks.
Therefore the objectives for this research are: to establish a baseline health and pathogenic micro-organism profiles for the paradise shelduck; to determine the geographic distributions of the pathogenic micro-organisms; and to assess the threat that the pathogenic micro-organisms pose to livestock.

Communicating science: Priorities and options for the NZ ecological society

Presentation Type: Oral

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What is the role of NZ Ecological Society in our stated objective to 'promote the application of ecology'? What issues or aspects of ecology should we promote? To whom, and by what means? Most importantly, why?

What do we hope to achieve by promoting ecology? A more informed general public? Better decision making in public policy? Better or more sustainable management of natural resources? More successful restoration projects? Which of these is the most important or urgent?

The NZES has recently completed a draft Science Communication Strategy. The Committee would like feedback from members and other ecologists on how to best fulfil our objective to "promote the application of ecology".

Modelling population genetics of Silverleaf Whitefly (Bemisia tabaci biotype B) at different spatial scales.

Presentation Type: Poster

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Bemisia tabaci is one of the most severe agricultural pest insects currently invading cropping systems worldwide, causing huge production and economic loss.
This has become exacerbated with the appearance of a much more damaging and problematic biotype B.

My aim is to model B. tabaci biotype B dispersal in Australia via genetic analysis to enable patterns of distribution and movement over different spatial scales to be determined. I expect that Mitochondrial DNA analysis will show little difference between populations within Australia. However, using Microsatellite markers I expect to show differing levels of genetic mixing between populations and within populations.

Understanding dispersal and dispersal mechanisms of an invasive species means we can improve predictions regarding invasions. Determining the level of gene flow and movement will allow greater planning of Integrated Pest Management (IPM). This information can inform landscape-scale management of crop plants, enabling crop choice, location, planting times, control methods, and control regime to be optimised to reduce damage and economic loss. Applying these techniques may aid in determining specific factors affecting a species distribution and contribute to the eradication/control of invasives.

Too hot to handle: Effects of heat events on Grey-headed Flying-fox camps

Presentation Type: Oral

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Mass mortalities, the phenomena where large numbers of individuals die in a relatively short period of time due to a deadly epidemic disease, or human-induced factors such as oil spills, are commonly reported in the literature. However, less attention has focused on the population consequences of mass mortalities caused by extremes in environmental factors such as temperature. Recently, exposure to prolonged, extreme heat conditions has been associated with an increased number of deaths in flying-fox camps in Australia. Although this phenomenon has been documented historically over 200 years of settlement, it appears that heat incidents have increased in frequency and intensity over the past decade. The actual cause for this shift is still unknown, with global warming and habitat modification being identified as the likely factors. In our study we look at heat mortality incidents that have occurred in NSW in the past two years in Grey-headed Flying-fox (Pteropus poliocephalus) camps. We analyse and compare the conditions and outcomes of these mortality events.. In particular we focus on counting and ageing the victims in an attempt to identify both the age group(s) at risk and the effects that such events might have on the population dynamics of this vulnerable species.

Clover Root Weevil: A case study in agro-ecosystem resilience

Presentation Type: Oral

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The concept of ecological resilience (sensu Holling) focuses on the degree to which systems can absorb perturbations while still retaining their essential structure and interactions. Case studies have shown that apparently stable ecosystems exhibit low resilience to novel pressures, undergoing structural (state) changes that are not easily reversible even with the removal of the apparent driver. The clover root weevil (CRW) represents an important step disturbance to the archetypal ryegrass-white clover pasture community that is the foundation of New Zealand pastoral agriculture. The paper uses field data and modelling to explore the resilience of a dairy farm pasture community to CRW invasion, and discuss whether a state change has occurred. The clover content of such communities was recognised as being under pressure from other drivers (spring grazing management, ryegrass vigour, nitrogen fertiliser use) prior to the advent of CRW, and these may have represented predisposing factors to the collapse that has been observed. We also address cross-scale

effects, in particular the response of ecosystem managers (i.e. elevated N fertiliser use by dairy farmers) to the new condition and how this might impact resilience at the farm system scale, to key drivers of system performance - climatic, market and regulatory.

Mallee reptile responses to fire: A replicated natural experiment.

Presentation Type: Oral

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Fire suppression is a dominant management strategy in agricultural landscapes. Remnant vegetation may not be burnt for decades, disadvantaging early successional species, but then be completely burnt in a single fire, disadvantaging late successional species. In this study I ask how many reptile species are fire specialists, and therefore may be threatened by altered fire regimes in fragmented landscapes? In each of five paired burnt and unburnt habitats, reptiles were sampled in two 400m transects with 11 pairs of pitfall traps per transect. Traps were open for five weeks during summer. Previous fire research suggested that mallee reptiles show three response patterns which corresponds with their biology. Burrowing species increase after fire then gradually decline, spinifex specialists decline after fire, then rapidly recover as spinifex returns, and leaf-litter specialists recover very slowly after fire as the leaf litter is gradually re-established. However, of 15 common species, only five showed patterns consistent with these predictions. The other species showed either a contradictory response, or no response to fire, implying that the model based on favoured microhabitat is too simplistic. Seven of fifteen species could be regarded as fire specialists and so may be vulnerable to decline from fragmented landscapes.

Impacts of the introduced ectoparasitic fly Philornis downsi on Darwin's finches in the Galapagos Islands.

Presentation Type: Oral

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Island ecosystems may be particularly vulnerable to introduced pathogens because they have a depauperate biota with low genetic variability, resulting in greater niche opportunities for novel pathogens, high colonisation and dispersal rates, and hosts that are immunologically naive. The avifauna of the Galapagos Islands currently face threats from the ectoparasitic blood-sucking fly, Philornis downsi, which is known to cause high mortality and fitness costs. A survey of P. downsi intensity on Santa Cruz Island between 1998-2006 showed that parasite intensity differed across six species of Darwin's finches on Santa Cruz Island, with greater parasite intensity in nests of larger bodied species. Nest parasite intensity remained similar between years and across the moist highlands and the arid lowlands, though it was significantly greater in years with higher annual average rainfall. Increased intensity of P. downsi was strongly associated with higher nestling mortality, with no difference in parasite intensity across clutch sizes. However, nests with lower mean P. downsi intensity and larger clutches were found have higher fledging success. The

impact of P. downsi on Darwin's finches has heightened concern for the conservation of this iconic group of birds within the fragile and unique ecosystem present on the Galapagos Islands.

Miniature farmers on a massive scale: Do scale insects regulate beech forest productivity?

Presentation Type: Oral

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Honeydew excreted by phloem-sap-sucking scale insects (Ultracoelostoma sp.) living on the bark of beech (Nothofagus) trees plays an important role in ecosystem process in native New Zealand beech forests. It has been estimated that honeydew corresponds to between 2 and >30% of the annual carbon uptake in trees with scale insects. It is possible that the host trees compensate for this loss with elevated rates of net photosynthesis; by acting as an extra sink for sugar, the insects may increase transport of carbohydrates from leaves, removing limits to photosynthesis that develop as end-products (starch, triose phosphate) of photosynthetic metabolism accumulate. Using experimental and modelling approaches we have investigated this hypothesis for a beech forest in Canterbury. Simulation models suggest that the carbon lost to honeydew is less than previously estimated. Results from a detailed environmentally-driven process-based model show that carbon uptake is greater in trees with scale insects than in those without, and that this difference is similar in size to the carbon lost to honeydew. However, results from experimental manipulations of host tree carbohydrate source-sink dynamics do not clearly support the end-product limitation hypothesis. Although it is not yet clear if there is a causal link between honeydew production and increased host tree photosynthesis, our results highlight the importance of the interaction between scale insects and their host trees for forest ecosystem processes.

Spatial patterns in soil nutrient availability driven by rats and seabirds on New Zealand's offshore islands.

Presentation Type: Oral

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Seabirds (Aves: Procellariiformes) move large quantities of marine nutrients onshore, but these nutrient additions may be localized. Invasive rats (Rattus rattus, Rattus norvegicus) alter spatial patterns by decreasing seabird populations, thereby diminishing the nutrient inputs that cause spatial hetereogeneity in soil. This study aims to elucidate these diverse patterns at the within-island scale. We geospatially sampled soil on six islands varying in seabird population and rat invasion history. For each soil sample, we measured various properties and processes relating to soil

nutrient availability. We expected spatial variance to be driven by burrow density and rat invasion history on individual islands, as follows: high burrow density < rats (low burrow density, but legacy effects possible) < intermediate burrow density. Patterns of spatial heterogeneity behaved as predicted for some soil properties, particularly pH, while some properties, such as inorganic N, were most variable on densely burrowed islands. Burrow density, though expected to drive spatial patterns at the within-island scale, was not consistently correlated with soil properties or processes on all islands, probably due to differing degrees of within-island spatial heterogeneity. Islands with different seabird densities therefore show different spatial patterns in soil nutrient availability, and invasive rats alter these patterns.

Biological control of possums in New Zealand

Presentation Type: Oral

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The brushtail possum (Trichosurus vulpecula) is regarded as New Zealand's number one vertebrate pest in both economic and ecological terms. Whilst conventional control methods (poisons, traps) are effective, the risks posed by the dependence on these methods pose difficulties for their continued long-term use. Biological management offers the only foreseeable technologies for cost effective solutions. To address this need, the National Research Centre for Possum Biocontrol (NRCPB) was recently formed. The NRCPB brings together principal research providers with major end-users into a single entity and represents the primary participants in the development and implementation of possum control in New Zealand. Its main objective is to produce a suite of new tools for the biological management of possums. A multi-disciplinary approach is being undertaken wherein target systems include immunologically based and non-immunologically based fertility controls as well as toxins that target unique transport mechanisms in the possum. Initially, the agents will be delivered in the field as baits and ultimately also as a self-disseminating system. It is anticipated that proof-of-concept models for the biological management of possums will emerge in the next 4-5 years. Social science and ethics will also be key components of this programme.

Rats, mice and possums: Comparative long-term dynamics in the Orongorongo Valley

Presentation Type: Oral

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Long-term studies in the Orongorongo Valley, Wellington, provide the most comprehensive data on the population dynamics of three introduced mammals: ship rat, house mouse, and brushtail possum. Rodent populations were monitored by index trapping over 27 years (1971-1998) and possum populations by capture-recapture over 40 years (1966-2006). Parallel data were collected on masting of hard beech and fruitfall of hinau. Orongorongo data provided some of the first and most persuasive evidence for fruitfall as a driver of population dynamics in each animal species. We compare the long-term patterns and re-evaluate the evidence for effects of fruitfall. Recent analyses of the rodent data contradict earlier

interpretations. Mouse eruptions were initiated before beech seedfall, and sometimes happened without it. Rat dynamics were not eruptive and did not respond to hinau fruitfall; rat density was annually regulated about a carrying capacity that varied inversely with the long-term changes in predator density.. The complex population ecology of introduced small mammals calls for greater sophistication from researchers, and more rigorous data collection and analysis.

Physiological responses of grass species as predictors of community success

Presentation Type: Oral

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Species level traits affect environmental mediated interactions between individuals. Here a species attribute approach is taken by measuring physiological responses of three grass species to variations in soil water availability under controlled greenhouse conditions. The three grass species co-exist in a semi-arid grassland in southern Arizona, U.S.A. Two of the species are exotic, and one, a native (Digitaria californica). One of the exotics has grown to abundance on the landscape (Eragrostis lehmanniana), and the other has maintained populations but remains uncommon (Eragrostis curvula). The physiological responses of all three species were measured in response to changes in availability of soil moisture to assess the performance of each of the species under these variable conditions. The instantaneous gas exchange, pre-dawn water potential, and fluorescence of each of the species were measured as soil moisture was varied. The soil moisture was measured at three depths. By comparing how the species responded to the variations in soil water, predictions are generated as to which conditions may favor each of the grass species. This species attribute approach will allow process based questions about species persistence and diversity at the neighborhood scale to be addressed in plant communities.

Life and love in a linear landscape: Comparative analysis of reproductive and genetic function of fragmented Emu bush populations.

Presentation Type: Oral

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In many parts of the Australian landscape native vegetation is reduced to patches and linear strips. This study focuses on a plant species common in such a landscape in Central NSW. Eremophila glabra is a bird pollinated, widespread understory shrub. We use it as a case study for investigating ecological and genetic functions of a plant in such a landscape. The study

consists of comparative analysis of the reproductive and genetic performance of replicates of five landscape elements ranging from interior patch populations to isolated linear strip populations. This includes measurement of flower production; pollinator community composition; pollinator behaviour; stigmatic pollen load; fertilisation; fruit and seed set; genetic diversity; level of inbreeding and fitness of progeny. Results on pollinator composition and fruiting success from the first field season suggest that populations occupying linear elements further from vegetation patches have different pollinator communities. They also experienced lower fruiting success than populations within the vegetation patches, even though there was similar flower production. This implies that isolation might reduce the fecundity of Eremophila glabra populations. Molecular genetic studies in progress will provide complimentary data on the implications of these landscape changes for genetic diversity and mating pattern.

Koala ecology: "Known knowns, known unknowns or unknown unknowns"?

Presentation Type: Oral

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In the process of developing long term datasets of habitat use by koalas I encountered some "vacant lots" within their ecological paradigm. To what extent are koalas philopatric? What is the impact of statistical errors in the generation of habitat use models? I generated an index of habitat fidelity and range reuse using a simple overlapping range matrix for koalas in central Queensland that revealed a variety of approaches to space within an open woodland habitat. I also investigated the relationship between signs of presence or of absence, with actual presence or absence of koalas, to develop a better method of predicting habitat use by this animal across its range in Queensland.

The challenges of ongoing exclusion of mammlian pests from Karori Wildlife Sanctuary, a fenced mainand island in New Zealand

Presentation Type: Oral

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Constructed in 1999, an 8.6km fence surrounds 225 ha of regenerating lowland forest just 10 minutes from downtown Wellington. Eradication and exclusion of at least 14 species of introduced mammals was achieved within 5 months of completion of the fence. Significant achievements were the first successful eradication of European hedgehogs (Erinaceus europaeus occidentalis), and the first eradication of at least 10 species of introduced mammal in a single operation. The fence has now operated successfully for nearly 6 years. However, the proximity to the urban environment of a fenced island where 14 species of endemic animals have been released, and reinvasion by house mice (Mus musculus), present particular challenges in maintaining biosecurity. Research and regular audits have been carried out as an integral part of a management programme to minimise the risk and effects of invasion. Biosecurity

breaches and the results of actions to control or eliminate invaders will be described.

Detectability and abundance estimation: Assessing a mixture model by simulation

Presentation Type: Oral

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Monitoring of wildlife abundance is commonly undertaken to assess population trends or to evaluate management actions. Many monitoring programs, however, fail to account for uncertainty caused by imperfect detection. Imperfect detection may reduce the power of monitoring studies to detect spatial or temporal variation in animal abundance if detection probabilities vary between treatments, through time, or in any systematic manner that is not explicitly accommodated in data analyses. Recently, Royle (2004) proposed the N-mixture model for estimating detection probability and abundance.. The N-mixture model takes advantage of spatially replicated counts to calculate individual-level detection probability and estimate the true (unobserved) abundance of a species at survey locations. If its assumptions are met the N-mixture model will play an important role in abundance estimation because it requires less field effort than mark-recapture methods. Using simulation we tested the robustness of N-mixture abundance estimates to low detection probabilities, high variation in detection probabilities and unmodeled covariates on detection probabilities. We finally recommend situations in which it is appropriate to use the N-mixture model.

Day-to-Day variation in sea-surface temperature negatively impacts pelagic tern foraging across the Great Barrier Reef

Presentation Type: Oral

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An increasing number of datasets point to within-season climatic variation as a potential source of severe detrimental impacts on tropical seabird reproductive biology. Extreme sea-surface temperatures (SSTs) (1-1.5 â—‹C above long-term averages) were observed on the southern Great Barrier Reef (GBR) during December 2005, coinciding in part with our study of Black noddy (Anous minutus) foraging success relative to day-to-day variation in SST. Significant negative relationships were observed between SST and day-to-day foraging success (meal size and feeding frequency) and chick growth. These findings were consistent with similar research into the relationship between Sooty tern (Sterna fuscata) foraging success and day-to-day variation in SST on the northern GBR and Wedge-tailed shearwater (Puffinus pacificus) foraging success and chick growth and day-to-day variation in SST at the same location on the southern GBR. Combined the results imply a significant negative effect of

forecasted climatic changes on seabirds breeding on the GBR.

Evidence for wasp-waist dynamics in food webs from two Australian rocky seashores

Presentation Type: Oral

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Most studies of predation have focussed upon the "top-down" influence of apex predators and other consumer species high in the food chain on lower down. Specific effects like trophic cascades or keystone predation have been demonstarted but are probably not ubiquitous. Since 1990 we've also considered "bottom-up" effects of factors such as upwelling or energy subsidies, expanding our focus to influences flowing in both directions within many assemblages. By comparison, so-called "middle-out" effects propagated from the intermediate levels of a food web have received less attention. I draw attention to the development of a new idea from pelagic fisheries studies, where the functional flow of effects both up and down food webs are mediated by a one or a few species. This is termed "wasp-waist dynamics", alluding to how such food webs appear functionally narrow in the middle due to only a few species being important. Like keystones, this idea focuses on crucial species that are few in species number but they may be very abundant. I present data from experiments focussing on a barnacle and a herbivorous snail in two divergent rocky reef assemblages in Australia that suggest a "wasp-waist" interpretation may best summarise the dynamics there.

High level of genetic diversity among disjunct populations of the wind pollinated shrub: Bertya ingramii T. James (Euphorbiaceae)

Presentation Type: Oral

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Wind pollinated plants may be more resilient to the erosive effects of small population sizes than species with specialised pollinators.. Migration of new genotypes into populations may buffer against local extinction. Bertya ingramii is a threatened species of shrub known only from three populations in 2 km2 area in northern New South Wales, Australia. Populations are separated by deeply dissected gorges. We investigated genetic diversity using ISSR fingerprinting and found that the smallest population (50 plants) was unexpectedly the most diverse and held more unique alleles than the other two populations. Compared with other restricted wind-pollinated species, the levels of genetic diversity detected in B. ingramii were high. We hypothesise these results are the consequence of wind patterns within the gorge system.

Conserving genes: The biopolitics of ancient DNA and species recovery

Presentation Type: Oral

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How do stakeholders react to the idea of cloning an extinct species? What are the implications for conservation? This paper addresses these questions via a case study of the thylacine cloning project at the Australian Museum. From 1999 to 2005, scientists at the Museum studied the possibility of cloning a thylacine from recovered DNA. This research does not judge whether or not cloning an extinct species is feasible. Rather, discourse analysis of reactions to the project provides important insights into the political and ethical frames that emerged around the idea of "conquering extinction." The study uses qualitative methods, specifically narrative analysis. The data include open-ended elite interviews and analysis of both popular media accounts of the project and scientific discourse on ancient DNA. The paper demonstrates that competing narratives about the thylacine became a way to discuss unease surrounding the settlement of Australia, the relationship between humans and the environment, and the ownership of cultural images and histories. Themes of environmental guilt, and redemption through science, also emerged. The idea of cloning the thylacine thus slipped the boundaries of technocratic discourse, suggesting further politicisation and polarisation of wildlife conservation in the era of advanced biotechnologies.

Mathematical tools to operationalise resilience

Presentation Type: Oral

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Resilience is an emergent system-wide property that describes the capacity of a system to absorb perturbations and persist in a variable environment. In human-modified natural systems, such as agroecosystems and landscape mosaics containing both farmland and remnant native vegetation, we claim that: a) long-term system dynamics is often determined by interactions and feedbacks between social, economic and ecological sub-systems, rather than instantaneous stocks and flows of material throughout a system; and b) instantaneous system behaviour is often dominated by stochasticity, variability and uncertainty.

We examine mathematical techniques based on dynamical systems theory and systems science that embrace feedbacks and uncertainty using the concept of resilience. We present results from research into generic landscape exploitation systems, and discuss plans to apply similar techniques to a variety of ecosystems and agroecosystems in a new research program comparing resilience in Australian and New Zealand. We explain how our methods will provide a useful complement to both "precise" simulation models and the expert knowledge of experienced land managers.

Feral pig predation threatens the indigenous harvest and local persistence of snake-necked turtles in northern Australia.

Presentation Type: Oral

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Northern snake-necked turtles (Chelodina rugosa) provided an important seasonal source of protein for indigenous communities in Arnhem Land, northern Australia. We used radio-telemetry to quantify survival rates of C. rugosa at a traditional turtle harvest site in Arnhem Land, in relation to harvest, predation by feral pigs (Sus scrofa) and environmental factors. Although turtle survival was positively correlated with body size, the survival of turtles of all sizes and stages of maturity were compromised by pig predation. Contemporary harvest rates of C. rugosa were very low because pig predation depleted available stocks immediately before Aboriginal harvesting. Seasonal variation in the onset, duration and severity of rainfall, and associated influences on periodic drying are also important in determining C. rugosa survival. Persistence of C. rugosa in Arnhem Land today depends on years of high rainfall, and the frequency of such years, when both pig predation and Aboriginal harvest rates are low. Aboriginal harvest rates are regulated also by the frequency and timing of ceremonies and other cultural activities that coincide with harvests. Until recently, such incidental regulation of turtle harvest would have contributed to the local abundance and persistence of C. rugosa. In contrast, pig predation is unrelenting, and years of high turtle survival are now restricted only to years of high wet season rainfall.

Predicting the long-term consequences of introduced rodents and red deer in a mixed New Zealand forest

Presentation Type: Oral

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In forests in which turnover of species may take hundreds of years, models provide a means of exploring the long-term consequences of multiple introduced herbivores on forest structure and composition. In this paper, we will describe the parameterisation of such a model in a mixed forest in south-west New Zealand. The model consists of four sub-models governing forest dynamics: resources, recruitment, growth, and mortality. The model contains a record of the species, size, and spatial location of individual

plants, and determines the fate of each individual throughout its life. A run of the community-level model proceeds from an initial condition of species, location and size as measured in the field. The product of the functional and numerical responses of rodents determines the effect of these herbivores on recruitment. The effects of both rodents and red deer on the growth and mortality of seedlings are being estimated using exclosures. The model will be used to evaluate the long-term effects of the following four management actions on the abundance, age and size structure, and spatial distribution of tree species: no active management of rodents or deer; control of only rodents or only deer; control of both rodents and deer.

Long term vegetation/ climate dynamics of the late pliocene and early quaternary in Auckland: Evidence from the Patiki-2 pollen record

Presentation Type: Oral

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The Patiki-2 pollen record was obtained from a late Pliocene and Early Quaternary carbonaceous sequence in west Auckland.

The Pliocene section of the pollen record portrays a regional vegetation record of Nothofagus brassii type beeches associated with modern beech and podocarp taxa. Northern New Zealand was a last refuge for the brassii beeches and other taxa before their migration to warmer latitudes at the onset of the Quaternary.

The Early Quaternary section of the Patiki-2 core was rigorously age constrained to 1.4 - 1.0 Ma (Marine Isotope Stages (MIS) 45-28). This was a time when glacial and interglacial cycles were less extreme than those of the Late Quaternary.

The pollen record portrays detailed vegetation and climate dynamics for the Auckland region. Multiple compositional shifts from Nothofagus-dominated to conifer-dominated vegetation are broadly correlated to changes in the marine isotope record between MIS 45 and 28. The inferred climate was moist, temperate and cooler than at present, but never as cool as the Last Glacial Maximum.

Under the more equable climatic conditions cool and warm climate taxa that are geographically separated in New Zealand today were able to shift throughout the region and mix to a greater extent than is currently observed.

Waitemata Coastal Sanctuary Project - ecology informing management in an urban landscape

Presentation Type: Oral

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The Uruamo Headland (North Shore City, Auckland) is a focus of interest for its current, and potential, environmental and recreational values. The headland consists of 260ha of contiguous vegetation on the Waitemata Harbour coastline, but lies within an urban matrix of residential and commercial landscapes. Current tenure of the headland includes local authority, Crown (Defence), private industrial and private residential.

Integrated management for the headland that acknowledges its regional environmental significance, and the potential for ecological restoration, has been established through a voluntary accord between North Shore City Council, Royal New Zealand Navy, and local community groups. The accord is a management strategy that incorporates a holistic view of the landscape and associated environmental issues rather than fragmented perspectives inherent with diverse landowners. The 'Waitemata Coastal Sanctuary Project' is the realisation of this integrated management.

This paper will illustrate how the application of ecological concepts has influenced both the management direction for the project and the public vision for the future management of the headland.

Distribution and abundance of giant scales (Hemiptera: Margarodidae) in Auckland forests.

Presentation Type: Oral

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Sap feeding insects that excrete sugars (honeydew) can have major effects on community structure and ecosystem functioning. In New Zealand, many South Island beech forests ecosystems are shaped by the extensive honeydew resource produced by two endemic giant scale species (Ultracoelostoma spp.). There are eight other endemic giant scale species in New Zealand that utilise a range of plant hosts but the ecological role of these species is poorly understood. A survey of mainland forests in the Auckland Ecological Region was conducted February-April 2006 to investigate the distribution and abundance of giant scale species in this area. The survey detected three species. Coelostomidia pilosa was widespread in podocarp/broadleaf forests, but was typically present in low numbers, was not associated with sooty mould, and was unlikely to produce sufficient honeydew to generate community level impacts. Coelostomidia zelandica was detected at only two sites although its hosts were widely distributed in coastal forests. Extensive C. zelandica infestations were however detected on two islands in the Hauraki Gulf. The third margarodid, Coelostomidia wairoensis, was present in all manuka/kanuka stands examined and often formed heavy infestations. Further investigations of honeydew production rates and community impacts are warranted, particularly for C. zealandica and C. wairoensis.

Modelling plant detectability using failure time analysis: Implications for threatened species management.

Presentation Type: Oral

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A model of plant detectability is presented that is based on the failure time analysis (also known as survival analysis) that is widely used in medical and engineering fields. Several recent studies have addressed the issue of animal detectability, and a range of methods exists for estimation. Estimating plant detectability presents unique challenges that are not adequately addressed by methods designed to estimate the detectability of animals, most of which are based on mark-recapture or distance sampling theory. For perennial plants, spending more time surveying a location most effectively increases the probability of detecting a species, rather than increasing the number of times locations are surveyed. Failure time analysis is well suited to plant detectability studies as it can accommodate censored data, which occur when a species that may be present at a location is not detected within the time allocated to a survey. This research has important implications for determining the survey effort required for threatened species monitoring and impact assessment.

The prevalence of psittacine circovirus (beak and feather disease virus) in wild populations of exotic parrots in New Zealand.

Presentation Type: Oral

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The aim of our study was to determine the prevalence of psittacine circovirus (PBFDV) in exotic parrots in the wild in New Zealand. One hundred and sixty two eastern rosellas (Platycercus eximius) were caught from Te Puke, Wellington and Dunedin between April 2004 and February 2006. Two hundred and fifty five sulphur-crested cockatoos (Cacatua galerita) were captured for pet trading from November 2001 to September 2004. Feathers from both species were tested for PBFDV using an established polymerase chain reaction (PCR). Twenty four eastern rosellas (14.8%) were positive for PBFDV. The true prevalence range at the 95% confidence interval was calculated as 8.56-20.44% (n=162). Eastern rosellas that were positive for PBFDV showed no clinical or histological signs of disease, suggesting a carrier status. Seventy sulphur-crested cockatoos (28%) were positive and the true prevalence range at the 95%

confidence interval was calculated as 22 - 33 % (n=255). This study has serious implications for the conservation of native parrots and the export of wild-trapped parrots from New Zealand. Serological studies for PBFDV in wild exotic parrots, and molecular studies of virus genotype are recommended to further characterise the epidemiology of the disease in wild exotic parrot populations.

The effects of community assembly on recruitment success in a guild of coral reef fish

Presentation Type: Oral

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The relative importance of larval settlement (e.g., Lottery Hypotheses) versus competitive interactions in structuring reef fish assemblages remains controversial. Settlement is generally viewed as a process that establishes initial variation in an assemblage that may subsequently be reshaped by competitive interactions. Most commonly, competitive interactions are evaluated for conspecifics (e.g., "density dependence"), or else only for a limited suite of heterospecific competitors. Here, we employ quantitative surveys of community structure and habitat use by a guild of coral reef fish within the lagoon of Mo'orea, French Polynesia. Specifically, we explore indices of habitat use, ecomorphology and niche overlap within the Labrid-Scarid guild to infer the potential strong- and/or diffuse competitive interactions. We then compare these predictions with patterns of spatial co-variation across age classes to evaluate the strength of competitive interactions, or alternatively, the ghost of competition past. Although this research (and data analysis) is ongoing, our work aims to estimate the effects of community assembly on competitive interactions and potential recruitment success.

The foraging and breeding ecology of the North Island Blue Penguin (Eudyptula minor iredalei).

Presentation Type: Oral

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The North Island subspecies of the Blue Penguin (Eudyptula minor iredalei) is presently classified as "near threatened" by Department of Conservation. Populations protected from predation, such as those on predator-free islands, are surviving. Yet many smaller coastal mainland populations are in decline. Effective conservation management of this marine bird requires an understanding of the factors affecting its survival and breeding success. However, there is little information on the feeding and breeding ecology of the Blue Penguin, especially in the northern most parts of New Zealand. The aims of this study were to: 1. Determine what the penguins forage upon, 2.Quantify breeding success, and 3. Attempt to identify factors that are influencing mass mortalities. The study targeted Blue Penguin colonies that inhabit Tiritiri Matangi Island. Feeding ecology was explored via regurgitation samples and stable isotope analysis. Breeding ecology was examined through quantifying the nesting success of

breeding pairs, and the influences of abiotic factors. Necropsies of eggs showed the stage of failure, which was compared to incubation length. Necropsies of chicks and adults helped establish cause of mortalities. Mass mortalities were also correlated with storm events. This baseline information provides valuable insite for future research on this species.

Upwardly mobile weta population seeks most desirable location on restoration island.

Presentation Type: Oral

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This paper reviews 6 years of monitoring of a tree weta population, established from 33 individuals on 25 hectare Matiu/Somes Island in Wellington Harbour as part of an island restoration programme. At the northern release site, the predominantly herbivorous weta (Hemideina crassidens (Orthoptera: Anostostomatidae) initially exploded in numbers, as measured by their occupancy of middle-class 'weta motels' but the individuals were largely undersized and failed to qualify for the weta "Hurricanes". After 3 years, numbers in this planned suburban enclave had declined to very low levels. Meantime, their roving agents had discovered a highly desirable location at the southern end of the island, where a community of normal sized front-row forewards has now built up. Possible key resources for a successful tree weta community will be discussed.

'Mainland islands' ten years on.

Presentation Type: Oral

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In 1995 and 1996 the New Zealand Department of Conservation (DOC) established six 'mainland island' projects; Trounson Kauri Park, Northern Te Urewera, Boundary Stream, Paengaroa, Rotoiti and the Hurunui South Branch. All of these projects have ecosystem focussed (as opposed to single species focussed) restoration goals, which at the time of their creation were quite unique for conservation projects on the New Zealand mainland. Over the last ten years pest mammal populations have (for the most part) been suppressed to very low levels at five of these sites producing many noteworthy conservation outcomes, especially for threatened native forest birds and plants. However, an important, and often unrecognised aspect of these sites, is that they are places where research and rigorous testing of conservation management techniques is encouraged, if not expected. The work done by staff working at these mainland islands was central to the creation of DOC 'best practice' techniques for controlling feral cats, mustelids and rodents. Staff at these sites have also been pioneering techniques for translocating native birds into areas without natural or man made barriers to dispersal, and where pest mammals are still present in very low numbers.

Born to be wild? Predicting enemy release and niche expansion of non-target clover populations following release of genetically modified virus-resistant host genotypes

Presentation Type: Oral

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Rapid improvement of transgene technology over the past decade has led to debate over the level of risk posed to agricultural and natural ecosystems by genetically modified (GM) plants. Pathogen-resistant genotypes are thought to be of particular concern because a large number of diseases are known to impact on host plant population dynamics and invasiveness. However, few studies have investigated the risks posed by GM pathogen-resistant plants to non-target ecosystems, and surprisingly little information is available concerning the role of pathogens in shaping long-term coevolved host-pathogen systems in general. In this study we developed a framework for assessing the impact of pathogen release on niche size and growth rate of host populations and applied this to the risk assessment of GM Clover yellow vein virus (ClYVV)-resistant Trifolium repens (white clover) in native montane grasslands and woodlands in SE Australia, where white clover is a significant environmental weed. Results of a 3-year field study indicate that in these environments transgene-mediated release of wild white clover populations from the effects of ClYVV is likely to result in a 2-15% increase in population growth rate and possible expansion of white clover into marginal environments, some of which contain nationally endangered plant communities. We conclude that transgenic plants that target long-term host-pathogen systems for agricultural improvement can pose quantifiable risks to non-target native plant communities, and that it is crucial to conduct associated risk assessments within an explicit community context.

Host-parasite ecology of the tuatara (Sphenodon punctatus)

Presentation Type: Oral

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Parasites can play a central role in host ecology and evolution. Hence, understanding host-parasite interactions and the dynamics of parasitism are important to understanding the impacts of parasites on host populations. In this study, we examine how parasite load varies among seasons, and in relationship to population structure in a field study of the tuatara (Sphenodon punctatus). The tuatara (Sphenodon punctatus) is a threatened reptile from New Zealand, and is restricted to off-shore islands. Tuatara are host to a diversity of parasites, including ectoparasitic ticks (Aponomma sphenodonti) and chiggers (Neotrombicula sphenodonti), and a protozoan blood parasite species (Haemogregarina tuatarae). We conducted a mark-recapture study of tuatara on Stephens Island (Cook

Strait, New Zealand) during seven field trips between November 2004 and June 2006. Tuatara from three circular, 10m radius plots were captured, marked, measured, and ectoparasites were counted during each trip. Ectoparasite loads varied significantly among seasons, with tick loads highest in May, while mite loads were highest in March. Males tended to have higher parasite loads compared with females. These results will be discussed in relation to host and parasite life-history and ecology.

Habitat quality assessment of remnant riparian rainforest on tropical coastal lowlands: Demonstration of restoration priorities for local government

Presentation Type: Oral

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Provision of connectivity for wildlife in urban and rural landscapes constitutes a major goal for wildlife conservation outside protected areas. Many rainforest faunal species may be unable to traverse landscapes lacking closed canopy habitat. In tropical coastal areas in Far North Queensland, closed canopy habitat is often restricted to thin remnant strips of riparian forest preserved to protect against stream bank erosion. These comprise potential movement 'corridors' for rainforest wildlife. We assessed habitat quality of riparian forest vegetation together with gaps in connectivity for small mammals and birds, caused by clearing to the edge of watercourses or by roads and powerline clearings. Gaps can restrict movements of rainforest-dependent species for foraging, dispersal and migration, thereby reducing the effectiveness of riparian rainforest 'corridors'. In this project, a combination of aerial photography and GIS analysis together with field survey was used to create a rapid assessment methodology for riparian vegetation quality. Bird observations and small mammal trapping data were then related to riparian quality. The results were used to prioritise restoration efforts along streams and depicted in a free, easy-to-use GIS software package allowing consideration of faunal connectivity concurrently with erosion reduction for small local governments which cannot access expensive GIS technology.

On the edge of the abyss: Rangeland degradation and recovery on Australia's eastern catchments

Presentation Type: Oral

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For over 125 years livestock, mainly cattle have grazed the rangelands in the catchments that feed into the Great Barrier Reef Lagoon. It is now acknowledged that, the reduction of vegetation cover as a result of grazing has lead to loss of sediments and nutrients into the river systems, which impact on the coastal marine ecosystems and also on pastoral enterprise profitability. Past research has shown that, under grazing, the dynamics of vegetation communities in Australia's rangelands reflect a state and transition model. Our research, on the degradation and recovery of grazed rangelands, shows that livestock preferences for the different vegetation communities can lead to continued degradation of pastures, even when the overall condition of the system is recovering. Our conclusion is that researchers and managers need to focus on key hotspots in rangelands where the plant/herbivore interactions are particularly important as drivers of system dynamics, rather than measuring management outcomes as the average response of the system as a whole.

Assessing reserve design strategies with real-world complications

Presentation Type: Oral

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Recent developments in reserve design algorithms have resulted in a large number of methodologies for selecting reserves, though little work has been done to compare the effectiveness these strategies in a given situation. Here, we present the results of a framework designed to assess and compare different reserve selection strategies in terms of species persistence. The framework enables a variety of landscapes (both real and simulated) to be combined with simulated species data. A multi-species metapopulation model is then used to determine quantitative persistence measures for a given reserve selection. Using this framework, we examine several aspatial site selection algorithms and Zonation, a spatially explicit heuristic selection algorithm. We asses and compare these approaches using different initial species distributions and abundances. We also determine which type of approach is most robust to the addition of real-world complications, such as loss of habitat over time, budgetary constraints in choosing reserves and large uncertainties in species data.

Variation in field assessments of vegetation condition: Implications for biodiversity

Presentation Type: Oral

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Contemporary biodiversity conservation is based on a policy of 'No Net Loss', in which clearing of vegetation is offset by management actions. Assessments of vegetation condition are used to determine offset requirements. These assessments rely on field estimates of vegetation attributes, including visual estimates of cover, which are often reported to be inconsistent between observers. This research aims to quantify variation in vegetation condition assessments amongst assessors. Field assessments of vegetation condition were conducted at 20 sites within Cumberland Plain Woodland in the Sydney Basin, NSW. At each site, vegetation condition assessments were conducted independently by multiple assessors, using six different quantitative and qualitative methods for assessing vegetation condition, including Habitat Hectares and BioMetric.

Results show that the average magnitude of variation in condition scores was similar for Habitat Hectares and BioMetric, in the order of 15%. The variation in total scores was attributable to various components of the indices, not only estimates of projective foliage cover. Rank correlations show that assessors generally ranked sites similarly using different quantitative methods. Future work will evaluate the effectiveness of training in reducing observer variation. Such variation in condition scores could have significant implications for biodiversity conservation.

Approaches to selecting replacements for invasive plants for use by frugivorous birds

Presentation Type: Poster

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Invasive plants can be a source of conflict for conservation managers. While the detrimental impacts of plant invasions on biodiversity and ecosystem function are well known, invasive plants can perform important roles in supporting fauna. Fleshy-fruited invasive plants, for example, can provide food that subsidises indigenous frugivore populations. How can such conservation vs. invasive plant control conflicts be managed? We suggest one approach in which indigenous plants that are functionally similar from the perspective of indigenous frugivores are identified. These could then be used to replace the invasive plants in ecological restoration projects, at highly modified sites where fleshy-fruited plants are an ecologically appropriate part of the goal community, natural seed sources are insufficient and support for frugivore populations is required, and in urban gardens and parks. We demonstrate approaches based on either fruit characteristics or the frugivore communities of the invasive and indigenous plants. We illustrate these methods using Lantana camara, the

most significant invasive plant problem in south-east Queensland, as the target species. Those indigenous plants identified as functionally similar on the basis of fruit characters were used by more of the frugivores of L. camara than randomly, providing limited validation of the approach.

Can the impacts of para grass (Urochloa mutica) be managed?

Presentation Type: Poster

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Para grass (Urochloa mutica) is highly invasive in tropical wetlands of northern and eastern Australia. There is broad agreement that it results in major shifts in the structure and composition of native communities of these ecosystems. Para grass makes up around 90% of the above-ground biomass (20 t/ha) of the freshwater wetlands on the Townsville Town Common Conservation Park in north-east Queensland (TTCCP). This dominance has significant consequences for animal communities. Research on TTCCP is examining whether and how combinations of cattle grazing and burning can reduce dominance by para grass and how communities of birds and small mammals respond. Because of the seasonal climates of the region and the consequent cycle of flooding and drying of the wetland, there are relatively narrow windows of opportunity for burning and grazing. Burning takes place when grass fuel moisture levels are low enough to carry an effective fire (August-September). Cattle are subsequently grazed on both burned and unburned plots until the beginning of the wet season (December). Fire and grazing bring about major short-term changes in the vegetation structure and these changes correlate with different levels of utilization by birds and small mammals. The results of this research will be used to develop strategies for managing the impacts of invasive grasses in tropical wetlands of conservation signficance.

Inter-population variation in breeding systems and mechanisms of infertility in the threatened species Grevillea Rhizomatosa (Proteaceae)

Presentation Type: Oral

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Plant breeding systems are seldom studied across the breadth of a species' range. This precludes an informed assessment of the evolutionary biology of a species, particularly of the factors that shape fecundity. Grevillea rhizomatosa [Proteaceae] is a threatened species of shrub known only from a 7 x 8 km area and c. 2000 plants in northern NSW, Australia. The species reproduces asexually from rhizomatous suckers and fruit are only produced in a few populations. Over two flowering seasons the extent of sexual reproduction and the mechanisms of infertility were determined in five populations. The breeding system varied among populations from obligate outcrossing to facultative outcrossing to fully sterile. Seed were only produced in three populations. Stigmatic opening and receptivity were found to be functional in all populations. Inter-population crosses using fertile pollen failed to recover fertility in an infertile population. A breakdown in female and male fertility mechanisms was found including a fault in the mechanical release of pollen from anthers, <10% viable pollen and a post pollen-deposition event that prevents fertile pollen from effecting seed-set. Sexually reproducing populations are threatened by the incursion of asexual forms that may be favoured by frequent disturbance from wild-fires.

The Warra log decay project: saproxylic beetles from the first three-year sampling cycle

Presentation Type: Poster

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In 1999, twelve Eucalyptus obliqua trees, in two size-classes ('oldgrowth' and 'regrowth') were felled (over three successive seasons) in mature mixed forest at the Warra LTER site in southern Tasmania. Over the subsequent year, successive sections of each log were enclosed in emergence traps, each 3 m long and each furnished with three collecting heads to capture emerging insects. Each log eventually had five traps, and each section remained enclosed and sealed for three years. After this time, each was exposed for a further two years (to allow renewed colonisation by insects etc) before being re-enclosed for a second three-year cycle. The intention is to alternate enclosure and exposure over the coming decades, to gradually build up a picture of saproxylic (dead wood dependent) insect succession during the process of log decay.. Having logs in two size-classes will also help elucidate whether or not regrowth-sized logs (35-65 cm dia), will follow a similar decay trajectory, and will be capable of supporting similar insect assemblages, to oldgrowth-sized (130-220 cm dia) logs. This has conservation implications because regrowth-sized logs are likely to

remain abundant in the production forestry landscape, while oldgrowth-size logs are likely to become rarer. This poster reports on some findings from the first three-year cycle.

Accommodating coarse woody debris dynamics into native forest harvest scheduling

Presentation Type: Oral

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Tasmania's lowland wet eucalypt forests harbour some of the highest volumes of coarse woody debris (CWD) in the world. They also support an economically important timber industry. Maintaining sufficient CWD for dependent biodiversity requires understanding its dynamics in space and time, and how these relate to the equivalent dynamics of forest harvesting and silviculture. Building on several years of research on CWD, we are beginning to explore models that allow the concurrent spatial modelling of CWD dynamics and forest harvest scheduling. The aim is to find ways to optimise harvest scheduling while giving due consideration to the conservation of CWD-dependent biodiversity.

Habitat characteristics are correlated with the distribution of four skink species (Reptilia: Lacertilia) in a mainland island reserve

Presentation Type: Poster

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The effects of habitat loss and introduced predators on endemic species are of global concern. Predation by introduced mammals is a significant problem for New Zealand reptiles. In addition, New Zealand lizards are preyed upon by native predators, such as tuatara. Understanding habitat requirements is critical when introducing species to environments, for example nature reserves. This study investigated effects of habitat characteristics, introduced and native predators, and seasonal weather variation, on the abundance and distribution of skinks at Karori Wildlife Sanctuary, Wellington. Standard pitfall trapping and mark-recapture techniques were used. Statistical analysis used loglinear quasipoisson models. Results showed highest captures in summer and increased with increasing temperature in all seasons. Oligosoma nigriplantare

polychroma were caught most often, and in highest numbers in a wetland area. Detection decreased with closed or dense canopy. Cyclodina aenea were caught least. Predation regime and substrate stability were not significant predictors of skink distribution. A ccorrelation between detection and habitat characteristics is supported by other studies, as is the relative abundance of the species found.

Community structure of herbivorous insect specialists in lowland Canterbury

Presentation Type: Oral

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Communities of insects that specialise on a particular plant species can provide a model system in which we can easily address theoretical questions of community structure in a spatial context. Obligate species reside on 'islands' of suitable habitat (their host plant), surrounded by an uninhabitable matrix. We used the obligate herbivorous insects of New Zealand cabbage tree (Cordyline australis) occurring within and around Christchurch City as a model system to examine the causes of community structure across a fragmented, highly-modified landscape. Twenty-three herbivorous insect species have been recorded as being primarily associated with cabbage tree. Of these, 10 are considered monophagous; they represent taxa from four orders. We examined the relative importance of factors at two spatial scales: among trees and among sites. Detailed sampling of the invertebrate community of cabbage trees was conducted during the summer of 2004/05. Abiotic and other structural habitat variables were recorded at both the site and tree scales. A total of 100 trees from 25 sites from lowland Canterbury were sampled. We used ordination to characterise the variation in community composition, and mixed models to examine the relationships among community structure, habitat variables, and insect life-history characteristics.

Distyly and pollination of Nymphoides montana (Menyanthaceae)

Presentation Type: Oral

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In flowering plants, distyly is a genetic polymorphism, involving reciprocal positioning of anthers and stigmas between two floral morphs. Distyly probably evolved to increase the efficiency of cross-pollination because reciprocal positioning promotes intermorph pollen transfer. In Nymphoides montana populations, we found equal frequencies of short-styled morphs (SS, stigmas below anthers) and long-styled morphs (LS, stigmas above anthers). We compared morphs for sex-organ

reciprocity, gamete production and seed set following experimental and natural pollinations. Reciprocity of short-level organs was zero, indicating LS anthers and SS stigmas were at the same height. Reciprocity of long-level organs was less than zero, indicating SS anthers were lower than LS stigmas. Further, stigma-anther distances were less for SS than LS morphs. LS morphs produced more pollen grains and fewer ovules than SS morphs. Both morphs produced few seeds following selfing and intramorph crossing, but SS morphs produced more seeds than LS morphs. Under natural conditions, both morphs had high fruit set, although SS morphs produced slightly more seeds per fruit. Our results confirm most expectations of distyly. However, reduced stigma-anther distances and greater self and intramorph compatibilities of SS morphs could result in lower outcrossing rates compared with LS morphs.

Integrating information sources into statistical analysis: Widening the Bayesian Net for Lyngbya majuscula

Presentation Type: Oral

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Lyngbya majuscula is a marine cyanobacterium that occurs naturally in Moreton bay. However, the size and frequency of Lyngbya blooms has increased since the early 90's. These blooms have been associated with substantial adverse ecological, economic and human health impacts. Despite considerable effort, the cause of Lyngbya blooms is not yet well understood, and it has not as yet been possible to determine the relative importance of risk factors that contribute to Lyngbya blooms. A variety of factors at differing spatial scales have previously been considered as candidates for contributing to the initiation of Lyngbya blooms, and no single factor has emerged as the primary cause of these blooms.

A Bayesian Network (BN) was constructed in order to capture and integrate various forms of information, including expert opinion, empirical data and simulation output. This has served as a guide for other statistical techniques that are being used to evaluate the factors that influence Lyngbya bloom initiation. Although the BN continues to be refined as more data come to light, parallel investigations are being conducted in order to maximise our capacity to analyse the problem including Bayesian logistic regression modelling of time series.

The influence of introduction history variables on their distribution and abundance of Exotic vines and scramblers in Australia

Presentation Type: Oral

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The environmental damage caused by invasive vines and scramblers in Australia has resulted in this group of plants being listed as a key threatening process, however very little data is available for this damaging group of flora. This research focuses on vines and scramblers that have been introduced into Australia, investigating relationships between their invasion success and key introduction-history variables. An exhaustive search of herbarium records, census of plants for each state and other literature was conducted to establish the introduced vines and scramblers in Australia. This was then complemented with data regarding introduction-history variables that may relate to the invasion success of each species. A total of 195 introduced species from 41 different families were found to have been established in Australia. However, five families accounted for over 50% of these species. Significant relationships relating to the introduction-histories and the abundance of species were found, with distinct biases observed regarding the country of origin, residence time and reason for introduction. We show that the introduction history of a species is pivotal in explaining the distribution and abundance of introduced plants and is necessary to consider in conjunction with life-history and other biological traits when forming predictive frameworks for invasive species.

Saproxylic beetles associated with mature living Eucalyptus obliqua in southern Tasmania

Presentation Type: Oral

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Mature trees are an important part of a forest ecosystem providing a range of unique habitats that are utilised by vertebrates, invertebrates, fungi and other microorganisms. Forestry practises in Tasmania's production forests are reducing the number of mature trees. The landscape-level effect this will have on the saproxylic communities is unknown due to a lack of knowledge of both the species involved and their habitat requirements. However, in Europe many species of invertebrates associated with old trees are rare or threatened, due to a severe decline in habitat availability.

Results are presented from a study into the invertebrate assemblages sampled from Eucalyptus obliqua trees of three different ages: young (70

years), mature (105 years) and old growth (>150 years). Findings indicate that old growth trees have a greater diversity of Coleoptera than younger trees. These results can be used to gauge the possible effect of any reductions in mature trees, and to develop strategies to mitigate adverse impacts.

Argentine ants in New Zealand: Temperature limitations at national and microclimatic scales.

Presentation Type: Oral

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Several lines of evidence suggest that low temperatures will ultimately restrict the invasive spread of Argentine ants in New Zealand. Annual surveys conducted between December 2001 and March 2005 revealed the slow expansion of Argentine ant populations (<50 m/yr) in two urban centres (Dargaville and Hastings) and a decline of their spatial extent in a third (Wellington). At the first two locations, population expansion occurred into open habitats with a mix of short grass and paved surfaces. At two coastal sites, ant populations occupying sand dune habitats also showed limited rates of expansion. These observations, combined with surveys from Hawaiian mountains, support the predictions of two bioclimatic models: at a broad scale, Argentine ants are most likely to be found where mean daily temperatures in winter average 7 degrees Celsius or more (above ground), and at a microhabitat scale, nests are most likely to survive if soil temperatures exceed 450 degree-days above 15.9 degrees. In New Zealand, these temperature requirements are fulfilled in many open habitats, but rarely in forested areas.

Egg laying on patchy resources and the importance of spatial scale

Presentation Type: Oral

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We investigated how ovipositing cabbage white females responded to different plant densities measured at different scales. Cabbage plants set out in different spatial arrangements served as host plants for ovipositing butterflies. The definition of high or low density clusters of plants was dependent upon the scale at which plant density was measured. In our experiments we found that female cabbage white butterflies concentrated their eggs on isolated host plants. This effect was strongest when measured at an intermediate scale.

Bird assemblages in agricultural land mosaics: do landscape structural properties and avian life-history traits affect community composition?

Presentation Type: Oral

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The contribution that productive landscapes make to biodiversity conservation is increasingly recognized and, due to the global expansion of human-dominated environments, increasingly important. To investigate how different properties of agricultural landscapes affect bird communities, birds were sampled in both native and anthropogenic landscape elements in 27 study mosaics (1 km x 1 km) located in Victoria, Australia. Study mosaics incorporated variation in two landscape properties: native vegetation cover and richness of landscape elements. The primary gradient in community composition was identified by correspondence analysis using incidence data for 73 bird species recorded in mosaics. Variation in bird assemblages in mosaics followed a gradient in tree cover extent (native vegetation and non-indigenous plantation) within mosaics and native vegetation extent in the surrounding landscape. To test whether this community gradient resulted from variation in the ecological characteristics of birds, all species were classified by six life-history traits widely identified as responding to habitat fragmentation. Species incidence in relation to three trait groups (nesting substrate, foraging substrate and clutch size) varied significantly along the community composition gradient. These findings highlight the strong influence of landscape properties, particularly vegetation extent, on bird assemblages in agricultural mosaics, as well as the contribution of countryside habitats to bird community composition.

Patterns of abundance, recruitment and fecundity for an intertidal barnacle approaching its range limit on the southeast coast of Australia

Presentation Type: Oral

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The design of effective marine reserve networks requires an understanding of patterns of distribution, dispersal and connectivity among local populations of marine organisms at large spatial scales. Here we assessed the large scale changes in adult abundance, recruitment, and reproductive potential of an intertidal barnacle with widespread dispersal approaching its southern range limit on the southeast coast of Australia, and examined the relationships between these stages of the life cycle to infer the extent of connectivity between local populations. We found that adult abundance and recruitment gradually decreased towards the range limit, and were therefore strongly correlated at a large spatial scale. The proportion of fecund individuals, however, remained constantly high from range centre to range edge, and therefore did not correlate with either adult abundance

or recruitment. At smaller spatial scales, no significant relationships were detected between adults, recruits and fecundity, either within the range or the range limit. These results imply that for a marine benthic species with widespread dispersal, localised reductions in recruitment can negatively impact the large scale abundance of adult populations.

Behavioural plasticity in habitat use enables large, nocturnal geckos, Hoplodactylus duvaucelii, to persist following invasion by kiore, Rattus exulans

Presentation Type: Oral

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Commensal rodents are efficient invaders on a global scale and pose a significant threat to native biota, particularly on oceanic islands with few native mammals. Kiore (Pacific rats; Rattus exulans) are implicated in extinctions, range restrictions and declines of vulnerable endemic faunae throughout New Zealand and the Pacific, yet research into the ecological strategies that enable some native species to persist in their presence is lacking. I examined the population structure, behaviour and microhabitat use of similar-sized, nocturnal, Duvaucel's geckos, Hoplodactylus duvaucelii (radio-telemetry), and kiore (spool-and-line tracking) on three New Zealand islands with different histories of kiore incursions and eradication: (i) Green Island, historically kiore-free, (ii) Korapuki, eradicated 20 ya, and (iii) Ohinau, before and 6 months after eradication. Although kiore and Duvaucel's geckos share habitat at a broad spatial scale, little overlap in micro-habitat use exists where they are sympatric. In the presence of kiore, Duvaucel's gecko capture rates and recruitment are reduced. Six months after kiore eradication I observed a four-fold increase in capture rate of adult geckos, as they reverted to using niches characteristic of those on kiore-free islands. Spatial avoidance behaviour by these large, nocturnal geckos is a highly plastic response to kiore enabling their persistence.

Setting and achieving effective and realistic restoration goals in a changing world

Presentation Type: Oral

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Restoration ecology has made significant advances in the past few decades and stands to make important contributions both to the practical repair of damaged ecosystems and the development of broader ecological ideas. I highlight four main areas where progress in research can assist with this. Firstly, we need to enhance the translation of recent advances in our understanding of ecosystem and landscape dynamics into the conceptual and practical frameworks for restoration. Secondly, we need to promote the development of an ability to correctly diagnose ecosystem damage, identify restoration thresholds and develop corrective methodologies which aim to overcome such thresholds. This involves understanding which system characteristics are important in determining ecosystem recovery in a range of ecosystem types, and to what extent restoration measures need to overcome threshold and hysteresis effects. A third key requirement is to determine what realistic goals for restoration are, based on the ecological realities of today and how these will change in the future,

given ongoing changes in climate and land use. Finally, there is a need for a synthetic approach which draws together the ecological and social aspects of the issues surrounding restoration and the setting of restoration goals.

The tails of two geckos: Does dispersal prevent extinction in recently fragmented populations?

Presentation Type: Oral

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There is emerging evidence that some species are at greater risk of extinction in fragmented landscapes than others. Habitat specialisation might be an ecological trait that is linked to extinction in isolated habitat fragments. We present a comparative study of the genetic structure of two gecko species that differ in their degree of habitat specialisation. Gehyra variegata (a habitat generalist) and Oedura reticulata (a habitat specialist) occur sympatrically in the Western Australian wheatbelt, where they have been subjected to severe habitat fragmentation. We used microsatellite DNA markers to address the hypothesis that a higher level of specialisation leads to a lower level of dispersal.

Our fine-scale genetic study supported this expectation: Dispersal rates and distances revealed by assignment testing, allelic richness and heterozygosity were higher for G. variegata than for O. reticulata. The genetic differentiation among populations of O. reticulata was higher than for G. variegata, and there was no isolation-by-distance effect in O. reticulata.
From a conservation perspective, this study indicates that the specialist species O. reticulata is likely to be a good genetic indicator species for monitoring the impact of anthropogenic perturbations in Western Australian woodlands.

Mast-seeding: Effects of productivity at various spatial scales

Presentation Type: Oral

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It has been predicted that mast seeding species (those that display synchronous and variable reproduction) should have more variable reproduction in less productive areas, both within and between species. This is backed up by recent individual-based models of mast-seeding that provide a mechanistic explanation for why this should be so, but attempts to test this prediction using worldwide datasets have to date resulted in inconclusive results. In this talk we test this productivity hypothesis through meta-analysis of a previously compiled worldwide database containing 570 datasets for over 50 mast-seeding species. We also present results from a detailed analysis comparing long term datasets for Chionochloa pallens and C. macra at two different altitudes on Mt Hutt.

Meta-analysis results showed a significant negative relationship was found to exist between proxies for productivity and reproductive variability once potential confounding effects, such as species turnover, were accounted for. Furthermore, this relationship held at the global, regional and local scales, ranging from multi-species relationships across a wide geographical range to single species relationships between populations at different altitudes. This new evidence supports the prediction that environmental productivity influences reproductive variability, which has implications for the potential effects of environmental change (e..g. global warming and subsequent changes in productivity) on the dynamics of mast-seeding systems.

A research-based restoration programme for the Norfolk Island biota

Presentation Type: Oral

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The Norfolk Island biota, the basis for the island's tourist economy, is seriously threatened by introduced mammalian predators, exotic weeds, and environmental change. Extirpation of colonies of burrow-nesting seabirds on the highlands has removed a key source of nutrients, precipitating ongoing changes in the biota. Halting and reversing the loss of diversity will depend on removal of mammalian predators from significant areas of the island, and restoration of the marine nutrient subsidy. An integrated restoration programme, underpinned by international multi-disciplinary research efforts, will be a model for island - and mainland island - restoration programmes in the Pacific and elsewhere.

Management in the face of extinction: The Grand and Otago Skink recovery programme

Presentation Type: Oral

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Grand skinks (Oligosoma grande) and Otago skinks (O. otagense) are two of New Zealand's largest lizards and endemic to Otago. They now persist in only the montane periphery (<10%) of their former range. Population trends and population viability analyses inform that they will be functionally extinct by 2012. Historic predator control programmes failed to alleviate the decline but identified a broad suite of potential predators. These skinks are slow to mature with K selected reproduction. Therefore management trials do not have the time or resources to test potential agents of decline individually before functional extinction. An experimental management trial has now been established which aims to test survival, habitat use and population dynamic responses in both skink species to all-mammal exclusion (mammal-proof fencing and attempted eradication) and mammal suppression (conventional trapping operation) with controls. The management trials are accompanied by monitoring for ecosystem responses in other flora and fauna. Due to the low detectability of these skinks, highly sensitive photo-mark/recapture monitoring

techniques have been developed to detect responses to management. Patch occupancy is also monitored to quantify colonisation and extinction processes and to inform our understanding of metapopulation dynamics which are vital to long-term management of both species.

Seeding a future: Experimental sowing of Dactylanthus taylorii (Balanophoraceae), a threatened New Zealand parasitic flowering plant

Presentation Type: Oral

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Dactylanthus taylorii (Balanophoraceae) is New Zealand's only native fully parasitic flowering plant, growing largely underground as a long-lived tuber attached to the roots of native host trees. Introduced mammals prevent seed set by browsing flowers and fruit, causing serious decline of most populations. Management of the species has therefore focussed so far on browse-protection of existing populations. To assess hand-sowing as a tool for the establishment of new populations, an experimental sowing trial over 24 field plots was started in 1999, with encouraging results to date. After seven years, D. taylorii had established in 75 % of plots, with prolific flowering of tubers. Sowing density and species of host trees appear to be less important to successful establishment than canopy openness, while exposure of tubers seems to stunt their growth.
Hand-sown plants produced predominantly female inflorescences, a complete reversal of the sex ratio observed in natural populations. This unexpected result forces a review of our understanding of dioecy and sex determination in the species. Hand-sowing is a promising new tool in conservation management of D. taylorii and the opportunity to study plants of known age is shedding further light on the biology of this unique and cryptic species.

Wood-inhabiting fungi in Eucalyptus obliqua logs: Examining the effect of log size and forest type on fungal community composition

Presentation Type: Oral

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Coarse woody debris is regarded as an essential habitat for biodiversity management in forest ecosystems. Fungi, as one of the key wood decay agents, are critical to understanding and managing biodiversity associated with decaying wood. In Australia, wood-inhabiting fungi are poorly known and the biodiversity associated with coarse woody debris has not been well studied.
This study took place in the wet eucalypt forests in southern Tasmania. It

examined the wood-inhabiting fungi in large (>85cm) and small (30-60cm) diameter Eucalyptus obliqua logs in mature, unlogged forests and regenerating forests 20-30 years after clearfelling. Fungi were isolated from decayed wood and identified from cultures using a combination of morphological and molecular techniques.
Significant differences in fungal community structure were found between mature forests and regenerating forests. Some differences in fungal species richness and community composition were also found between logs of different sizes. Two species of Basidiomycetes were identified as indicators of large logs in mature forests.
This study is the first to examine wood-inhabiting fungi in E. obliqua logs in Tasmania. The ecological information obtained from this research will assist in the development and deployment of strategies for the management of logs in wet eucalypt forests in Tasmania.

Is brigalow regrowth vegetation a good habitat for ants?

Presentation Type: Poster

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Brigalow-dominated (Acacia harpophylla) ecosystems in Queensland and northern New South Wales have been severely impacted by agricultural development. Less than 10% of the pre-clearing extent of these regional ecosystems persists, with 85% listed as endangered or of concern. Under Queensland legislation, regrowth resulting from clearing after December 1989 can be re-cleared for agricultural development, raising concerns over the maintenance of biodiversity dependent on early successional and disturbed environments. We assessed the value of brigalow regrowth for ants by sampling ground active species in 4 age classes (4, 15 and 20 years since clearing, and remnant). Greatest species richness and more than half of rare species were found in remnant sites, with only five species confined to regrowth sites. Ant assemblages of remnant and 4-year regrowth sites were not significantly different, but both were significantly different from 15- and 20-year regrowth sites. Ant functional groups responded predictably to habitat structural attributes. Other faunal groups (and plants) may respond differently to regrowth age and have greater dependence on early vegetation successional stages, but for ant diversity the conservation of remnant brigalow appears to remain a priority.

The effects of landscape structure on exotic plant invasion into native forest fragments, West Coast, New Zealand

Presentation Type: Oral

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Habitat fragmentation and biological invasions are arguably the most significant threats to global biodiversity, however very few studies have explicitly considered the interactions between landscape structure and invasion processes. Forest fragments are vulnerable to processes occurring in the surrounding landscape, and external disturbances may act synergistically with the effects of fragmentation, further enhancing invasion. Despite their importance, very little research has been conducted on the effects of forest fragmentation in New Zealand, and little is known about the interactions between introduced and native plant species in fragmented habitats. The project aim was to investigate the effects of landscape structure on exotic plant invasion into native forest fragments, using the lowlands of the West Coast as the model system. Fragments in four size categories were selected in landscapes with varying amounts of forest loss in order to reveal patch- and landscape-level effects on invasion processes. Native and introduced vascular plant species were surveyed in the adjacent matrix habitat through the forest edge and up to 256 m into the forest interior. Mechanisms driving weed invasions in different landscapes are also being investigated with propagule addition experiments. This study is one of the few to consider the effects of fragmentation on biodiversity and invasion processes at multiple spatial scales (edge, patch and landscape), and the results may have important implications for restoration of lowland forest habitats in New Zealand.

What can ecologists bring to urban design? A landscape architects view

Presentation Type: Oral

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As New Zealand's urban population grows, government funding is being directed towards urban planning and design that is more sustainable, healthy and 'green'. There are a number of research initiatives aimed at controlling amplitude and quality of storm water, improving energy efficiency, minimizing waste, empowering citizens, and establishing viable and visible biodiversity. An Ecological Design Studio (3rd year Bachelor of Landscape Architecture program at Lincoln University, New Zealand) in 2005 based its major design around a Low Impact Urban Design and Development (LIUDD) approach to residential subdivision. The goal was to identify opportunities and problems with current conditions in terms of natural, cultural and design features in a relatively new subdivision (Aidanfield) and propose a new design vision that addressed all

requirements of the LIUDD concept. This new vision is seen as a navigation guide for creating new generations of subdivisions in New Zealand using principles of ecological design. The objectives of the project were to investigate different landscapes surrounding the subdivision itself (including 'green corridors'), and at an individual property or streetscape level to propose appropriate 'plant signatures'. These plantings were to provide new 'ecological' solutions for design in private gardens, streets, roads, swales, public gardens, parks and parking lots.

Analysis of the movement of Loggerhead Sea Turtles off coasts of Japan

Presentation Type: Oral

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For a lifetime, loggerhead sea turtles Caretta caretta nesting off coasts of Japan are known to journey an immense distance, ranging from southeastern Japan and Okinawa archipelago, either heading to Japan Sea or circling in the North Pacific, and sometimes wandering off to the shores of California and back. Reasons for this movement are still uncertain.

Argos satellite tracking devices were attached to 26 turtles each at different times and conditions, and recorded their tracks from several months to over a year. The unequally spaced noisy data were smoothed to obtain the most reasonable paths taken. Physical and biological factors of the ocean along with random some randomness are believed to determine the variability in these paths and were investigated to discover the underlying behaviour of the turtles. The Kuroshio and other strong ocean currents play a key role in deciding their movements. Further analyses were undergone in relation to other factors including temperature, salinity and chlorophyll a concentrations.

Environmental changes are expected to affect the routes of sea turtles, as well as their nesting locations, and may be the deciding factor for their future.

A dynamical systems approach to modelling honeydew beetles

Presentation Type: Oral

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A dynamic model to describe the formation of a honeydew droplet is derived using simple fluid dynamics. The model predicts different types of behaviour depending on local environmental conditions. The model is fitted to new data and conclusions are drawn about the modelling assumptions, in particular the role of the scale insect within the system.

Indigenous afforestation can restore bush vitality long-term.

Presentation Type: Oral

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Lowland indigenous bush remnants' long-term vitality often requires to remedy their isolation. Large-scale indigenous afforestation projects can restore connectivity, generate sustainability capital and help maintain indigenous biodiversity, which proves to be a popular land-use option with both Tangata Whenua and Federated Farmers. This presentation introduces an integrated indigenous afforestation methodology, which is presently being developed and applied.

Bush Vitality Assessment. Growing Common Futures

Presentation Type: Poster

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What makes seabirds defensless to invasive rats? An analysis of seabird characteristics affecting vulnerability

Presentation Type: Oral

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On rat-invaded islands, seabird populations have been extirpated or severely reduced from rat predation pressures. Although invasive species eradication is widely accepted as a conservation tool, it has been highly contested by some stakeholders, who often cite inadequately documented rat effects as reasons to forego eradication. We reviewed the literature to examine which seabird characteristics make them vulnerable to invasive rats. 75 studies cited rat impacts, totaling 95 rat-seabird interactions on 54 islands. Seabirds with low mean adult weights were impacted most severely ($p < 0.001$). Seabirds of all nesting types were vulnerable, with crevice and burrow nesters enduring the most severe impacts ($p < 0.001$). Nesting types preyed on varied according to different rat species ($p < 0.001$), with R. rattus preying on mostly burrow nesters, and R. norvegicus preying on mostly ground nesters. 85% of studies cite rat impacts anecdotally without experimental analysis. Scientists should pursue studies that experimentally document impacts of rats on seabirds to fill in our data gaps and advance our current knowledge.

Do carnivorous plants produce leaf volatiles to attract prey?

Presentation Type: Oral

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Carnivorous plants are adapted to catch and digest insects for nutrients. However, only very few studies have been conducted to determine the nature and role of chemical signals that may be involved in the attraction of insect prey. To understand if carnivorous plants produce chemicals signals to attract prey insects, leave volatiles of carnivorous Sarracenia and Drosera species were analysed via headspace adsorption followed by gas chromatography mass-spectrometry (GC-MS).
Our data shows that the leaves of the pitcher plant Sarracenia leucophylla produced more than 60 different volatile compounds. Many of these compounds are known from floral odours. Methyl benzoate, a main

component in the leaf odour of S. leucophylla, is a typical component from flowers of moth-pollinated plants. In contrast, the investigated Drosera species showed a weak odour emission and most of the odours were typical green leaf volatiles. The differences in odour production and odour composition will be discussed in relation to their potential to lure insects as prey, and the different trapping mechanisms of the leaves.

Acknowledgements
Thanks to Vanessa Mitchell and Lee-Anne Manning for help in the lab. This work has been supported by the New Zealand Marsden Fund, title: "Do carnivorous plants actively separate reproduction and feeding?".

Monitoring coastal sand dune vegetation communities for conservation.

Presentation Type: Poster

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Coastal sand dunes are a distinctive feature of the New Zealand landscape, but their ecological character is increasingly being degraded due to coastal development and the introduction of non-indigenous species. Owing to the general lack of legal protection of coastal areas it is not surprising that a large number of plant taxa of conservation concern appear to be in this ecosystem. A recent review by the Department of Conservation in the Wellington region (Milne & Sawyer 2002) identified a lack of contemporary and systematic information on the physical condition and vegetation communities of the region's coastal sand dunes - a need that is probably repeated across most of New Zealand. This poster describes a field survey method designed to collect such information in a standard and repeatable fashion, suitable for general conservation monitoring of coastal sand dunes. It is designed to capture the overall changing physical and vegetation structure of sand dunes, with an emphasis on coastal foredunes. An accompanying handbook provides further information on dune geomorphology, conservation values, threats, as well as data recording sheets, photographs and information about the plant species occurring in the Wellington Conservancy.

Ngati Whatua o Orakei Papakainga: Establishing cultural and environmental linkages to inform ecological management.

Presentation Type: Poster

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Whenua Rangatira is the prestigious waterfront gateway remnant of the Ngati Whatua o Orakei Papakainga on the Waitemata Harbour, Auckland. Ngati Whatua o Orakei maintain mana whenua through tuku iho of Okahu Bay, Orakei and Takaparawhau within a setting of a tumultuous political and cultural history, paving the way for a successful co-management role between Ngati Whatua and the Auckland City Council.

The area is flanked with the extensive urban development of Auckland City. Extant urban ecology is highly influenced by the alteration of the coastal processes and interaction between land and sea, with major issues resulting from the disturbed hydrology of Okahu Bay. Conservation objectives centre on establishing cultural and environmental linkages within the urban landscape through recreating coastal and terrestrial ecotones. Amalgamation of whanaungatanga and ecology seek to base management on sound science - sharing knowledge through co-management.

Full monitoring of ecological functioning and structure will set direction for development and application of catchment-wide ecological restoration, including re-instatement of the original wetland and Orakei stream. Analysis of ecological, cultural and historic ecosystem structure, composition and functioning is required to set direction for management objectives in order to fulfil the role of Kaitiaki.

Human population spread and the implications for conservation in Australia's biodiversity hotspots

Presentation Type: Oral

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Peri-urbanisation is an intense process of human occupation of rural landscapes. This process is occurring rapidly in Australia and appears to be leading to land-use intensification and biotic homogenization with adverse consequences for the ecological integrity of these landscapes. Human population growth, ranging from 5% to >25%, is briefly examined across each of the major peri-urbanising regions and is contrasted to current threatened species listings and distributions. When the human population data is overlaid on the Commonwealth listed regions of high biological diversity and endemism (biodiversity `hotspots'), the peri-urbanising regions coincide with eight of the fifteen biodiversity national hotspots and one globally listed hotspot. In the absence of effective planning and land-use policies that specifically cater for biological conservation in these regions, the dynamics of human disturbance would seem to point to an

accelerating species loss and widespread biotic simplification. Some suggestions are advanced for redressing this critical issue.

Regional variation in herbivory and insect herbivores on Nothofagus cunninghamii in Tasmania

Presentation Type: Poster

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The current season's leaves were collected from Nothofagus cunninghamii, and insect herbivores sampled by branch beating, at three visits (early, mid and late season) to each of 12 sites across Tasmania between 2/11/1999 and 23/5/2000. The total number of leaves collected from each site ranged between 404 and 1433, these were sorted into 'chewed' or 'intact' leaves and the leaf area lost from the chewed leaves was estimated. Mean percentage leaf area loss was calculated per site as a measure of herbivory. The herbivores were sorted to morphospecies and identified to species where possible.
The mean percentage leaf area loss varied between sites from 3.6% to 27.5. Of the 37 taxa of herbivores collected, none occurred at all 12 sites. A geometrid larva (Lepidoptera: Geometridae Ennominae Nacophorini sp.novum) occurred most frequently (8 sites and overall abundance 16), while Ewanius nothofagi Reid (Coleoptera: Chrysomelidae Cryptocephalinae) was most abundant (72 adults between 5 sites, 103 larvae between 4 sites).
Where N. cunninghamii is growing at the limits of its climate tolerance it may be stressed sufficiently to be more susceptible to herbivore attack. Geographical isolation, particularly in the North East, could result in differing suites of herbivore taxa.

Wetland boundaries (Ecotones) between river and bog in a Waikato wetland

Presentation Type: Oral

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A research plan was developed to delineate, quantify and deduce the causes of ecotones along the river to bog gradient in Waikato wetlands.

A 650 metre transect was sampled contiguously along a river to peatland gradient in a small wetland complex called Opuatia, in the Waikato. A total of 72 vascular plants were sampled in 650 plots. Vegetation sampling included collection of height, cover % (canopy, mid, ground) and DBH data. Fifteen surface peat samples were taken at 50 metre intervals along the main gradient and tested for Total C, N, P, NO_3, NH_4, anaerobically mineralizable N, H_2SO_4 extractable P, moisture content, bulk density, pH, and electric conductivity.

Preliminary results show at least 4 different community types along the river to bog gradient and potentially 5 ecotone boundaries can be identified. The first observable ecotone occurred at the bog edge and was characterised by a change from a Baumea sp. / Empodisma minus / Gleichenia dicarpa dominated community to a Leptospermum scoparium /

Salix cinerea / Baumea rubiginosa dominated community. Other key changes at this ecotone included a rapid increase in height of vegetation and an increase in species richness.

Changes in the peat chemistry also occurred across this first ecotone with sharp increases in total and organic P (TP = 0.071 %, Org. P = 0.066 %) and Total C (TC = 41.4 %). After calculating the N : P ratio for peat samples this ecotone still appears P-limited. The other ecotones along the transect appear driven by different combinations of environmental factors (nutrients, flooding regime, disturbance) over both space and time.

Can protocols for red-listing threatened species forecast extinction?

Presentation Type: Oral

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Risk-ranking protocols are used widely to classify the conservation status of the world's species. Here we report on the first empirical assessment of their reliability by using a retrospective study of 18 pairs of bird and mammal species (one species extinct and the other extant) with eight different assessors. The performance of individual assessors varied substantially, but performance was improved by incorporating uncertainty in parameter estimates and consensus among the assessors. When this was done, the ranks from the protocols correctly predicted the extinction outcome in 70-80% of pairs and there were mismatches in only 10-20% of cases. This performance was similar to the subjective judgements of the assessors after they had estimated the range and population parameters required by the protocols, and better than any single parameter. When used to inform subjective judgement, the protocols therefore offer a means of reducing unpredictable biases that may be associated with expert input and have the advantage of making the logic behind assessments explicit. We conclude that the protocols are useful for forecasting extinctions, although they are prone to some errors that have implications for conservation. Continued testing and refinement of the protocols may help to provide better absolute estimates of risk.

Inbreeding: a handy backup on islands, or a pernicious drain?

Presentation Type: Oral

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It has been argued that small isolated populations (on real or habitat islands) may be less susceptible to inbreeding depression than large continental populations, as a history of inbreeding may have purged deleterious alleles. Famously, the recovery of black robins from a single female seemed to support this idea. Moreover, inbreeding could provide some benefits through reproductive assurance (allowing some reproduction even when mates are scarce). However recent data suggests that this may not be true, and inbreeding depression may have been given too little weight. We review the evidence for NZ and Australian birds and trees, and present new data for two trees.

The New Zealand flora shows very little self-incompatibility, so that mixed mating systems (where some seeds are selfed and some result from cross-pollination) are expected to be frequent. Selfed offspring might be expected to show some inbreeding depression, but it has been assumed that partial selfing still provides some benefits from reproductive assurance. However, Scofield & Schultz (2006) recently proposed that in long-lived plants such as trees, inbreeding depression continues over the life of the seedlings and saplings, and essentially no selfed offspring survive to reproduce. If so, selfed offspring offer no reproductive assurance, instead they are a waste of resources on doomed cripples.

Here we present data from inbreeding depression experiments on two bird-pollinated New Zealand trees, Fuchsia excorticata (Onagraceae) and Sophora microphylla (Fabaceae) over >5 years. In both cases, inbreeding depression has become increasingly severe, so that Scofield & Schultz's predictions of zero survival to reproductive age seem plausible. This seriously reduces the options of native plants in responding to the current reduced density of native pollinating birds. The few data from Australia suggest similar patterns of inbreeding depression are found there.

Do frogs avoid water bodies infected with chytridiomycosis (Batrachochytrium dendrobatidis)?

Presentation Type: Oral

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Chytridiomycosis is an amphibian disease caused by the skin fungus Batrachochytrium dendrobatidis (Bd). It has been implicated as a proximate cause of amphibian declines around the globe and is listed as a key threatening process under the Australian Environment Protection and Biodiversity Conservation Act. However, its effects on anuran population dynamics vary widely as some species can persist despite becoming infected while others are driven extinct. In addition to the more obvious factors such as differences in innate or acquired immune function, susceptibility to infection may be due to variable interspecific selection of microenvironments and water bodies. Our laboratory study compared the ability of L. genimaculata (wild populations which have been affected by Bd) and L. caerulea (wild populations which do not appear to have been affected by Bd) to detect the presence of Bd zoospores in water. Our results indicate that L. caerulea spent significantly less time in infected water bodies than in non-infected water bodies, whereas L. genimaculata did not. This suggests that L. caerulea can detect the presence of Bd in water and thus may be able to avoid infection. The results may help to explain the observed variation of susceptibility to chytridiomycosis in Australian frogs.

Functional diversity of invertebrates in salinised agricultural landscapes

Presentation Type: Oral

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The Sustainable Grazing on Saline Lands program is an industry-funded research and extension program with five major research sites in four states (WA, SA, VIC, and NSW). The main emphasis is on 'best management practice' treatment of salty discharge areas to increase production and provide environmental benefits. Monitoring of biodiversity is a key component of the research at these sites, including twice-yearly pitfall trapping of soil surface invertebrates. The trap catches are first sorted to Order and then, where necessary, further sorted to Family (or Genus for ants) to enable subsequent re-aggregation of abundance and biomass data into 'functional groups.' This paper outlines the results of a single spring sampling event from all sites.
More than 100 000 individual invertebrates were collected from 300 traps spread across 3 experimental treatments (current management, best management practice and, where available, remnant vegetation similar to pre-clearing vegetation) . The most abundant order overall was springtails, followed by ants but this varied markedly between States. Twenty-six orders were represented. There were significant differences in diversity, abundance, biomass and composition between the three treatments.

Rapid genetic identification of local provenance seed collection zones for restoration

Presentation Type: Oral

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Use of local provenance seed for restoration is generally accepted as best practise, but guidelines on appropriate seed collection zones are lacking. We are using a DNA fingerprinting technique (AFLP), minimal sampling, and multivariate approaches to the analysis of spatial genetic variation to help delineate local genetic provenance seed collection zones for key species in urban bushland remnant restoration and minesite revegetation in south-west Australia. Our focus has been on Bold Park, the largest urban bushland remnant in Perth, which is the focus of a major rehabilitation program. Results for nearly 30 species to date indicate marked population genetic differentiation is typical, suggesting where possible seed should be collected from the local population to maintain genetic integrity and maximise restoration success assuming a home-site advantage. We also consider the utility of a spatial autocorrelation analysis approach to a more rapid genetic delineation of local provenance, and highlight a method for the rapid and simple communication of results to managers and restoration practitioners.

Climate, morphology and chytridiomycosis

Presentation Type: Oral

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Chytridiomycosis is an emerging infectious disease of amphibians associated with mass mortalities, population declines, and species extinctions worldwide. We conducted chytridiomycosis surveys in Southeast Queensland to determine the magnitude of seasonal variation in disease levels in a single population of Litoria lesueuri. A strong seasonal effect of the disease was evident, with disease prevalence peaking at nearly 60% in early spring, and dropping to 0% by late summer. We also conducted surveys at 31 lowland sites distributed north-south along 2315km of the Australian east coast. Of 863 L. lesueuri sampled, 26% were infected. Batrachochytrium dendrobatidis was found at 77% of the sites, including sites at the northern and southern limits of the transect. However, frogs from temperate regions had significantly more severe infections than did their tropical counterparts, often carrying an order of magnitude more B. dendrobatidis zoospores. The prevalence and severity of chytrid infections were significantly greater at sites with high rainfall and cool temperatures. Further, small frogs were both more likely to be infected, and carried more severe infections than larger frogs. This

information is a major addition to our understanding of chytridiomycosis host-pathogen ecology, and will prove useful to amphibian conservation programs.

Persistence in a degraded riparian system: A comparison of native and exotic plant functional traits

Presentation Type: Oral

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Riparian systems are among the most degraded ecosystems in the world. In many instances the species that presently exist in these areas differ greatly from historical descriptions and exotic species dominate. An understanding of the traits that are associated with persistence in such degraded systems helps explain why some species have successfully invaded, why some native species have persisted and is also important for effective rehabilitation. This study examined the traits of contemporary species and species known to have previously inhabited the riparian margin of the Upper Hunter River in NSW, Australia. Species were classified as extant exotic, extant native and extinct native. A list of extant species was compiled from field surveys conducted in the Upper Hunter River riparian zone. A list of extinct native species was sourced from the Flora of NSW. Twelve functional traits relating to plant colonization, reproduction and growth were collected for each species. Analysis across all growth forms revealed a number of key differences between extant exotic species and extinct native species. Further comparisons revealed patterns specific to graminoid, forb and woody growth forms.

Invasive ant meets invasive scales: Consequences for a native host tree

Presentation Type: Oral

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On islands with depauperate faunas, both the ants and the hemipterans they tend are often non-native and their strong mutualistic interactions may underpin their invasion success. We investigated the effects of invasive ants on resident sap-sucking insects and a native host plant on an islet nature reserve in Mauritius. We conducted a factorial experiment with two treatments (ant exclusion and leaf washing to remove hemipterans) on branches of Scaevola taccada. Over the 8 month experiment, Technomyrmex albipes accounted for 97% of all ants observed on ant allowed branches. The density of hemipterans and the proportion of leaves with hemipterans explained 69% of the variation in T. albipes density on the allowed branches. Ant-excluded branches had greater net leaf gain and fruit set than ant-allowed branches, but leaf washing had no effect on leaf gain or fruit set. The lack of an effect of washing on net leaf gain and fruit set is most likely due to rapid recolonization of hemipterans on washed branches and rapid death of hemipterans on ant-excluded unwashed branches. T. albipes tends hemipterans on several rare and endangered trees in Mauritius. The effects of the mutualisms on plant growth and

reproduction may be hindering plant conservation efforts.

Feast and famine: New Zealand datasets for mast seeding data.

Presentation Type: Poster

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We collated current and past mast seeding (and flowering) datasets that are being or have been gathered for New Zealand plants. We have obtained information for 226 datasets, 170 of which are continuing and 56 stopped. These are overwhelmingly in the South Island (199 sites), and the most common taxon is Nothofagus (102 datasets, including 82 continuing). Chionochloa is represented by a large number of datasets (39) and species (11), but at few sites (8, of which only 6 are continuing). In total there are 36 podocarp datasets. These podocarp datasets are concentrated on the West Coast and south of the South Island and most have only recently been started, for example 19 are in at Waitutu. Our work has identified several major gaps in the knowledge of long term flowering and fruiting of New Zealand plants: plants in the North Island; common canopy species such as tawa, kamahi, rata, and mahoe; podocarps; and fleshy-fruited species (including understory species) which provide food for birds and rodents.

Plant species distribution over the landscape and potential long-distance seed dispersal by emus and kangaroos

Presentation Type: Oral

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The mobility of a plant species through seed dispersal is crucial for the colonization of suitable but patchily distributed substrate-types. We surveyed the distribution of eleven species in 100by100 m grid cells over 5 km2 of heathland in southwestern Australia. Four Banksia and three Daviesia species are restricted to the deep sandy soils of the dunes, while another three Daviesia species only occur in the intervening swales. Acacia blakelyi is distributed sporadically over both. All species exist as discrete populations on average 270-500 m apart. Kangaroo droppings were abundant in all locations sampled. Emu droppings were not as frequent but were distributed throughout the study area. The presence and density of faeces were similar in the three substrate-types (crests, slopes, swales). Viable seeds of Acacia blakelyi were found in emu and kangaroo droppings, and pods of Daviesia species in emu droppings. Seeds of two Daviesia species passed undamaged through emus in captivity. For species with winged seeds (Banksia), wind vortices and/or granivorous parrots may be responsible for such long-distance dispersal. For species that are usually considered ant-dispersed (Acacia, Daviesia), emus and kangaroos appear likely candidates as alternative (non-standard) dispersal agents that enhance plant species dispersal capabilities and govern their migration rates.

Calviño-Cancela, M, Dunn RR, van Etten, E, Lamont, BB 2006. Emus as non-standard seed dispersers and their potential for long-distance dispersal. Ecography
He, TH, Krauss, SL, Lamont, BB, Miller, BP, Enright, NJ 2004. Long distance dispersal in a metapopulation of Banksia hookeriana inferred by population allocation from AFLP data. Molecular Ecology, 13, 1099-1109.

The ecological objectives of area-based protection tools in New Zealand's marine law - a place for biodiversity

Presentation Type: Oral

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The need to protect "biodiversity" increasingly finds its way into New Zealand's marine laws and our international agreements with other countries. Coastal management laws drafted in 1991 have key "natural character" and "ecosystem" related objectives, and found a place for "biodiversity" in 2003. In other laws, such as the 1996 Fisheries Act, biodiversity maintenance is the key ecosystem-related goal beyond the maintenance of fish stocks. The goal of the Marine Reserves Bill is to conserve biodiversity by protecting special and representative communities and ecosystems. Internationally, management measures centred on ecosystems are viewed as the best way to ensure healthy oceans.

This paper considers the place "biodiversity" occupies as an objective of area-based marine protection tools, compared to other attributes of ecological communities. It considers implications for the conservation of marine life, and the legal touchstone for acceptable levels of human impact.

A framework for generalized evaluation of reserve selection algorithms

Presentation Type: Oral

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Algorithms for the selection of networks of reserves are an important topic in biodiversity conservation due to the continued loss of biodiversity and the need to prioritize management. Numerous methods for selecting reserves have been proposed, however, few of these algorithms have been evaluated in a way that predicts their utility across a broad range of conditions and controlling influences. Moreover, little indication is given of the consequences for actual persistence of species, especially with respect to particular initial conditions or for robustness of the method to violations of initial assumptions. Most methods are rife with assumptions

about changes in availability, cost, and condition of sites for reserves, as well as characteristics of species such as models of movement (free-ranging vs. barrier-limited). This makes it difficult for users and researchers to judge whether the given method will perform well in their own situation. In this work, we examine issues related to these and other factors such as the initial abundance of the different species and the spatial configuration of the landscape itself. We then demonstrate a framework for evaluating the behaviour of reserve selection algorithms with respect to their effects on quantitative persistence measures under a broad range of conditions.

Repeated low-intensity burns in coastal foothill sclerophyll forest, NSW: Impacts on tree growth, mortality and diversity.

Presentation Type: Oral

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Fire is currently being 'prescribed' in Australia for many applications, primarily hazard reduction, but also to facilitate growth, diversity and restoration. However, while species and ecosystem responses to single fires are widely documented, there have been few long-term studies documenting the continuum of change effected by regular or repeated fires. This study examines the change in tree growth, mortality, and diversity in sclerophyll forest sites that have received frequent burning (3 yr cycle) since 1970, compared to sites that have been protected from fire. Repetitive measurements analysis show that the initial growth increase in the burn plots may be decreasing with time. However, despite the benefits to growth of the burn treatment, there is increased mortality and decreased recruitment in the burnt plots, which is predicted to be a result of the decrease in minimum bark thickness observed. Initial results suggest that while sites are intrinsically variable, there is a significant change in diversity in terms of species, but not of productivity (in terms of basal area). This calls to question the proposed benefits of prescribed burning (e.g. increased growth) over a medium to long-term time frame, particularly when biodiversity may be compromised.

Trees in a grazing landscape: Vegetation patterns in sheep-grazing agro-ecosystems in southern Queensland

Presentation Type: Oral

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The modification of natural woodland tree densities through tree removal or clearing has been used by landholders to increase native grass production for livestock grazing. This paper describes studies that aim to determine if vegetation management by graziers affect floristic composition, species richness and plant cover (including production attributes) in the Traprock wool-producing region of southern Queensland. Forty-seven sites were sampled across the study area according to vegetation type (ironbark/gum woodland and box woodland), density of mature trees (low: 6 trees/ha, medium: 6-20 trees/ha, and high: >20 trees/ha), and the presence or absence of woody regrowth in the understorey to determine vegetation patterns. A subset of 18 sites was selected to establish grazing exclusion experiments in both vegetation types under varying mature tree densities. This paper describes the general patterns in vegetation under differing mature tree densities and provides preliminary results of the 12-month grazing exclusion experiments.

Population viability analysis of the Southern Brown Bandicoot in the Greater Melbourne area

Presentation Type: Oral

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The Southern Brown Bandicoot (I. obesulus) is one of the few remaining marsupials with populations that still can be found within the greater Melbourne area. However in recent decades it has been disappearing most likely due to the widespread development of housing estates and the impact of fox predation on small isolated populations in the remaining fragmented remnants. Due to the decline in bandicoot populations around Australia and given the substantial current threats to the species, I. obesulus has been listed as vulnerable in SA and endangered nationally and in NSW.

A population viability analysis of I. obesulus was conducted to determine the most effective management actions to protect the species. The model predicted the decline of all populations apart from at the Royal Botanical Gardens Cranbourne under all realistic scenarios, even in the absence of further habitat destruction by housing development. Predation by foxes and lack of fire were the found to have the largest impact on the viability of

I. obesulus, both of which can be effectively managed given adequate resources. Sensitivity analysis indicated that assumptions about initial population density were highly influential; hence this parameter should be the focus of future data collection.

Mites, plants, and leaf domatia: Lessons from Coprosma in New Zealand

Presentation Type: Oral

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The mite-plant-leaf domatia system was investigated comparatively and experimentally in indigenous Coprosma species. Leaf domatia (sunken pits) are widespread and variable in Coprosma, but are characteristically in the axis of secondary veins where they are occupied by predatory and fungal feeding mites. Evidence is presented that indicates domatia are carbon-based defences, and are more common within and between Coprosma species in leaves with low LMA. The maximum number of domatia per leaf is constrained by leaf area and the number of secondary veins. Predatory (2.6% of the population) and fungivorous/organic scavengers (97.2%), peak in winter with the availability of food. Leaves with domatia support higher mite densities than those without, and higher mite populations significantly reduce certain elements of the biotic detritus on leaves. However, relatively few mites appear necessary to control leaf detritus. We demonstrate at the shoot level that fungal hyphae and spores on the leaf surface tend to reduce leaf longevity and the number of domatia on new leaves. In the short-term, leaf debris is also associated with increases in fruitset and production of new leaves.

Where do our invasive pests come from? Inferring the introduction pathway of Argentine ants (Linepithema humile) using mitochondrial DNA.

Presentation Type: Oral

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A key aspect for reducing the spread of exotic species is an understanding of introduction pathways.. We used a genetic marker approach to analyse the origin of the invasive Argentine ant (Linepithema humile) in New Zealand using the mitochondrial gene cytochrome b. The entire known range of Argentine ants in New Zealand was sampled. No genetic variation in cytochrome b was found suggesting one source population. We used two

alternative genetic analysis packages, and suggest a population, rather than phylogenetic based approach better suits the requirements of introduction pathway analysis. When compared to a global database, the genetic sequence of the New Zealand specimens matched a population from Melbourne, Australia. The New Zealand interception record concurs with this result, as Argentine ants are more frequently intercepted from Australia than from any other country. Our approach could easily be duplicated and the methodology widely applied to identify the routes of transmission for other invasive species, which would enhance biosecurity monitoring.

Characterizing the spatial distributions of two saltmarsh plant species

Presentation Type: Oral

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The spatial pattern of a plant community is determined by a combination of processes. Even though it is not possible to determine the specific processes involved in the creation of a given plant pattern by examining its spatial distribution alone, spatial pattern analysis can provide useful information to infer the underlying formative processes. The clear and objective description of spatial pattern is an important part of generating hypotheses about how controlling biological or environmental processes work.

A 0.5m wide and 96m long transect was continuously sampled with 0.5m-0.5m quadrats. Several pattern analysis methods were used to characterize the distributions of the two species. The results show that there exist spatial patterns at about 7.5m scale. That is, the average patch size for salt couch (Sporobolus virginicus) and average gap size for red samphire (Sarcocornis quinqueflora) is about 7.5m. And at this scale, the distribution of salt couch is also associated with the distribution of water depth. But the scale of the association between red samphire and water depth is different. This indicates that there exist complex relations among salt couch, red samphire and water depth.

Lichens of Tiritiri Matangi, Hauraki Gulf, New Zeland: A Pilot Study

Presentation Type: Poster

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Tiritiri Matangi is an island 4 kilometres off the east coast of the Whangaparaoa Peninsula, north of Auckland City with a land area of approximately 220ha. The island has a history of land disturbance and in 1971 only 6% of the original bush remained. A revegetation project began in 1984 and approximately 60% of the island is now covered in remnant, natural regenerating and planted areas.

A survey of the lichen flora on the island was undertaken in 2003, with the aim to develop a species list and to examine the effects of artificial and natural regeneration on the lichen flora. There were 7 general survey sites with 34 collection areas within replanted, regenerating, original bush and the coastal/maritime habitat. To date, 49 species from 27 genera in 14 families have been collected and identified.

Lichen species on the island are typical of coastal broadleaf forests on other islands in the inner and outer Hauraki Gulf. Differences are evident in both number of species and species composition between original remnant bush, replanted and natural regenerating bush. The differences are likely to be due to age and species composition of forest, particularly where there is a high percentage of pohutukawa used in the revegetation plantings.

Ecology of the uncommon and threatened black-chinned honeyeater (Melithreptus gularis).

Presentation Type: Oral

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The Black-chinned Honeyeater (Melithreptus gularis) is uncommon, listed as threatened and apparently declining in New South Wales. Unfortunately, quantitative research on the black-chinned honeyeater is lacking. I have compared foraging behaviour and habitat selection of the black-chinned honeyeater with a common relative, the fuscous honeyeater (Lichenostomus fuscus), to help understand why the black-chinned honeyeater might be uncommon and possibly declining. Overlap of foraging manoeuvre, vegetation choice and foraging height between species was high. However, important foraging differences between species were found by taking a closer look. Black-chinned honeyeaters did less gleaning off the surface of leaves and more prying between leaves that were bound together than the fuscous honeyeater. Ongoing study, through quantifying bird movement, shows that black-chinned honeyeater prey may be more sparsely dispersed than fuscous honeyeater's food resources. This has led to the black-chinned honeyeater's scarce distribution through the landscape.

Understanding evolutionary changes in invasive species: Density effects in the Australian cane toad.

Presentation Type: Oral

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Invasive species often display rapid adaptation to their new environment, and make excellent models for the study of evolutionary processes. Since their introduction less than 100 years ago, Australian cane toads (Bufo marinus) have become both smaller and less toxic. Theory suggests that both these trends could be the result of an adaptive shift in life-history parameters like growth rate and time to sexual maturity. Population density is a major driver of such shifts, and we have explored this relationship in a controlled rearing experiment.

Spread of an invasive freshwater snail: New methods to analyze historical data

Presentation Type: Oral

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Invasive species will be one of the greatest causes of biodiversity loss in freshwater ecosystems over the foreseeable future. Despite these large impacts, the patterns and processes of invasive species spread is poorly understood in freshwaters. We used GIS to analyze the spread of the New Zealand mudsnail, Potamopyrgus antipodarum, in Victoria, Australia, over a 110 yr period. We mapped the snail's spread, estimated the percentage of stream length invaded through time, calculated the rate of spread and investigated the role that two proposed vectors - fish stocking and angling - have had on this invasion. We show that the snail's range has increased exponentially and estimate that this snail has invaded 20% of total stream length in Victoria. Using long-term data can change inferred relationships between vectors of spread and invasion. When our data were pooled through time, fish stocking intensity and angling pressure were both correlated with the invasion status of catchments. However, when the data were broken into a time-series and fish stocking intensity was calculated up to the date of invasion, no relationships were found. Our results underscore the important role of time-series data when estimating spread of invasive species.

Thamnolia lichens: alpine canaries for climate change?

Presentation Type: Oral

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Thamnolia, or "White worm", lichens occur worldwide in alpine areas. In a reciprocal transplant experiment on the Rock and Pillar Range, Otago, which was designed to simulate the effects of reduced snow cover as might result from climate change, Thamnolia strand densities were monitored along with vascular plant community composition, and growth responses of three Celmisia species. Thamnolia showed the most rapid response to changing snow cover of any species surveyed, colonizing newly snow-free quadrats, and disappearing entirely from other quadrats, within one season. The two most common Thamnolia species worldwide are only differentiated by the ability of one to fluoresce under UV light due to differeing cortical compounds. We have found no sequence variation between the two supposedly separate taxa, but based on previous records the fluorescent form may be increasing in frequency in the Southern Hemisphere. We are currently looking at physiological differences between the forms to attempt to explain their global distribution and apparent recent changes in frequency.

The ecology of Little Blue Penguin (Eudyptula minor) populations with different degrees of predator control: A proposal

Presentation Type: Oral

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The little penguin is one of the few native bird species which still persists on the New Zealand mainland. However, they are very susceptible to predation by introduced mammals (Perriman & Steen 2000; Harrigan 1992). Little work has been done on how little blue penguin populations respond to ongoing conservation management, and different levels of predator control. This study aims to fill this gap by comparing aspects to penguin ecology; such as, breeding success, foraging and mortality, between sites with different levels of conservation management and predator control.
Little is known about the northern populations of little blue penguins and according to Taylor (2000), the size of all northern blue penguin populations is unknown; and accurate estimates of population size are needed from as many breeding localities as possible, therefore this study will also compare abundance between sites and across seasons.
It is predicted that the sites with a greater level of conservation management and predator control will have a higher breeding success and fledgling rate as a result of reduced nest predation and that the populations that are surrounded by marine reserves will make shorter

foraging tips in comparison to those populations not surrounded by marine reserves.

Perriman, L,. & Steen, H., (2000). Blue penguin (Eudyptula minor) nest distribution and breeding success on Otago Peninsula, 1992 - 1998.. New Zealand Journal of Zoology. 27, 269 - 275.
Taylor, G.A., (2000). Action Plan for Seabird Conservation in New Zealand. Part B: Non-Threatened Seabirds. Threatened Species Occasional Publication 17.

Roost selection by Gould's long-eared bat Nyctophilus gouldi in woodchipped forests of south-eastern Australia

Presentation Type: Oral

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The aim of this study was to determine the roosts selected by Gould's long-eared bat Nyctophilus gouldi in forests that had been logged for woodchips 25 years earlier. The bats were caught in harp traps, radio-tracked to roost trees and a comparison was made between trees used and trees available in random plots. A total of 10 male and 6 female N. gouldi were radiotracked to 23 different roosts over 10 days. The primary finding was that the bats were selective in both species and size of trees. Maternity roosts containing lactating females and juveniles were located in live eucalypt trees, whereas adult males also roosted under bark in dead wattles (Acacia mearnsii). This highlights the importance of retaining both the old hollow-bearing trees and decaying trees in commercial forests for bats.

Can Glossophora kunthii and Macrocystis integrifolia (Phaeophyceae) respond with inducible defenses after manipulation of amphipod grazing?

Presentation Type: Oral

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Macroalgae possess various defense mechanisms against herbivory. Some species produce antiherbivore secondary metabolites, but production of these substances can be costly. Therefore algae may produce defense metabolites only in response to herbivory (inducible defense) or defend particular parts of the plant differentially (within-plant variation). In the present study we examined whether two species of brown algae show evidence of inducible or differential defense, measured as palatability changes in feedings assays (with fresh algae and reconstituted food), after manipulation of amphipod grazing. While the alga Glossophora kunthii adjusted its defense, reducing its palatability in the absence of grazers within 12 days and increasing its defense level when grazers were present, no inducible defense was found for Macrocystis integrifolia. The reaction of G. kunthii was triggered even by the mere presence of grazers, which suggests that this alga can respond to water-borne cues by reducing palatability. Grazers preferred central parts of G. kunthii over apical and basal parts, indicating differential allocation of defenses. In M. integrifolia the amphipods avoided basal stipes but only in fresh algae, indicating structural defense in these parts, which provide support for the remaining plant. Our study showed inducible and within-plant variation of defense, indicating that different algae respond in different ways to herbivory.

Factors in the success of restored urban forest patches

Presentation Type: Oral

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In and near Hamilton City, sixty-six plots in fifteen experimental blocks were established to investigate restoration success. Vegetation development under different planting and maintenance regimes was compared with natural regeneration and mature native forest. Ten functional, structural and compositional attributes were assessed.

In deteriorating blocks, native species recruitment and regeneration diversity were low, and exotic liana species were increasing. The number of native lianas and epiphytes in restoration plots was generally very low.

In improving blocks, good quality maintenance and low level of human disturbance were generally beneficial. Diverse and enriched planting were beneficial if linked to good maintenance. Close proximity of seed sources improved restoration success. Exotic canopy nurse species reduced restoration success but soil condition or allelopathy may be implicated.

Cluster analysis of plots revealed three distinct groups, linked to soil texture. Species associations reflected soil water availability. Species composition related more to age than to functional and structural condition of restoration patches.

The concept of multiple restoration pathways is supported, rather than the idea of a closely defined assembly order in the vegetation community.

Attending to structure and function parameters, particularly regeneration and dispersal, in restoration patches is important for successful restoration.

Fire, fragmentation and herbivory: Impacts on vegetation dynamics of the sandplain heathlands in the Western Australian wheatbelt

Presentation Type: Oral

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Allocasuarina huegeliana, or rock sheoak, is a tree species commonly found in dense stands around granite outcrops throughout the wheatbelt region of Western Australia. Over the past 25-30 years rock sheoak has been rapidly expanding into neighbouring sandplain heathlands. These heathlands have high levels of species richness and endemism and are of high conservation value. Conservation in fragmented ecosystems such as the WA wheatbelt aims to maintain viable and representative species assemblages. However the heathlands are under threat from the expanding rock sheoak populations which rapidly dominate these systems and may cause a decline in floristic diversity.

Altered disturbance regimes, particularly the absence of fire and reduced or absent browsing herbivore populations, are commonly identified as the primary factors causing rock sheoak to invade heathland. However, these processes are complicated and likely interactive, with each other and also with a range of other biotic and abiotic factors. To appropriately manage these reserves for the conservation of heath species we need to gain a better understanding of the processes that controlled the historical sheoak-heath boundaries, how these have changed and how they interact to determine the distribution and abundance of rock sheoak.

Roads, fire and noisy miners: Determinants of woodland bird distribution in southern Queensland forests.

Presentation Type: Oral

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The Brigalow Belt contains some of the largest areas of continuous woodland in eastern Australia, yet the avifauna appears to be dominated by the aggressive noisy miner, usually considered an edge species. Over one million ha of these woodlands are to be moved from forestry to conservation tenure, but they are currently bisected by extensive road networks and all but Callitris woodland is subject to frequent fuel-reduction burns. We investigated the influence of road edges and vegetation type and structure on the avifauna of a 300,000ha woodland. The avifauna differed significantly among Callitris, grassy Corymbia, and shrubby Corymbia woodland, but not with proximity to roads. Noisy miners were rare in Callitris woodland but were 3x more common than any

other species in Corymbia woodland. The presence of a shrub layer in Corymbia woodland was associated with fewer noisy miners. The species richness and abundance of bird species smaller than noisy miners was significantly lower in grassy Corymbia woodland than Callitris or shrubby Corymbia woodland, with abundance 6x higher in sites without noisy miners. We conclude that Callitris forest is potentially an important refuge for smaller birds, and current burning regimes which reduce the shrub layer are suboptimal for avian conservation.

Storms, trees, and forest dynamics: A history of extreme wind events reconstructed using tree rings, North Island, New Zealand.

Presentation Type: Oral

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Forest disturbance history, with a focus on extreme wind events, was reconstructed for 18 forest stands in central and southern North Island. Sites were dominated by light demanding species, such as Libocedrus bidwillii and Nothofagus spp. which have distinct annual rings. Interpretations of population age structures and tree ring chronologies were used to date the timing and location of past storm events. Several storms, or periods of increased storm occurrence, were identified in the last 400 years, and compared to other storm proxies such as lake sediment records. The results suggest that the most damaging winds tend to be from the east, and these winds are often associated with the passage of ex-tropical cyclones. Climatic phenomena, such as the El Nino Southern Oscillation, influence cyclone occurrence in the New Zealand region, and therefore also cause periodic changes in our forest disturbance regime. Changes in storm frequency may play an important role in regional, long term forest dynamics.

Wetland Ecology Across A Region: Prioritising wetlands for protection across the Manawatu-Wanganui Region.

Presentation Type: Oral

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Until the mid nineteenth century, approximately eight percent of the Manawatu-Wanganui Region supported wetland habitat. Like elsewhere in New Zealand and Australia, this wetland habitat has undergone extreme degradation and loss especially in the lowland areas of the Region. Currently only 2% of the former cover of wetland habitat remains in the Region, much of which is on private land, generally in poor condition and subject to a myriad of pressures.

The wetland project is one of Horizons' community supported initiatives to address the widespread decline of biodiversity within the Region.

Wetland habitat was identified using satellite technology, aerial photographs, topographical maps and existing information in the first instance. Identified habitat (or potential habitat) was visited and assessed using Rapid Ecological Assessment methodology.

An inventory of the Region's wetland's was compiled and the habitats digitally mapped. Each site was assessed against ecological criteria, determined in conjunction with Landcare Research, including scores for indigenous biodiversity, areal extent, representativeness of habitat and contribution of remaining wetland area. This process will be outlined.

Despite some limitations identified in the development of this project, the outcome has built considerably on Horizons' knowledge base and provided direction to an ambitious region-wide management programme.

Linking Vision with Implementation: Determining priorities for wetland protection in the Manawatu-Wanganui Region

Presentation Type: Poster

Fleur Maseyk
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The Manawatu-Wanganui Region, like elsewhere in New Zealand and Australia, has lost significant areas of wetland habitat, with currently only 2% of the original extent remaining.

In order to develop policy in response to this drastic decline in wetland biodiversity, Horizons needed to improve its knowledge around the distribution, condition and vulnerability to threat of this remaining 2% of habitat. To this end, in 2001 a project to identify, visit, map and assess the Region's wetland habitats was commenced.

By 2005, the inventory was largely completed, and the individual wetland sites were scored against a number of ecological criteria to produce a ranking. Ecological criteria were determined in consultation with Landcare Research. To date, over 350 wetlands have been identified, assessed, and ranked providing direction for wetland management across the Region.

Building on the success of this project, Horizons is now moving into the second stage, concentrating on completing the inventory (particularly in the Ruapehu and Rangitikei Districts), and revising some elements in the application of the ecological criteria. This continued work will further strengthen Horizons ability to achieve real gains in wetland biodiversity protection.

Bird assemblages in different land cover types of Leyte, the Philippines: The role and conservation value of small-scale forestry

Presentation Type: Poster

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Small-scale community-based forestry is believed to improve biodiversity. However, there is limited evidence about whether these systems can actually protect biodiversity. This study assesses bird richness in different human-made land cover types and their potential to enhance bird biodiversity in the Philippines considered as a biodiversity hot spot.

Thirty-nine sites were grouped under four treatments: 1) 10 Tree Farms (TF),with exotic species; 2) 9 ITE Farms (ITE), with mixed native tree and fruit species; 3) 9 Open Areas (OA), of grass land; and 4) 10 Secondary Forests (SF). Two bird surveys using Area Search Method were conducted at each site in 2005. Multivariate analysis using PATN was employed.

A total of 2253 birds of 97 species were recorded in the study sites. There was a significantly higher number of bird species in the SF sites ($P<0.0001$) compared with the other 3 treatments. However, the composition of bird species differed significantly across the four treatments ($P<0.05$). Most forest species include threatened species were only found in SFs. As a mosaic of farming systems will not support all bird species, it is essential to ensure the protection of the remaining secondary forests. Alternative strategies to increase biodiversity in other land use areas will be needed.

Waves and wind: Parallel abiotic influences on autotrophs and their consumers?

Presentation Type: Poster

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Classic abiotic factors that cause phenotypic changes to plants are nutrients and shade. These factors often alter plant chemistry and hence palatability. These patterns of change underpin the carbon-nutrient balance hypothesis and others, which attempt to explain variation in secondary compounds in plants growing in different environments. A parallel can be drawn between the ways in which terrestrial plants and aquatic autotrophs, such as macroalgae, are affected by abiotic factors. Details may differ due to differences in pathways of supply, for nutrients for example, but the principles are the same.
One abiotic factor, likely to have large effects on autotrophs and hence their consumers, is the invisible yet powerful energy of air or water in the form of wind or waves. The influence of this environmental energy is almost completely neglected in studies of "plant"-herbivore interactions, except at the grand scale of catastrophic events. We examine and compare the potential influence that wind and waves may have on autotrophs, at the level of structural and chemical changes to photosynthetic material (leaves, fronds). We then consider how these changes can modify interactions between individual autotrophs and their consumers, and ultimately, shape communities in both terrestrial and aquatic ecosystems.

Plant poisons and predators: The dilemma for foraging herbivores and its influence on quitting patches

Presentation Type: Oral

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Herbivores must negotiate many perils when foraging; including plant poisons and predators. Spend too long eating one particular plant and absorbed toxins can cause physiological damage. Switch between plants and travel costs go up. Stay in one place too long and predation risk increases, but moving around can also expose you to predators. The ideal way in which to forage is therefore not easy to determine and may be a compromise of the best of a bad set of options.

In foraging ecology, predation risk is often used to explain patch quitting times. However, we have shown that plant toxins also affect when, and how often, herbivores quit patches. This means we must integrate the effects of plant toxins and predation risk on foraging, to understand and predict responses of herbivores to their environment. We discuss the implications of this integration from a fundamental and applied perspective. We argue that the spatial scale of plant diversity, along with characteristics affecting predation risk, are critical for defining how effectively herbivores can forage in different environments. Foraging costs in forests of high plant diversity at small spatial scales may be much less than those in forests with low diversity.

A parasitic clonally reproducing mammal? Tasmanian Devil facial tumour disease.

Presentation Type: Oral

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The Tasmanian devil, Sarcophilus harrisii, is the largest extant marsupial carnivore. A debilitating facial cancer was first detected in 1996 and has now spread over most of the Tasmanian devil's range, causing death within four months of almost all diseased individuals and causing population declines of up to 80%. It now appears that this cancer is a transmissible cell line, which is probably transferred between individuals by biting. If this is indeed correct, then the cancer is a clonally reproducing mammal that is an obligate parasite. We have compared population structure, reproductive output and survival at two sites before the disease's arrival and after its establishment. Our results suggest that the disease has caused an abrupt transmission from from iteroparity to semelparity in infected populations. The disease primarily affects adults of reproductive age: we

have found no difference in survival of sub adults before and after disease arrival, but a substantial decrease in adult survivorship in populations where the disease is present. Prior to the disease, the modal life history of females was to commence breeding at age two, and produce a litter annually for three years. Females generally now have one breeding opportunity and often do not survive long enough to rear that litter. Hence, they are now largely semelparous. Interestingly, there appears to be some reproductive compensation occurring in infected populations. Whereas breeding by first year females is extremely rare in uninfected devil populations, it is quite common in infected populations. This may be important for the continued persistence of the Tasmanian devil in the face of this disease. We use simple demographic models to assess the potential consequences for population persistence of this disease, and present some preliminary analysis to estimate transmission dynamics of the parasite.

A review of existing ecological studies of urban-rural gradients and an alternative approach comparing Melbourne and Auckland

Presentation Type: Oral

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Over the past decade, the urban-rural gradient approach has been effectively used to study the ecology of cities and towns around the world. In this presentation we will discuss how urban-rural gradients have been characterised and review the types of variables that have been studied. Most gradients have been characterised using three classes of variables: 1) physical and chemical; 2) landscape structure and 3) human population density. Response variables have included diversity and abundance of organisms, nutrient availability and pollutant levels. The responses of these variables to urban-rural gradients include no responses, negative responses, punctuated responses, intermediate responses, and positive responses. We propose that the assessment of the response of these variables to urban-rural gradients would be improved with the development of better techniques to characterise the gradients. In a previous study we identified four metrics that combine landscape measures with human population data to capture most of the variability in Melbourne's urban-rural gradient. We used these metrics to compare and contrast the urban-rural gradients present in Melbourne, Australia and Auckland, New Zealand.

Using artificial eggs to identify predators in ground nesting banded dotterel (Charadrius bicinctus) colonies.

Presentation Type: Oral

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There have been over 20 species of wetland bird recorded on braided rivers in New Zealand. Of these the Black Stilt is critically endangered, the Black-Fronted Tern is endangered and both Wrybills and Black-Billed Gulls are vulnerable. Predation has been found to be a major cause of nest failure in these braided river species. These species nesting sites are vulnerable to variable river flows, encroachment by introduced plants and introduced mammalian predators. The potential of artificial wax eggs as a tool to monitor and identify predators at Banded Dotterel nests was tested. Predators were found to readily interfere with wax eggs. Several wax egg designs were trialled, finally settling on using cryptically painted wax eggs. The wax eggs were placed in both real nests and artificial nests and left for the length of normal incubation. Data on interference was analysed using the logistic exposure model (Shaffer, 2004). Predation rates between the two base colours and the two nest 'colonies' were significantly different, however no significant difference was found between real and artificial nests. Predators could usually be identified into at least predator guild (mammal vs avian). Identification to species level was possible on some occasions where Hedgehogs and Black-Backed Gulls were responsible for predation. The use of wax eggs shows good potential as a tool to monitor nest predation on braided riverbeds.

Early holocene warmth in New Zealand as an analogue for greenhouse warming

Presentation Type: Oral

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Temperatures in the New Zealand region are predicted to rise by 1-2°C above the 20th century average by the end of this century. The ecological consequences of warming are uncertain, although major changes in forests are likely. Forest models and historical analogues can be used to reduce such uncertainties. The "climatic optimum" (11 500 to 7000 calendar years ago), was a period during the Holocene with sustained higher temperatures. We use pollen and macrofossil evidence for past podocarp forest in a presently beech-clad inter-montane Canterbury basin, along with a forest simulation model (LINKNZ), to investigate this analogue. The fossil evidence suggests mean annual temperatures 1-2 °C warmer than now 10 000 years ago. We used LINKNZ and various combinations of climatic factors to explore possible scenarios. Warming alone cannot explain the observed podocarp forest assemblage, and a substantially drier climate than now is needed to get a satisfactory match. We also obtained as

good a simulation by altering the seasonal pattern to a longer, cooler growing season and a warmer winter. Such a seasonal pattern may explain otherwise contradictory aspects of the historic record, such as a low early Holocene treeline, and is a likely scenario for the near future.

The Department of Conservation contingency plan for protection of threatened species from avian influenza (bird flu)

Presentation Type: Oral

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Avian Influenza (AI) viruses are members of the genus Influenza virus A. Many subtypes of AI viruses are carried by healthy wild birds, especially waterfowl and most do not cause disease. South East Asia H5N1 is a highly pathogenic strain of avian influenza virus (HPAI) with the potential to cause high levels of mortality in poultry and other species of birds. It has the ability to occasionally cause mortality in humans following prolonged close contact with infected poultry, with just over 200 cases since 1995. It has now been detected in mainly poultry in 57 countries throughout Asia, Europe and Africa. The virus has unusual characteristics compared with other avian influenza including the ability to survive for longer in the environment and the ability to cause disease in waterfowl. Discussion of its spread is controversial and includes the legal and illegal movement of poultry and poultry products, smuggled birds and migratory waterfowl (via short movements of birds rather than long distances along migratory pathways). There is great variation in the susceptibility of different species. New Zealand is fortunate that the migratory birds which visit the country are predominately waders that are considered a low risk in the spread of the disease. Even with high mortality rates, only species with very small populations and high susceptibility to the disease are at any degree of risk of extinction from the virus, however DOC is taking a precautionary approach and developing a contingency plan that includes a wider pool of species. The plan (currently draft) identifies threatened species at risk of extinction from HPAI, identifies the trigger points where intervention is required, and provides a prescription for the response which includes preventative measures such as hygiene, increased biosecurity and vaccination. Fears of a human pandemic relate to the ability of the virus to mutate or mix with other influenza viruses to produce a new human-adapted strain. A human pandemic virus is considered very low risk to avifauna.

A sustainable management model of eco-restoration

Presentation Type: Oral

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The Karori Wildlife Sanctuary, a world-first urban sanctuary, was created with five main objectives - conservation and science, recreation and tourism, education, community involvement and to be a self sustaining model. In other words, the Sanctuary aims to deliver its vision environmentally, socially, culturally and economically.

Ten years on, the Sanctuary has achieved significant milestones but what has been and will be the ongoing challenges for this type of sustainable management model. The writer will explore these issues based on lessons learned.

Can adult tuatara (Reptilia) survive on the New Zealand mainland in the presence of mice?

Presentation Type: Oral

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Introduced mammalian predators complicate the challenge of ecological restoration on the mainland with their frequent reinvasion of fenced areas. Tuatara (Sphenodon spp.) have been confined to offshore NZ islands since early last century due to their vulnerability to introduced mammals. Island populations, now stable, represent a small portion of their former range. Translocation of tuatara to mainland islands represents restoration of an important ecological component, and offers greater diversity of habitat for tuatara, important for facing future challenges like climate change. However, can tuatara survive in areas where mouse reinvasions threaten the introduced predator-free status? We translocated 70 adult tuatara from Stephens Island, Cook Strait to Karori Wildlife Sanctuary: 60 within and 10 outside a mouse exclosure. Sixteen tuatara were tracked daily using transmitters, and every five weeks, a week was spent catching as many tuatara as possible for growth, health and dispersal data. All 45 animals caught since release show increased condition, decreased external parasite load, and no damage from mice. The cryptic nature of tuatara implies missing animals are likely to be alive. Adult tuatara can survive summer in the presence of mice, but effects during winter when tuatara are constrained by temperature are yet to be assessed.

Interspecific dynamics between land hermit crabs (Coenobita spp.) and the invasive yellow crazy ant (Anoplolepis gracilipes) on Tokelau.

Presentation Type: Oral

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Land hermit crabs (Coenobita spp.) and the invasive yellow crazy (Anoplolepis gracilipes) are common and abundant inhabitants of coastal communities throughout the Pacific Islands. The yellow crazy ant displaces other ant species on the low-lying atolls of Tokelau, home also to three species of Coenobita land hermit crabs. We investigated the spatial and temporal distribution of the resident land hermit crab species on yellow crazy ant-infested and uninfested islets of Tokelau. In addition, we documented foraging activity of A. gracilipes, hermit crabs and other ant species over a 24-hour period to determine underlying mechanisms facilitating their coexistence. We found that as yellow crazy ant relative abundance increased hermit crab densities declined, whereas the pattern of temporal partitioning of foraging was more complex over a 24-hour period. Interspecific interactions between native hermit crabs and invasive ants are likely to be common on eastern Pacific islands where native ant species are scarce. With increasing ant invasions, it is likely that the role of land hermit crabs in community dynamics could change.

Estimating carbon in regenerating forests using radar imagery : A critical review

Presentation Type: Poster

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Monitoring forest biomass is a significant global issue, with the adoption of treaties limiting the emission of CO2 and other greenhouse gasses, while industries and countries, including New Zealand, consider schemes for trading carbon credits. As a consequence, scientifically sound methods must be identified to monitor biomass carbon in exotic and indigenous forest and shrubland environments.

Radar remote sensing has been promoted as a way to estimate above-ground carbon. The evidence from the literature suggests that, for uniform age and species forests on flat ground, empirical relationships with carbon are clear, and improve with increasing wavelength. Forests with a range of stand ages and species have less well-defined relationships, as do stands on sloping land.

Here, we review several key elements of the relationship between the radar signal from forests and the above-ground biomass, using forest and shrubland species from New Zealand. We show that systematic corrections to the radar imagery can correct the forest biomass relationship for sloping land. We also show that, by using a specialised form of radar imagery

(full-polarisation radar), it is possible to extend the empirical biomass relationships to cover a wide range of regenerating forest and shrubland types.

The efficacy of wind pollination in a forest understory shrub in New Zealand

Presentation Type: Oral

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Alastair Robertson
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The structural and floristic diversity, lack of deciduousness, and frequency of rainfall in evergreen forests are factors considered unsuitable for effective wind pollination, particularly as wind velocities are low within these forests. Coprosma spathulata is a small-leaved, endemic, dioecious, wind-pollinated, understorey shrub, mostly less than 2 m tall, with a restricted distribution in lowland native forests from the Waikato region northwards. It is relatively habitat-specific, occurring in discreet sub-populations, mainly on ridges in secondary native forest, usually under a broken canopy. Flowers are produced over a 6-week period during late winter and early spring. In 6 study quadrats in the Waikato region, population gender ratios were mainly male biased, and reproductive success (fruit set) was high (76.9-96.8%) in six of the plots. Factors negatively influencing fruit set in two quadrats were the distance to male plants, the low abundance of male flowers, and the high density of the shrub and ground flora. Nevertheless, wind pollination is mostly effective in this species, despite its forest habitat.

Relative abundance estimates of tomtits (petroica macrocephala) using line transect distance sampling.

Presentation Type: Poster

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This poster discusses two outcomes of line transect distance sampling analysis of tomtits in the Tongariro forest conservation area which took place yearly from 2001 through 2005. In particular we discuss, with reference to this study, the questions:

a) I have collected data from 3 sites over 5 years. Do I fit 1 detection function or 15? Where is detectability likely to be the same?

And,

b) My detection functions show there is consistent movement of animals away from observers. This violates the assumptions required for line transect distance sampling methodology. What can I do?

Urban design for interaction between natural character, wildlife and social knowledge

Presentation Type: Oral

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An empirically-based spatial model of forest tree dynamics, linked to reserve design theory and claimed human need for nature experience, suggests some minimum targets for forest patch size and density required to maintain indigenous ecological integrity in urban and rural landscapes. Constructed knowledge about relationships between wildlife and habitat, from recorded community experience, informs landscape design and in turn may be positively reinforced by the growing exposure of the populace to more frequent sightings of wildlife. An online system for recording and displaying informal natural history observations (New Zealand Biodiversity Recording Network - NZBRN) is under development. Pilot results from a web-based form, used to gather community observations of native birds in Christchurch, demonstrate the complex of environmental and social factors that may influence the data. Sightings of kereru and bellbirds are clustered in the leafier suburbs which may be both a habitat indicator and a reflection of socio-economic, educational or motivational levels in those suburbs. While we can infer that bush birds are associated with suburban forest habitat, the lack of records from other suburbs cannot be absolutely ascribed to inadequate habitat until there is more reliable absence data. The NZBRN will allow a comprehensive range of environmental, descriptive and condition data to be entered and retrieved, including absence records.

Salmonella carriage in wild and domestic populations of Geckos and Skinks in New Zealand

Presentation Type: Oral

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I am currently researching the incidence of Salmonella, Hafnia alvei and Aeromonas species of bacteria in wild and captive New Zealand reptiles. In studies from overseas the detection of Salmonella in both clinically normal reptiles and diseased animals is typically very high. International research has demonstrated reptile associated salmonellosis to be a significant threat to public health, domestic animals and wildlife. Salmonella serovars have been diagnosed in wild and captive reptiles in New Zealand and have been

shown to cause disease in rare cases. Hafnia alvei is a zoonotic pathogen that has been diagnosed in our native tuatara and is occasionally associated with gastroenteritis in humans. Aeromonas is the only one of the three bacterial species covered that cause's significant disease in reptiles. Aeromonas is often isolated from the infection site of stomatitis (mouth rot). The aim of this research is to identify the prevalence of Salmonella, Hafnia alvei and Aeromonas in wild and domestic populations of skinks and gecko's. My research sources were; wild reptiles caught free-living on Mana Island and two domestic populations (from New Plymouth and Lower Hutt). At the time of preparing this abstract my research results were unavailable but will be presented at the conference.

An introduction to the symposium on resilience in Australian and New Zealand agro-ecosystems.

Presentation Type: Oral

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Michael Dodd
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Henrik Moller
Agricultural Research Group on Sustainability (ARGOS)
David Hilbert
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This presentation introduces the concept of social-ecological resilience and its relevance to the future of agro-ecosystems in Australia and New Zealand. We argue that social-ecological resilience is a key attribute of sustainable management, and that operationalising this concept is therefore a significant scientific challenge. We provide definitions of terms, a framework for comparative and collaborative research between the two countries, and introduce a range of methods that may be applied to operationalising the concept.

Value of microsatellite markers in the conservation of two rare Cyclodina skinks

Presentation Type: Oral

Kimberly Miller
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The merit of using genetic markers in ecology is widely acknowledged, but there have been few applications of genetics to the conservation of the endemic New Zealand lizard fauna. Microsatellites are often particularly valuable for detecting variation within species, but where there is very low diversity, the utility of genetic data in making fine-scale management decisions can be limited. We used primers previously developed for use in Oligosoma grande to evaluate species-level diversity of Cyclodina whitakeri and Cyclodina alani at 13 and 14 microsatellite loci, respectively. Both of these Cyclodina species are listed as 'threatened' on the IUCN Red List, and evaluation of intrapopulation diversity and genetic structure is one of the top three research priorities in the DoC recovery plan for both species. Understanding total species diversity is a precursor to this work. We found lower levels of overall heterozygosity and allelic diversity than predicted, which could be attributed to restricted ranges or non-availability of

samples. Additional samples are being collected to detect private and/or rare alleles to distinguish populations and evaluate possible losses in genetic diversity during founder events or as a consequence of range restriction by introduced mammals.

Is small-scale diversity of soil mites related to land use type?

Presentation Type: Oral

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Jennifer Cianciolo
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The responses of soil communities to land management are usually examined at habitat-wide scales. Few studies have looked at land use effects on soil biodiversity at a smaller local scale, which is most likely to be relevant to soil microfauna. We report the results of a study which explores the relationship between landscape-level factors (land use type) and the diversity of soil mites at a within-site scale. The diversity measures were recorded across five agricultural and natural land use types.
The total species diversity observed in a habitat is dependent upon the local diversity within patches, the species turnover between patches, as well as the extent of sampling. We tested the null hypothesis that no relationship exists between land use type and the within-habitat diversity of soil mites. We also tested the hypothesis that the species turnover among samples will be lower in agroecosystems than in the forests.
An essential part of any biodiversity study is to quantify the relationship between sample size and observed species richness. We report the efficiency of our sampling in representing the true species richness in the studied habitats.

An Illustrated Guide to New Zealand Soil Invertebrates

Presentation Type: Poster

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The web-based illustrated guide to New Zealand soil and litter invertebrates (http://soilbugs.massey.ac.nz) has been developed and launched as a part of NZ Terrestrial and Freshwater Biodiversity Information Systems Programme. The Guide provides public access to an identification key and extensive image galleries for all major groups of NZ soil invertebrates. Twenty chapters (web pages) describe biology, distribution, endemism, ecosystem role and conservation status of major groups of soil invertebrates, and provide comprehensive lists of New Zealand taxonomic literature. The Guide is linked via the Internet to significant national and international resources for soil invertebrates. The Guide and its Image Gallery increase public awareness and facilitate access to the soil biodiversity information in New Zealand.

Managing New Zealand cities for indigenous landbirds

Presentation Type: Oral

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Factors potentially limiting indigenous birds in managed forest reserves in urban areas today are vastly different to what they were when our cities were established, and most forest birds declined to local extinction. Problems encountered when attempting to restore indigenous forest birds in urban landscapes go beyond providing sufficient habitat and reducing predator impacts; many New Zealand landbirds have limited powers of dispersal, and translocations may be a necessary component of restoration.

Forest birds are returning to Wellington city as a result of effective possum (Trichosurus vulpecula) and rat (Rattus sp.) control in urban reserves, as well as translocations of 11 forest bird species to predator-free sites within or near the city. Most of these translocations have been to the Karori Wildlife Sanctuary, a 252 ha predator-fenced reserve embedded in the Wellington townbelt. Characteristics of bird species that affect their vulnerability to urban predators are discussed, and predictions on their ability to survive outside the fence are made. Suppression of arboreal predators, especially possums, ship rats (Rattus rattus) and stoats (Mustela erminea) irrespective of cat (Felis catus) control may be sufficient for a guild of locally extinct indigenous forest birds to recolonise or be reintroduced to New Zealand cities.

Campbell Island snipe (Coenocorypha undescribed sp.) recolonise subantarctic Campbell Island following rat eradication

Presentation Type: Poster

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The Campbell Island snipe (Coenocorypha undescribed sp.) was unknown to science until its discovery on 19 ha Jacquemart Island in 1997. Following the successful eradication of Norway rats (Rattus norvegicus) from 11,268 ha Campbell Island in 2001, there was increasing evidence that snipe had begun to recolonise the main island: footprints were found at Monument Harbour in 2003, and a fully-feathered dependent chick was captured nearby in March 2005. A survey of Campbell Island snipe recolonising Campbell Island was undertaken by the authors and a trained bird-locater dog during 7-15 January 2006. We confirmed the presence of snipe and their successful breeding at two sites: the outlet to Six Foot Lake (head of Monument Harbour), and near the mouth of Kirk Stream at the head of Six Foot Lake. We estimated at least 22 adult snipe to be present. Twelve adult snipe were caught, along with 5 dependent chicks with estimated ages ranging from 8 to 37 days old. One snipe nest was found. Subsequent sightings in February 2006 revealed at least two snipe to be present on the north-western shores of Perseverance Harbour, approximately 3 km north of where we recorded them. We document the successful re-establishment of snipe on Campbell Island within 5 years of rat eradication, and recommend that their natural recolonisation be left to continue unaided.

Restoring burrow-nesting seabirds to islands: Translocation as a means to restore ecosystems

Presentation Type: Oral

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Burrow-nesting petrels (Procellariiformes) once formed enormous populations on most islands and parts of mainland New Zealand, where they heavily modified terrestrial ecosystems through input of marine-sourced nutrients, their burrowing activity, and physical disturbance of ground cover, seedlings and leaf litter. Burrow-nesting seabirds were disproportionately affected by predatory mammals, but there have been few attempts to restore them to sites where they have become locally extinct. Reintroduction efforts have been hampered by the absence of practical methods to overcome the strong philopatry typical of petrels. We describe techniques developed to reintroduce three species of burrow-nesting petrels to Mana Island (Cook Strait, New Zealand), and describe the outcomes of the first two translocations. Our models of potential population recovery of remnant and reintroduced petrel populations reveal that the ecological impacts of introduced predatory mammals may persist for centuries after their eradication.

Implementing "Gifts & Gains". "The Fiordland Guardians" approach to marine protection

Presentation Type: Oral

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Marine reserves - areas of the ocean environment where no extraction of marine life is allowed - are increasingly viewed as a valuable method for protecting areas of high biodiversity and as a buffer against scientific uncertainty in managing marine ecosystems. Such measures, however, are not without controversy as communities reliant upon these resources typically resist exclusion from traditional grounds; thus, efforts at implementing marine reserves as conservation tools have not met widespread acceptance. Local stakeholders in the Fiordland area of New Zealand advanced a novel method to reconcile such seemingly conflicting values of resource conservation and utilization in the development of the Fiordland Marine Management Regime, a bottom-up community participation model for marine management that may prove useful in other jurisdictions with similar characteristics. This investigation analyses the Fiordland Guardians' strategy from a development theoretical perspective, critically applying World Bank methodologies for stakeholder analysis and assessment of marine protected areas.

The consequences of clumpyness: Effects of spatial aggregation on competition and ecosystem processes.

Presentation Type: Oral

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Most models of interspecific competition for resources make the simplifying assumption that species are distributed randomly or diffusely in space. In reality though, species are distributed in a range of spatial patterns and are aggregated to varying degrees. The degree to which species are aggregated in space may have significant effects on the potential for niche complementarity to be expressed and resource partitioning to occur. Here I present the results of an experiment where different levels of spatial aggregation were applied to 2-way species combinations, from a pool of plant species common in native grasslands of SE Australia. The effects of spatial aggregation were examined for a range of variables, including plant growth, resource use (soil moisture & light), and other ecosystem variables. Spatial aggregation had significant effects on a range of plant growth parameters, although these effects were not always consistent between species. Similarly, the effects of spatial aggregation on niche space occupancy and resource use varied between species and species combinations. These results indicate that a greater awareness of the spatial distribution of species is essential in efforts to adequately conceptualise and model how interspecific interactions influence ecosystem processes.

Latitude and seed production

Presentation Type: Oral

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We compiled data from seed rain studies from around the world to determine whether the greater mean seed mass of tropical species is associated with production of fewer seeds. We found no significant linear relationship between latitude and log10 annual seed rain per unit ground area, but found some evidence for a mid-latitude peak in seed rain (quadratic relationship, P = 0.015; R2 = 0.26). Combining seed rain data with seed mass data suggests that vegetation at the equator produces between 20 and 153 times more total mass of seed per year than vegetation at 60º. This gradient in seed production would far outweigh the doubling in net primary productivity (NPP) over the same range of latitudes. Thus, tropical vegetation seems to allocate a greater proportion of NPP to reproduction. This suggests two questions for the future: 1) why might tropical vegetation commit more energy to seed production than vegetation further from the equator?
2) What aspect of plant growth might receive proportionally less energy in tropical ecosystems?

He said, she said: Duetting in North Island kokako

Presentation Type: Oral

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The endangered, endemic North Island kokako is renowned in New Zealand for its song. In addition to having a sound described as "beautiful" and "haunting," kokako duets are remarkable for their slow pace, complexity and flexible sex roles. We have examined pairs' responses to playback of several different versions of typical duet sequences. Manipulations included one versus two spatial sources of sound, one versus two singers (both male), and one versus two sexes contributing to playback song. Our results show that kokako differentiate strongly between one and two sources of sound and that they may be capable of discriminating female from male singers. Pairs perceived two-speaker playback as a greater territorial threat than one-speaker playback, as shown by their faster approaches and and frequent use of aggressive countersinging behaviours. When spatial cues were not available (all playback was through one speaker), kokako did not alter approach latency in response to the number or sexes of singers; however, aggressive countersinging behaviours occurred less often when a female voice performed part of the duet. Results of playbacks offering birds a "choice" between male and female singers also suggested that birds could make song-based determinations of sex.

Calling all kokako: An update on the use of acoustic anchors in a mainland translocation

Presentation Type: Poster

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Intensive predator control programs have allowed kokako numbers to increase in most remaining populations, allowing the possibility of reintroduction to additional mainland areas where this endangered endemic was formerly present. The difficulty with such translocations is that kokako can wander widely and leave the safety of areas protected by pest-proof fencing or intensive predator control. How can we persuade birds to remain in target areas, maximising the birds' chances of surviving and successfully reproducing?

At last year's NZES meeting, we presented preliminary results of a pilot study of "acoustic anchoring" in a reintroduction of kokako to a mainland site. This was the first trial of such a technique with a passerine anywhere in the world. In this experiment, we simulated a small "neighbourhood" of kokako using song playback, and found that most released birds

approached and/or vocally interacted with playback speakers, and birds approaching the playback area often encountered one another. This poster updates last year's presentation with monitoring data collected during the breeding season following the release. At least five territorial pairs formed and made four breeding attempts. One pair fledged at least one chick. All released birds were within the target predator-control area when last located.

Recovery planning: Is it working?

Presentation Type: Oral

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The preparation of Recovery Plans for listed threatened species is a requirement of both State and Australian Government legislation. Recovery planning does not appear to be keeping pace with either the listing of species or the legislative timetables. Many plans remain in draft form. We examined a sample of recovery plans in order to review the scope, quality and certainty of the science and the extent to which it flows into plan objectives and actions. The quality of the plans varies considerably. We will discuss the results of this research and draw out a number of broader policy implications for recovery planning. This research is part of a large project looking at the interface between science and law in threatened species conservation.

The social mating system of tuatara (Sphenodon punctatus)

Presentation Type: Oral

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Reptile mating systems are predominantly polygynous, with large males often dominating reproduction. Tuatara, medium sized, sexually dimorphic reptiles and the sole extant representatives of the Order Sphenodontia, are highly territorial, particularly during the breeding season. On Stephens Island, New Zealand, where the largest population of tuatara remains, we investigated the spatial structure and mating system of these reptiles. From 2005 -2006 observations were made on individually marked tuatara in three study plots, and behaviors were recorded. Locations were recorded before and during the mating season (November and March) and were plotted in a GIS. Spatial structure of individuals remained stable over seasons, with the exception of gravid females migrating to and from nesting rookeries. Male core areas did not overlap, and sizes did not correlate with morphometric measurements. Female-male territories did overlap, and mating observations confirmed that the mating system is socially promiscuous. Adult males observed mating were significantly larger and heavier than the average adult male. Larger males are therefore more effective at securing territories and

winning aggressive interactions, thereby gaining greater access to females. Further research is needed to confirm what is actually driving this system, and whether the genetic mating system reflects the social mating system.

Alternative approaches to valuing the future

Presentation Type: Oral

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Recently much attention has been payed to the benefit of employing active adaptive management strategies in natural resource management. Active adaptive management looks at the benefit of employing strategies that may appear suboptimal in the near future but which may provide additional information which may facilitate better management in future years. When convential geometric, or exponential, discounting is employed the value of future outcomes quickly decline with time, contributing little to the expected net present value of the system. Under such a discounting scheme incurring additional costs now in order to better manage a system in the future is often suboptimal, and may often even favour drastic exploitation of resources. Despite the wide use of geometric discounting in ecology, there is substantial evidence to suggest that this is not how we value the future. Indeed extra conditions are often included when formulating optimisation problems which emphasise our desire for sustainability or species persistence. We look at how employing a discounting scheme which places more value on future outcomes, such as intergenerational discounting, changes the optimal strategy and places more value on learning.

Negative effects of biodiversity on epiphyte biomass in a mixed species artificial-seagrass assemblage

Presentation Type: Oral

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The rate at which biodiversity is being lost due to anthropogenic activity is threatening ecosystem functions that provide a planet habitable for humans. Much of the research focusing on the relationship between biodiversity (i.e. species richness) and various functions has been performed in grasslands, with few marine studies. To redress this imbalance, we investigated the effects of three different seagrass generic forms on epiphytic biomass accumulation (an ecosystem function), using artificial seagrass that accurately mimicked forms from the genera Posidonia, Amphibolis & Zostera. The experiment tested the effect of species richness versus identity on mixed treatments versus monocultures, and total surface area of artificial seagrass units on epiphytic growth. A variety of analytical approaches were applied to determine any potential richness or identity effects. The significant regression of epiphyte biomass on model surface area did not take into account the differences between the treatments from differing morphologies, and was not sufficient to explain the difference between epiphyte load between treatments. Our determination of the biodiversity effect utilizing a recent approach indicates that there were both negative and positive effects of mixing

different growth forms, with negative being the predominant outcome, and was most pronounced at the highest richness.

Decadal change in an urban mistletoe population

Presentation Type: Oral

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Introduced tree hosts of creeping mistletoe in suburban Heidelberg, Victoria were resurveyed after an interval of ten years. There was substantial turnover of hosts in the decade, and increasing disparity in the density of both infected trees and mistletoes between the elevated western block compared to the adjacent valley slopes to the east, with more than five times the density of infected trees and ten times more mistletoes in the west. Differences in potential host densities between the sites do not explain the differences in infection rates.

A new frequency analysis method for constructing fire histories from fowering events in austral Grasstrees (Xanthorrhoea australis) from Southern Victoria

Presentation Type: Oral

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Austral Grasstrees often flower in response to fire, leaving a discernable scar on the trunk. These scars act as a record of flowering, and by measuring the distance between the scars, and relating the growth to a known growth rate, a fire chronology can be constructed from each measured tree. By analysing the frequency distributions of the fire dates calculated from a population of grasstrees, lengthy fire chronologies can be constructed. While the results are provisional, a resolution of two years and spans exceeding 100 years are possible. The technique has considerable advantages over current methodologies, and should find applications in fire ecology, ecological history and vegetation management.

Impact of the hyperparasitoid Baeoanusia albifunicle Girault (Hymenoptera: Encrytidae) on primary parasitoids associated with Paropsis charybdis control in New Zealand

Presentation Type: Oral

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The self introduced hyperparasitoid Baeoanusia albifunicle was detected in New Zealand in 2001, 14 years after its host, the egg parasitoid Enoggera nassaui, was successfully established as a biocontrol agent of the eucalypt defoliating beetle Paropsis charybdis. Field sampling has revealed that B. albifunicle reduces the effective parasitism of P. charybdis by E. nassaui however it is not clear if control of the pest has been compromised. A second primary parasitoid, Neopolycystus insectifurax, was also detected

in 2001 and may substitute in part for the apparent reduction in E. nassaui, as it has not been recorded as a field host of B. albifunicle. Studies are underway to investigate the new balance forming between the three parasitoids and the consequent impact on P. charybdis. Laboratory assays are being used to assess the biology of, and ecological interactions between, the hyperparasitoid and the available paropsine and parasitoid hosts in New Zealand. Preliminary data indicate that the hyperparasitoid is a highly fecund, long lived species. Contrary to earlier reports, hyperparasitism is successful only when oviposition occurs after P. charybdis eggs are parasitised by E. nassaui. P. charybdis eggs parasitised by N. insectifurax also elicit an oviposition response from B. albifunicle in the laboratory.

Biodiversity in Auckland: Can urban restoration projects really make a difference to biodiversity conservation?

Presentation Type: Oral

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Many of New Zealand's threatened lowland and coastal ecosystems lie within urban areas. The protection and restoration of the ecology of urban environments, therefore, contributes significantly to turning the tide of lowland biodiversity loss. The Auckland region is the fastest growing in the country with over a third of NZ's population. Despite the loss of ecosystems, significant remnants and unique ecology remains, e.g. volcanic systems, gulf islands, large forested ranges, estuarine ecosystems, lowland remnants, threatened species. Restoration is needed to restore ecosystems, create linkages, and improve habitat quality. The benefits of a large population include the growth in interest in community restoration projects. Projects undertaken by landowners, communities and councils will be described. Successes include mainland islands, corridor concepts, pest free islands, revegetation projects, covenanting mechanisms and incentives, species reintroductions. Ecological monitoring indicates that biodiversity gains are being made but are they enough? Is restoration working and how is it contributing to the loss of biodiversity in the Auckland region and NZ as a whole? Biodiversity protection and restoration in an urban environment has different challenges, e.g. weeds, stormwater, growth and subdivision. Innovative ways are needed to protect and restore ecosystems into the future and to encourage an urban population to value the environment.

Fidelity versus flexibility in nest site choice by female tuatara (Sphenodon punctatus): Implications for population persistence under global warming

Presentation Type: Oral

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In reptiles with temperature-dependent sex determination, the nest sites chosen by females affect both survival and sex of offspring. The ability to be flexible in nest site choice in response to environmental cues may influence the sex ratio of the population as a whole and, by extension, the persistence of such species, particularly in the context of global warming. Stephens Island, Cook Strait, supports the largest population of tuatara in the world. Between 2002 and 2005, over 1300 gravid females have been individually marked on nesting rookeries. Seventeen percent of these have been recaptured on nesting rookeries in subsequent years, with 98.7% of recaptured females indicating strong fidelity at the macro-site scale of the nesting rookery. At an intermediate scale, half the females nested within 7m of their previous nest site, and half nested further from their previous nest site but within the same rookery. Female tuatara in this population appear to be relatively habitual in their nesting behaviour in a predictable environment. If similar nest site specificity occurs in other, smaller populations living in less diverse habitat, the likelihood of a skew in sex ratio resulting from global warming may be greater, and population persistence may be jeopardised.

The impact of reproductive divergence and clonality on the genetic diversity of the threatened species Grevillea Rhizomatosa olde and marriot (Proteaceae)

Presentation Type: Oral

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Inter Simple Sequence Repeats (ISSR's) were used to analyse the genetic variation and the distribution of genetic variability in populations of the clonal threatened species Grevillea rhizomatosa. The study was conducted in two parts. The first component sampled individuals from four geographically proximal populations. Two of these populations were known to be self-incompatible, one population sterile and the remaining population, self-compatible. The results indicated that high levels of genetic variation were currently maintained within populations irrespective of the type of reproductive strategy that was being utilised. Sterile populations were not the exception. There was also a high level of similarity between populations indicating historical, and/or ongoing interaction between populations. The second component of the study investigated the small scale distribution of variability in a neighbourhood within a sterile community (5m x 3m). The results indicated that plants

were reproducing clonally on a small scale. Combined, the results suggest that populations may be made up of many genets and that sexual reproduction may have been, and may continue to be, an important mode of recruitment. As such, the development of sterility may represent a change in the way that this species persists in the landscape.

How Generalised are New Zealand Pollination Systems?

Presentation Type: Oral

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The impression that most of New Zealand's pollination systems are highly generalized has led to an overemphasis on the idea th at any and all potential pollinating taxa will visit a given flowering species. The Landcare Research Community Pollination Project was designed to investigate the possibility that some flowering species could be specialized, at least cryptically specialized. If all pollinators have access to a given flower but they all do not visit then this is a form of cryptic specialization and will be due to pollination syndrome characters that are not readily apparent such as floral scents, colour or limited nectar rewards. Furthermore, the influence of competing floral resources in the community will determine which potential pollinators prefer a given species at any given site. Our daytime data from Nov-Dec 2005 based on 9 transects at 7 mainland sites throughout New Zealand show that some species are dominated by certain floral visitors and may be cryptically specialised. From 10 to 20 days observations at 4 diurnal intervals were conducted on over 100 species of native and exotic plants with varying levels of replication. The data show clear preferences by floral visitors for some plant species at the level of the major groups: bees (honeybee, bumblebee, native bee), flies, beetles and bugs as well as moths and butterflies. However, many plant species are generalized with a close to uniform distribution of visiting insect groups when a composite floral visitor profile is constructed from all sites and all replicates.

Congruence of different operational approaches to circumscribing 'units of biodiversity': The influence of spatial scale

Presentation Type: Oral

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Impediments to the allocation of specimens to described species has led to a growing trend in ecology and conservation biology to use operational surrogates for putative species within the context of a particular research project. These local operational (parataxonomic) classifications differ markedly from traditional taxonomic classifications in the scale of observation and may, therefore, be sensitive to spatial scope. To test this, three classifications of two ant genera, Camponotus and Rhytidoponera, collected from Sturt National Park, Australia, were independently derived using morphological criteria. The 'parataxonomic' classification assigned specimens to taxonomic units without specialist expertise; the 'taxonomic' classification assigned specimens to taxonomic units using specialist taxonomic expertise; the 'phenetic' classification assigned specimens to taxonomic units using a K-means partitioning algorithm on basic morphometric data. This procedure was repeated on assemblages of specimens defined at multiple spatial scales. Congruence between classifications, as tested by Kendall's Test of Concordance, tended to decrease with increasing spatial scale supporting the prediction of Mayr that closely sympatric species are more easily discriminated. This pattern is attributed to two biological causes: (1) an increase in within-species morphological variation with increasing spatial scale; and (2) a limit to morphological similarity of potentially competing species at small spatial scales.

Awarua wetlands, Southland, viewed through time series of satellite images

Presentation Type: Poster

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A study of the Awarua wetlands area, Southland, is focusing on past and current vegetation cover and change. One component of the study is using time series satellite images, supported by field work, to:

* Map broad vegetation communities for the full wetland area (approximately 17,000 ha)
* Determine the natural seasonal fluctuations in characteristics such as net primary productivity (NPP)
* Track post-fire revegetation, as an example of real change (as distinct

from seasonal variability).

The study is complementary to the wetland mapping contracted by DOC that is being carried out under the EcoSat protocols (http://www.landcareresearch.co.nz/services/ecosat/). The latter maps the major wetland types at a point in time for the whole of New Zealand. In contrast, we are studying detailed vegetation types and temporal trends within a single wetland complex. Working from satellite images that are frequent in time, though spatially coarse, we will present graphs showing the marked seasonal fluctuation in NPP visible in the wetland area. Working from images that are more spatially detailed (though sporadic in time) we will illustrate the abrupt change in vegetation cover from before to after the October 2005 fire, followed by the beginnings of revegetation.

Modelling wilding conifer spread and control

Presentation Type: Oral

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Self-sown introduced (wilding) conifers are a serious environmental weed in the South Island high country. Central and local government agencies have some funding for wilding conifer control but this is limited relative to the scale of the problem. Thus, the control budget needs to be allocated carefully to achieve best results for the dollars spent. Good predictive models can be powerful tools for determining the best intervention points in the wilding spread sequence and the most cost-effective control strategies. Over the last two years, Environment Canterbury (Canterbury Regional Council) has supported the development of two models of wilding conifer spread and control and tested these on areas of interest to the Council. The first model is a broad-scale GIS prediction of areas at risk of wilding invasion in the Upper Waitaki catchment. The second is a simulation comparing the relative efficacy of potential control strategies under various spread scenarios, that has been piloted at Constitution Hill in the Upper Waimakariri catchment. The development and application of these models is described in this presentation.

Leaf carbon and the production of domatia in new leaves on Coprosma rotundifolia.

Presentation Type: Oral

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Leaf domatia, small indentations on the undersides of leaves, occur in hundreds of woody plant species. Domatia can be structurally complex and appear to serve no physiological function. However, they are often inhabited by potentially beneficial mites and other arthropods. Plant morphological traits that enhance mutualistic relationships may result in increased plant growth rates and reproductive success, and should enhance some elements of plant fitness. Domatia appear to be a carbon-based defence and are more common in Coprosma species with low leaf mass per unit area (LMA). Low LMA equates to highly productive, but highly palatable leaves. To determine whether carbon-limitation influenced domatia expression, I established an experimental study to determine if leaf carbon is a limiting factor in domatia production in Coprosma rotundifolia. Nursery sourced C. rotundifoia plants were grown under conditions of carbon-stress by increasing respiration rates during night-time hours using elevated temperatures (12° C control vs 20° C treatment) in a climate chamber. Photosynthetic leaf measurements on fully expanded leaves from the previous season indicate that shrubs with elevated night temperatures have 40% higher respiration rates than the control. Leaf carbon and domatia on the new season's growth will be recorded at cessation of the experiment in July.

How effective are Tui as seed dispersers?

Presentation Type: Oral

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This Honours project has examined how far seeds are dispersed after consumption by Tui (Prosthemadera novaeseelandiae). Four birds were radio tracked in Taranaki to give minute by minute GPS data on each bird's location. A further four birds in captivity will be used in a feeding trial to determine the gut passage time for seeds of several native species. Analysis will allow for the average distance a seed is moved after consumption to be calculated. This will allow for evaluation of the importance of tui as dispersers of native seeds and the implications of this for New Zealand conservation. Comparisons will be made with similar work undertaken by Debra Wotton on kereru for a PhD thesis.
[Please note, feeding trials and data analysis will take place in June/July - so results cannot be provided at this point. I am happy to send an updated abstract at a later point].

Soil seed-banks in a regenerated forest community

Presentation Type: Oral

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Anthropogenic disturbance can alter community processes. For plant communities recovering from such disturbance regeneration processes in particular may be disrupted. In such instances examining the soil seed-bank can give an indication of the regeneration potential and disturbance response of the 'derived' community. This study aimed to characterise the soil seed-bank of Ironbark communities in the threatened Victorian Box-Ironbark system; a regenerated dry-sclerophyll eucalypt forest that today covers 15% of its former extent, a consequence of an intense period of disturbance following European settlement.

A survey of soil seed-banks at 48 sites suggested they provide a minimal contribution to the regeneration of these forests. Seed densities were low and species composition represented a limited subset of the extant community. Traits over-represented in the seed-bank included ectozoochory and tussock-grasses, while those under-represented included anemochory, rhizomatous-herbs and -grasses, tussock-herbs and strong resprouters. Seeder density in the seed-bank was higher with less frequent fire and more time since fire. Richer seed-banks had the same plant functional types as poorer seed-banks i.e. greater richness was due to trait redundancy. Seed-bank response to fire-related cues was used to contribute to an exploration of the role of fire in these forests. Results suggested that the seed-bank flora is tolerant of fire but not reliant on fire for regeneration.

Creating Islands of green, not just another drain on our landscape.

Presentation Type: Poster

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During the late 1800's, the introduction of intensive irrigation without consideration of drainage and the consequential alteration and impediment of natural flow patterns across the Loddon Campaspe Irrigation Region changed adjacent ecosystems. Before land managers set any surface water management restoration goals, it has been necessary to examine the patterns of temporal change in salinity, water quality, vegetation and fauna in the proposed catchments during the last 100 years and establish the range of natural and anthropogenic impacts on ecosystems.
In the Koondrook-Benjeroop catchment historical agricultural practices and the associated impediments to natural flow have provided threatened species with a niche that would otherwise be non existent. Providing drainage to landholders in this catchment, to remove irrigation tailwater after rainfall events and to reduce groundwater ascensions and soil salinisation, has meant the incorporation of water servicing in drain design to ensure the longevity of, in particular, EPBC Act listed Growling Grass Frog (Litoria raniformis) but also threatened wetland habitats in this area.

Hatching asynchrony, nestling growth and sex ratios of a translocated population of red-crowned kakariki

Presentation Type: Oral

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Life history traits in Psittaciformes suggest that asynchronous hatching is less costly than in other avian groups. Furthermore, in some species females have the ability to bias primary sex ratios. These aspects have just started to be addressed in New Zealand parrots despite their theoretical and conservation relevance. I describe the pattern of hatching of red-crowned kakariki and present an analysis of fledgling growth in relation to natural levels of hatching asynchrony. I also present novel information on patterns of sex allocation for this species. Regardless of hatching rank, nestlings reached similar asymptotic mass, mass at fledging and tarsus length. Similarly, first, middle and last hatched nestlings showed similar rates of mass increase and wing growth. However, nestlings from highly asynchronous broods presented slower wing growth. Broods were equally productive despite levels of asynchrony. Primary sex ratio and sex ratio at fledging did not differ from parity; however there seemed to be a higher proportion of males in clutches laid earlier in the season. Further research is needed to determine if age of first reproduction differs between sexes in kakariki and to establish if parents obtain greater fitness returns by producing the sex that reproduces sooner, as in other species.

Drivers of soil microbial stability

Presentation Type: Poster

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Soil microbial stability (resistance and resilience) may affect many other ecosystem functions, including soil carbon storage, nutrient cycling and plant productivity. However, the drivers of soil microbial stability are little understood. This poster summarises three experiments aimed at determining the role of soil resources, plants and C substrates in driving soil microbial stability. The interaction between soil microbial stability and soil resources was measured during three primary plant chronosequences. Although soil resources were related to stability, the direction and strength of correlations depended on the response variable and chronosequence considered. A glasshouse experiment tested whether plant community characteristics contributed to this context-dependency. Plant species composition, but not diversity, proved to be a strong driver of soil microbial function and stability. As different plant species may alter soil microbial function and stability by depositing different carbon substrates, a further experiment manipulated the composition and diversity of carbon substrates added to a base soil. The composition, and sometimes the diversity, of added substrates affected the soil microbial community, its function and stability. Overall, it appears that the strongest drivers of soil

microbial function and stability in this set of experiments were the composition of plant and soil microbial communities, and soil resources.

Restoration of islands: Advances and constraints in eradication of invasive species

Presentation Type: Oral

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Many pest species have been eradicated from islands around the world, and successes and failures are summarised here. However, new challenges are emerging that increase risks of failure, and require more rigorous feasibility plans to convince funders to risk their money. A few high profile failures when it was clear (a posteriori)that inadequate risk analyese were conducted will make funders risk-averse, when a priori identification of risks would encourage them to accept risks - to the eventual benefit of island biodiversity. Solutions include combinations of new control methods (e.g. generic-specific toxins for say Rattus), new ways of applying them in space and time (e.g. when should mice be targetted on islands with irregular natural food resources such as Guadalupe Island, Mexico), and new ways of detecting and dealing with survivors or auditing contractors (e.g. stopping and payment rules for feral pigs on Santa Cruz Island, California). These issues are reviewed in light of the new pest species that are being contemplated for eradication (e.g.. cane toad on Viwa Island, Fiji), the increasing scale of planned attempts against species that have been eradicated elsewhere (e.g. ship rats on Lord Howe Island, Australia), changing needs for measuring detection probailities and application of search theory to provide objective estimates of the probability that animals survive (or immigrate) as the cost-benefit ratio of stopping to soon versus going too long changes (e.g., rodents and rabbits on Macquarie Island, Australia). Proponents of eradication are also increasingly being asked by funding agencies to consider social and non-target constraints, and the ecological consequences of eradications - all of which will be illustrated by current examples.

Habitat-contingent promotion of competitive dominance

Presentation Type: Oral

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Disturbance can affect ant assemblages through a variety of mechanisms, including change in the level of behavioural dominance. With the global functional group scheme for ants, disturbance is predicted to increase behavioural dominance under moderately stressful environmental conditions, primarily because it increases insolation. This has been shown for Dominant Dolichoderinae, especially Iridomyrmex in Australia. However the group Dominant Dolichoderinae does not occur in southern Africa, instead species of Pheidole, Monomorium and Anoplolepis are locally behaviourally dominant. It is not clear how disturbance affects behavioural dominance in this situation. This study therefore investigated the effect of disturbance (in the form of repeated fires) on levels of behavioural dominance in three different African savanna habitats. In addition, because the mechanisms involved the promotion of dominance have been suggested but rarely explicitly examined, this study explores the importance of temperature and micro-habitat complexity as potential

mechanisms for change in dominance level. Repeated burning increased the level of competitive dominance, although the extent of the response varied with habitat type. Thus importantly because dominant ants can reduce species richness through competitive exclusion, physical disturbances, such as fire, have the potential to indirectly alter community structure by mediating dominance levels and competition.

"Diverse Weights and Diverse Measures" Glitches in Ageing Juvenile Grey-headed Flying-foxes (Pteropus Polioephalus)

Presentation Type: Oral

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Grey-headed Flying-foxes, Pteropus poliocephalus are considered Vulnerable under both State and Federal legislation. However very little is known about the life history of this animal in the wild and central to determining the population dynamics of P. poliocephalus is the need to age wild animals accurately.
Traditionally, juvenile P. poliocephalus are aged by comparing their forearm measurements and weights, to scales based on the growth rates of known-aged captive animals. In this paper this method's reliability is assessed by investigating 10 years of data collected by the Wildlife Animal Rescue and Care Society, a rehabilitation organisation in NSW. This data consist of weekly weights and forearm measurements for both orphan flying-foxes that had been hand-reared and mother-reared animals that had been born to captive flying-foxes over periods in which the diet varied for both adults and hand-reared juveniles.
Forearm size is a more reliable indicator of age than weight. However the growth of the forearm is not uniform from animal to animal as both inheritance and diet cause variations in the rate of growth. Neither forearm length nor weight gives an accurate assessment of the age of a juvenile P. poliocephalus and other methods of ageing should be investigated.

Disentangling competition, herbivory, and seasonal effects on young plants in newly restored communities

Presentation Type: Oral

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Optimising techniques of impact and consequence assessment are critical when faced with the challenges of reclamation within a damaged or altered ecosystem. We assessed concurrent environmental pressures by means of repeated measurements using three common indices of plant performance (biomass, shoot extension, survival) in conjunction with monitoring for t

and timing of plants eaten. Twenty-four species, representing a range of taxonomic groups and growth forms, were planted at low and high densities, inside and outside large-scale mammal exclosures. We demonstrate that biomass and height measurements are correlated (at both the individual and combined species levels), while the survival index often showed independent information. Using the most conservative measure (survival), we delineate between plant deaths attributed to seasonal effects, competition (some facilitation was apparent) and herbivory (both compensation and loss of fitness was demonstrated). Plant spacing effects depended on the index (response variable) and whether we measured individual or combined species. The survival index rarely showed competition effects. The comparison of the relative order and magnitude of plants being eaten against impact identified vulnerable and compensating species. Once identified, compensating species may be used sacrificially to buffer damage in new reclamation systems, while deterrents may be used around known vulnerable species.

Ecological interactions between sleepy lizards and Salmonella

Presentation Type: Oral

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Exotic and endemic pathogens are an emerging threat for conservation management. To manage this threat we need more information about the dynamics of the interactions between microbial organisms and wildlife populations. Salmonella enterica is an enteric bacterial species which infects Australian reptiles. Here we report the results of a study to elucidate the transmission dynamics of S. enterica in a population of sleepy lizards (Tiliqua rugosa), from Mt. Mary, South Australia.

At the beginning of the lizard activity season, 52 lizards were captured and treated with streptomycin until all their enteric microflora had been eliminated. They were fitted with radio tracking devices, released, and cloacal samples taken at weekly intervals. This study revealed that the probability of detecting S. enterica in a female increased at a significantly greater rate than in males, with prevalence changing in females from 9 to 85 % and in males from 18 to 60 % over the lizard's activity period. We hypothesise that transmission is via ingestion of contaminated food and that these differences are a consequence that female lizards feed more than males during spring.

The effect of suburbanisation on a small insectivorous Australian bird; the superb fairy-wren (Malurus cyaneus)

Presentation Type: Oral

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Whilst small insectivorous birds are thought to be in decline in urbanised areas, superb fairy-wrens appear to respond differently. They show a positive response to fragmentation around remnant edges and are also found in suburban gardens, though their distribution is very patchy. Four concepts were examined here: (1) territory size, (2) foraging duration and behaviour, (3) food availability and (4) habitat requirements to determine how life in suburbia affects superb fairy-wrens.
Suburban territories were smaller and used more effectively than non-suburban territories (rural/remnant edges). Within the suburbs, wrens foraged for longer but their behaviour was otherwise unchanged. Short grass was the preferred foraging substrate and while invertebrate numbers were similar in both habitats, individual were often smaller, resulting in birds foraging more intensively to obtain equivalent biomass. However, food availability was not limiting bird distribution, with other suburban sites lacking wrens showing similar invertebrate availability. Superb fairy-wrens instead appear restricted by habitat suitability. While floristic origins of the vegetation was unimportant, structural diversity, particularly the development of a shrub layer, was vital to superb fairy-wren presence.
Therefore, where the required habitat is available in suburban gardens, suburban wrens appear able to live as successfully, if not more so, than those found in remnant edges.

Pre-emptive removals reveal the above- and belowground impacts of plants in primary succession

Presentation Type: Poster

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Although plant species are widely known to have contrasting impacts on community composition, soil properties and ecosystem processes, differences in these impacts between native and non-native species has only recently been recognised. Here, we compare the impacts of native and non-native plants on above- and belowground community development and ecosystem properties in a floodplain primary succession using a novel preemptive removal experiment. We applied nine removal treatments to experimental plots for 4 yr following a catastrophic flood to preempt the establishment of either dominant shrub species (the non-native invader Buddleja davidii, and the native N-fixer Coriaria arborea) and all other non-native plant species, and included full removals and no removal control treatments. Surprisingly, total N and soil N mineralisation rate

were low in plots with Coriaria, suggesting that this dominant N-fixing shrub did not necessarily stimulate N availability early in primary succession. Both non-native plants and Coriaria stimulated basal respiration (BR) and basal to substrate induced respiration (BR:SIR) of the soil microbial biomass (SMB), suggesting that these plants enhanced soil microbial biomass but also somehow suppressed the glucose-responsive portion of the SMB. In contrast, Buddleja was associated with lower BR and BR:SIR, which suggests a smaller but more responsive SMB. Soil microbial diversity, measured as the diversity of PFLA substrates, was similar among intact plots or in plots with Buddleja or Coriaria removed alone, but declined about two-fold in other removal treatments. Removing non-native species had much greater negative impacts on plant and nematode diversity than removing either Buddleja, Coriaria or both of these dominant shrubs. In summary, our results illustrate that non-native plant species can have contrasting impacts on both above- and belowground processes and diversity, but that these impacts can be either positive and negative depending on which property is being considered.

Take me to the water: Individual-based spatial modelling of fish population dynamics in intermittent streams in SE Australia

Presentation Type: Oral

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Nick Bond

Many lowland streams in southern Australia are intermittent with flow ceasing over the summer, and a subsequent contraction to small and isolated pools. The presence of large sediment slugs in many of these streams, coupled with possible climate change and changing demand for water for agriculture, makes changes in the hydrological regime of these streams likely. In turn, such changes to the hydrologic regime are likely to determine the long-term persistence of populations of aquatic organisms, such as native fish, in these streams. To explore the dynamics of these stream ecosystems we have developed a spatially explicit individual-based model of fish populations, which incorporates in a simple way the seasonal hydrology (cessation and resumption of flow). Although we have used Carp Gudgeon (Hypsoletris spp) as an initial target species, the model framework is extendable to other species within the system such as Southern Pygmy Perch (Nanoperca australis) and Mountain Galaxias (Galaxias olidus). We believe that this is the first such model to be developed for these systems, or indeed for any (small) native fresh-water fish in Australia. Here we present the rationale and design for the model and some initial findings based on its use.

How from where? Pattern and process in high-diversity shrubland communities in South-western Australia

Presentation Type: Oral

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Although spatial processes are believed to play a crucial role in the maintenance of local biodiversity, explicitly linking these processes to ecological patterns is difficult. Based on exhaustive mapping of four fire-prone, high-diversity Mediterranean-type shrubland communities near Eneabba, Western Australia we attempted to unravel the links between pattern and process. We found that at all four sites the majority of species showed an aggregated distribution, with the extent of aggregation across the sites possibly related to soil nutrient levels. The life-history traits of woodiness and regenerative response to fire are reasonable predictors of a species spatial pattern within sites, but other traits, including dispersal mode, are not. Instead, the physical environment, in this case the likely availability of water and soil nutrients, seems more important in explaining differences between the patterns of distribution observed in the four communities. While theoretical models have demonstrated the pervasive influence of spatial processes on community dynamics, it is difficult to demonstrate these effects empirically. Although in the high-diversity communities we consider the majority of species are not randomly distributed, attributing the observed patterns to specific processes is difficult.

Surfs up: Cascading effect of wave energy on herbivory

Presentation Type: Oral

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Defences against herbivory include both structural and chemical deterrents that are influenced by abiotic and biotic factors. Wave energy mediates the morphology of algae with algae from wave exposed habitats varying their shape and size to minimize hydrodynamic stresses caused by water motion. Wave energy can also influence the chemical composition of an alga through increased mass transfer as a result of increased wave energy. Yet, there have been no studies that have examined how these structural or chemical changes from wave energy influence herbivory.

We examined the effect of wave energy on herbivory with the kelp, Ecklonia radiata, and the generalist herbivore snail Turbo torquatus. We found that wave energy not only influenced kelp morphology and

chemistry but snail choice as well. Kelp from exposed habitats was smaller and narrower than those from protected habitats but there was no difference in tissue strength between habitats. Chemically, E. radiata from exposed habitats tended to have greater concentrations of protein and phlorotannins than kelp from protected habitats. Choice and no choice feeding trials showed that snails from protected habitats consume algae based on its chemical constituents while snails from exposed habitats consume algae based on morphological characteristics.

Internal fragmentation in the rainforest: Edge effects of highways, powerlines and watercourses on tropical rainforest understorey microclimate and vegetation

Presentation Type: Oral

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Linear clearings for human infrastructure, including roads and powerlines, are widespread within the rainforests of the world and the Wet Tropics World Heritage Area of north-eastern Queensland in particular. Edge effects of these linear clearings have the potential to substantially increase the disturbed area within existing tracts of rainforest, potentially affecting a wide range of rainforest biota. We investigated the effect of linear infrastructure on understorey microclimate, vegetation structure and composition, seedling disturbance and seedling regeneration of the adjacent rainforest in the Wet Tropics World Heritage Area of north-eastern Queensland. Microclimatic gradients were detected near the rainforest edge and were correlated with gradients in the structure and composition of forest flora. Edge patterns were also detected in patterns of seedling disturbance and regeneration. We will discuss the potential effects of these edge gradients on the future regeneration of rainforest adjacent to linear canopy openings.

Some aspects of kereru ecology in urban-rural landscapes

Presentation Type: Oral

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Kereru and tui are iconic species for the New Zealand public because of their large size, distintive form and colouration, confiding habits, and occurring in private gardens and parks of some cities. The public are keen to maintain both species in rural and urban areas as has been evident by councils, landcare groups, and individuals planting food species specifically to attract kereru and tui, providing sugar-water for tui, and carrying out weed and pest control in native forest patches. The Department of Conservation recognises that it can not carry out conservation efforts for all native species everywhere, and that it needs to empower others to carry out such activities beyond the conservation estate. By using kereru and tui as flagship species for conservation efforts by councils and the public in rural and urban landscapes there are likely to be benefits for a wide range of species, both plant and animal. To this end the

Department funded a 4-year study into various aspects of the ecology of kereru and tui in urban and rural landscapes about New Plymouth and Invercargill, of which information relating to kereru will be presented. The main findings include that both species can be highly mobile, are habitat and food generalists, and that their nesting success is reduced by introduced predatory mammals (rats, possums, stoats, cats), and possibly, in the long-term, by weed invasion of native forest patches, their nesting hotspots.

Kaitiakitanga and conservation biocontrol: Towards a collaborative approach to enhance ecosystem services in agro-ecosystems in New Zealand

Presentation Type: Oral

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Modern agricultural practices have reduced ecosystem services (ES) by substituting monoculture for ecological diversity, leading to a reliance on input substitution, usually oil-based, rather than on the regulatory processes provided by more diverse ecosystems.

This dramatic modification of the land has degraded the Mauri ('life-force'), which is of concern to Maori people. With the loss of native species goes the intimate knowledge associated with their use. Therefore, ecosystem restoration goes hand in hand with the restoration of the knowledge associated with native species. Conservation biocontrol offers agriculturalists opportunities to incorporate native plants into conventional systems to enhance the provision of ES for the management of pests and diseases.

As well as providing ES useful to agriculture, native species used in this way may have cropping potential if Maori knowledge is used. Finding new and re-constituting traditional uses for native species restores the Mauri, fundamental to Kaitiakitanga (environmental ethic).

Global markets are increasingly more aware of the sometimes negative environmental effects of food production. The positioning of New Zealand producers in global markets as leaders in environmental and cultural standards is becoming increasingly important.

This is illustrated by the use of endemic plants in vineyards for the 'Greening Waipara' project.

Sentencing for threatened species offences

Presentation Type: Oral

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Legislation commonly protects threatened species, populations and ecological communities.

When an offence against the legislation is committed, courts must determine the appropriate sentence. This involves understanding the purposes of sentencing that are appropriate for the environmental offence and assessing the objective seriousness of the offence and the subjective circumstances of the offender.

The objectives of the statutory scheme, principles of ecologically sustainable development and the environmental harm caused or risked, will also be relevant. Case studies of sentences for threatened species offences will be discussed.

Dynamics of the shrub-herb balance in species-rich woodlands: Cause and consequences of encroachment by Leptospermum scoparium

Presentation Type: Oral

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In recent decades, there have been numerous examples of increases in woody plant cover in herbaceous ecosystems, with consequences for biodiversity and ecosystem function. Leptospermum scoparium has increased in abundance in woodlands and grasslands, over recent decades in Australia and New Zealand. In Australia, encroachment has occurred in communities that are some of the most species-rich at small-spatial scales, with up to 45 species found in 1 m2. We used aerial photography and dendrochronological methods to assess vegetation changes that have occurred in open woodlands in the Grampians National Park in the last 50 years. Analysis of aerial photographs indicated that 333 ha of a 370 ha study site (90%) had greater than 50% cover of L. scoparium in 1997, an increase of 171 ha since 1948. Rapid expansion appears to have occurred following the removal of sheep grazing in this region. As well as land-use changes, encroachment is influenced by variability in plant reproductive fitness associated with differences in soil moisture. Increased cover of L. scoparium in herb-rich woodlands was associated with reductions in species richness and shifts in community composition. Changes in the dominant growth-form in these communities influenced the micro-environment below the shrub canopy resulting in the exclusion of most of the open woodland flora. With ongoing recruitment of L. scoparium, plant diversity in these species-rich woodlands should continue to decline.

Defining and quantifying structural gradients in Australian landscapes

Presentation Type: Oral

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The dominant paradigm in landscape ecology is the discrete patch model of landscape structure, where landscapes are considered to be mosaics of suitable habitat within non-suitable matrix. Human-modified landscapes form the basis of this model where landscape structure ranges from intact, through fragmented, to relictual. However, the suitability of this model for many Australian landscapes is being challenged. In landscapes where human disturbances are spatially variable and/or less intensive, habitat variability is often continuous rather than categorical. Many landscapes exhibit a pattern of both clearly defined boundaries and superimposed continuous gradients in vegetation structure. A lack of reliable measures for testing and defining gradients in habitat structure means that we are currently unable to conceptualise and quantify continuous gradients in landscape structure, especially in Australia's tropical savannas and arid zone landscapes. This has led to the inability of studies to test the importance of the landscape context for fauna conservation in these regions. This paper presents a conceptual model and alternative measures for quantifying gradients in landscape structure. We build on existing landscape analysis tools and present alternative measures for quantifying the weighted area and spatial patterns of habitats of varying quality in landscapes with a continuous structure.

Ephemeral ecosystems: Categorisation and conservation

Presentation Type: Oral

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Ecosystem-level management is often successful, but one ecosystem type only infrequently considered is the ephemeral system, although such systems are difficult to study, and have special management and conservation needs. We define ephemeral systems. In contrast to vernal systems which are seasonal, ephemeral systems rely on resources (water, light, nutrients or substrate) which are pulsed in supply or only become available for transitory periods. We propose a categorisation distinguishing between systems which are ephemeral in time, and those which are

ephemeral in both time and space. We illustrate our categorisation with examples from the literature before discussing the management and conservation needs of ephemeral systems.

Demography and ecology of flood damaged tawa (Beilschmiedia tawa) in Turakina Valley, Rangitikei, New Zealand

Presentation Type: Poster

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In February 2004, extremely high floods affected the lower North Island, including the Turakina Valley, between Wanganui and Bulls. Macpherson's Bush is a 10 hectare reserve of tawa-titoki-podocarp forest in the Turakina Valley. In February 2004 Macpherson's bush was flooded by up to 9 m of water, and many lower elevation tawa died.
Two pairs of live and dead stands were chosen as the study site, and all tawa trees were cored and DBH recorded. Percentage vegetation cover was recorded, as were 1m x 1m seedling plots. Topographic height was recorded through relevant bush sites.
Preliminary results show extensive dieback of tawa in low-lying sites, followed by rapid collapse of dead trunks. Some survival occurred on better-drained edges. Demographics indicate such flood damage has occurred before. However, vegetation in the damaged areas is now dominated by aggressive weeds, and future regeneration from the plentiful tree seedlings is problematic.

Implementing the Vision: Success in wetland protection across the Manawatu-Wanganui Region

Presentation Type: Poster

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In considering the state of Horizons environment, it was evident that the Region's remaining wetland habitat (a mere 2% of former cover) was under sustained threat of further losses to species, habitat and function. The first inventory and ecological ranking of the Region's wetland habitat was completed in 2005 and provided direction to halt this continued decline of wetland habitat.

The development of new council policy has seen the protection and management of wetland habitat become fully entrenched in Horizons core work, both through regulatory and non-regulatory methods.

One such non-regulatory method, the wetland programme is a community supported initiative that aims to bring 100+ of the Region's top ranked wetlands under sustained management by 2016. Currently in Year Zero, the project has been immensely successful.

This success has relied largely on an innovative approach to funding, and employing a variety of mechanisms to deliver the programme. Horizons' intervention and support extends past fencing, and can include pest

control, planting, hydrological manipulation, project management and in some cases providing an alternative stock water supply.

Greening the City: Creating an ecological network to enhance Auckland's native biodiversity

Presentation Type: Poster

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The Auckland Region has been heavily impacted by urbanisation, leading to severe habitat fragmentation and ongoing native biodiversity loss. Only 30% of the Region remains in native vegetation, mostly in the Gulf Islands, and Waitakere and Hunua Ranges with many small fragments in between. These fragments are isolated from each other and from large remnants, limiting their ability to sustain biodiversity.

The objective of this research is to produce a strategic level assessment of a portion of the region to identify remaining natural resources, and how they could be integrated into an ecological network to create links between large fragments and increase the urban area's sustainability. While individual small fragments generally cannot support viable populations, together they can create regional "meta-populations" of species, supported by large remnant "source" populations.

GIS and vegetation data of the region will be analysed to determine where existing habitat and linkages can be enhanced and expanded. Focal native species will be chosen (initially birds) to allow specific restoration goals to be set, potentially widening over time to include other native species. The project will provide useful support for local authorities and conservation groups as a way to integrate their efforts into a wider framework.

Explaining the boundaries between "marsupial lawns" and woody vegetation in lowland and alpine Tasmania.

Presentation Type: Oral

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Grazing animals both influence the nature of vegetation and respond to it. Native grazers have been shown to be a critical element in the creation and maintenance of grasslands. In Tasmania, high density of marsupials are believed to be a factor in creating and maintaining short 'lawn-like' vegetation which occurs sporadically on fertile sites from sea level to the alpine zone. These species-rich herbfields are locally known as 'marsupial lawns'. While the effect of grazing on native grasslands and grassy woodlands have been studied in pastoral landscapes in Tasmania, little is known about the effects of native grazers on native vegetation in less modified landscapes. We investigated two contrasting 'marsupial lawn' sites (sea level and alpine) and compared these to the surrounding woody vegetation. Our focus was the boundary between the lawns and other vegetation types and the factors that maintain that boundary. While the

response of vegetation in exclosures and scat data were consistent with grazing as a factor in the genesis of the lawns, the explanation may be more complex than grazing alone. Inundation and cold air drainage may be locally important in excluding woody vegetation from the lawns.

The good, the bad, and the ugly: Disharmony in plant-pollinator relationships

Presentation Type: Oral

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Plant-pollinator systems are expected to show two features when at evolutionary equilibrium - a "fit" between floral features and the effective pollinators, and seed production limited equally by pollen supply and by resources. Departures from these expectations imply a system out of equilibrium. We present data from a South African fire-lily (Cyrtanthus contractus) where neither expectation is met. First, the floral syndrome strongly suggests bird pollination, but in the veld around Pietermaritzburg (Kwazulu-Natal), the only large resident amethyst sunbird has a bill that is too short to reach the nectar and instead robs nectar from the base of the flower. Instead, the effective pollinators appear to be pollen-collecting honeybees. Second, seed set is generally strongly pollen limited (less than 5% that of hand-pollinated flowers). Sites that lack honeybees show reduced pollination success, and in sites where bees are present, pollination regularly occurs within cages that exclude birds. We suggest that this disequilibrium in the pollination system is the result either of the contraction in the range of another sunbird with a longer bill - the malachite sunbird which is now found at higher altitudes, or to the expansion of the plants range beyond that of the malachites facilitated by honeybees.

What's the story kakerori? - conserving a Cook Islands endemic flycatcher

Presentation Type: Oral

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The kakerori (Pomarea dimidiata) is a small (22g) insectivorous passerine endemic to the Cook Islands. In 1989, it was one of the 10 rarest birds in the world with a declining population of 29 individuals. They were confined to three steep forested valleys in the southern part of Rarotonga. Since 1989, rats and cats have been poisoned within the 155 ha Takitumu Conservation Area. The bird's breeding success and survival has increased markedly. Despite naturally low annual productivity of 1-2 clutches of 1-2 eggs, the population grew rapidly reaching 255 birds by August 2001. Since then the emphasis of management has shifted from "recovery" to "sustaining" the population at 250-300 individuals on Rarotonga and establishing an insurance population on Aitu. This talk will highlight the effects on the birds of five tropical cyclones battering the Cook Islands during February-March 2005 and share data derived from the just completed 2006 season of fieldwork.

A Wallaby and Kangaroo Massacre

Presentation Type: Oral

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The fatality of fauna crossing roads dissecting remnant urban or rural landscapes has occasionally been studied in eastern Australia. This study contributes to this body of knowledge in regard to road kill macropods in the rural Central Western Slopes of NSW. Weekly counts of road kill macropods were recorded on the same section of road (approximately 90km length) over a ten-month period from winter 2005 to autumn 2006. Over a 100 dead individuals from four species (Eastern Grey Kangaroo, Macropus giganteus; Common Wallaroo, Macropus robustus; Red-necked Wallaby, Macropus rufogriseus; Swamp Wallaby, Wallabia bicolor) were documented. Each road kill, when possible, was sexed and its hind-foot length measured. On both sides of the road at each kill location the habitat was classed as one of four broad habitat combinations describing the vegetative landcover of the road verge and adjacent 'paddock'. The landform position (e.g. hillslope) and the central road markings (e.g. double lines) were also noted. An analysis comparing the habitat at the road kill location to the proportion of that habitat available will be presented and some general recommendations provided.

Evolution and ecology of New Zealand's calcicolous plants

Presentation Type: Poster

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New Zealand has approximately 100 vascular plant taxa confined to calcareous landforms of limestone, marble, and dolomite. Because calcareous cliffs, karrenfield, and talus are spatially restricted, most taxa are classed as narrow-range endemics. Most are herbs, grasses, and low shrubs adapted to these environmentally-stressed, erosion-resistant, and soil-deprived substrates. Explanations for the evolutionary specialisation and endemism of plants to calcareous outcrops include 1) reduced competition from taller plants on bare rock landforms, 2) tolerance of soils of extreme chemistry using various selective nutrient uptake mechanisms and, 3) isolation preventing gene interchange between adjacent outcrops (insularity). Because of its inherently high fertility and summer dryness, the calcareous rock ecosystem is mostly degraded and recognised as threatened in eastern South Island and throughout the North Island by fire-clearance of fringing woody vegetation, by agricultural conversion of surrounding land, and by pest herbivory.

To understand the ecological evolution of all these taxa, we are addressing two questions:
*Are plant-environment correlations consistent and predictable across bedrock or formation types and at different scales of observation (sampling)?
*Do their endemic distributions conform to a geological classification of calcareous bedrock based on formation age, spatial geography, and petrology (see map)?

We are also examining threat syndromes at species' biology and ecosystem process levels as input to recovery planning for calcareous habitats throughout New Zealand.

Concepts for improving success in ecological restoration

Presentation Type: Oral

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The Botanic Gardens and Parks Authority (BGPA) is committed to restoring and enhancing biodiversity of the bushlands under its care and of Western Australia's biodiverse ecosystems. This commitment is achieved through a multidisciplinary research and adaptive management approach. The first key feature of the approach represents outcomes of a multi-disciplinary team e.g. post-mine restoration may involve genetic, weed ecology, seed dormancy, cryo-storage and plant propagation research. The second key feature of the approach involves intimate links between BGPA researchers and operations staff; as well as industry and community groups, enabling timely application of practical research outcomes to conservation and restoration programs.

To highlight an example, BGPA's restoration research team is guiding management to enable 'best-practice' restoration of a significant bushland within metropolitan Perth: the Bold Park bushland. The BGPA is committed to restoring 60ha of this degraded bushland. To facilitate restoration success, several areas of intensive research are highlighted as being pivotal. As such, the restoration research program involves integration of a gamut of science disciplines that have great bearing on ecological restoration, together with strong links between science, managerial, and operational staff, with the expected outcome being restoration of Bold Park bushland to a more diverse and healthy ecosystem.

Climate, fire and treeline dynamics in the Australian Alps

Presentation Type: Oral

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Current interest focuses on the effects of global warming on alpine treeline dynamics. If it is assumed that tree species at the tree-line are at some sort of climatic limit, then it is probable that this ecotone may respond to a shift in climatic conditions. However, treeline position is a function of complex interactions between climate, disturbance, vegetation, substrate, topography, and time, and migration rates are inherently difficult to predict in the short-term.

This study will focus on the roles of climate and fire in shaping the Australian alpine treeline.
This research examines stand structure, growth form and age over the alpine treeline ecotone (dominated by 'Eucalyptus pauciflora') in the Victorian Alps in relation to a recent history of climatic variability and disturbance. The results from a short term study into the response of the treeline to the 2003 fires will also be assessed. Findings indicate that current treeline populations in Victoria are relatively stable. Mortality rates and recruitment following fire were low, though seedling emergence

increased in the following years. Whilst fire has created the opportunity for seedlings to establish beyond the treeline boundary at some sites, there is no significant expansion in range.

Invasion ecology of rats on New Zealand islands

Presentation Type: Oral

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New Zealand remains the world-leader in rodent eradication methods for conservation. Nevertheless, rats have reinvaded numerous rat-free islands despite efforts to intercept them on arrival. The reasons for difficulties with early interception are not known. This puts all eradications at risk, including large conservation projects such as Campbell Island (11,300ha $2.6million for eradication). Our research investigates the ecology and genetics of rat invasion of islands by monitoring recent reinvasions of small islands in New Zealand, and releasing single adult male Norway rats with radio-collars onto small rat-free islands. Upon first arrival, invading Norway rats roam widely before settling into a more stable home-range, in accord with psychological theory. Behaviour varies greatly between individuals, as does the ease of detecting and eliminating each invading rat. Rats may disperse from an island despite being the only rat present. Following invasion, rat numbers can increase rapidly. On small islands that have been recently invaded it is possible to estimate census and effective population sizes using catch-effort and indirect genetic methods. Invasions result in clear genetic bottlenecks, though invading rats are well adapted both ecologically and genetically to recovering from such bottlenecks.

The use of native floral resources to enhance conservation biocontrol.

Presentation Type: Poster

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Waipara Valley in North Canterbury is the fastest wine-growing region in New Zealand. The 'greening Waipara' project is a research-driven programme, the aim of which is to increase biological diversity in and around the vineyards by restoring some of the vegetation which is native to the Waipara region but which has become rare or has disappeared. This project is supported by FRST and is carried out in collaboration between Lincoln University, Landcare Research, Waipara Valley Winegrowers

Association and of course the wine-growers themselves.
A key part of this research is looking at the sugar ratios in plant nectar and how these can be used to enhance the efficacy of beneficial insects - those that aid in the control of insect pests. The poster will summarise the research work conducted so far on sugar ratios and how this can be applied in conservation biocontrol in the agricultural/horticultural environment using the 'greening waipara' project as an example.

Mast seeding and the role of diapause in a cecidomyiid pre-dispersal seed predator of native grasses (Chionochloa spp.)

Presentation Type: Oral

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Chionochloa (Poaceae), a genus of perennial tussock grasses native to New Zealand exhibits mast seeding, i.e, great interannual variation in seeding that is synchronized among individuals within populations. The evolutionary origin of mast seeding is largely explained by the predator satiation hypothesis, which suggests that specialized seed predators will be satiated during occasional mast years and kept in small populations during non mast years. One of the three known seed predators to the different species of Chionochloa is an undescribed cecidomyiid fly. This insect is probably using diapause to skip non-mast years and therefore avoid starvation. In order to know if plant manipulations can induce flowering and affect diapause, we treated 120 different plants from two species in the summer season of 2004-05. The different treatments included a control group, gibberellins, root pruning, heating, a combination of heating and gibberellins and a combination of root pruning and gibberellins. Emerging insects were collected from each of the treated plants and diapausing insects were counted after emergence stopped. Diapause rate increased with elevation and heating, while gibberellins reduced the amount of insects entering diapause. We therefore concluded that there is probably a predictive diapause in the undescribed cecidomyiid.

Is it time to close the borders?

Presentation Type: Oral

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New Zealand must achieve a balance between open access to obtain genetic material from overseas for the benefit of New Zealand business and the protection of the indigenous plant resources of one of the world's centres of plant diversity. The number of exotic plant species in New Zealand numbers more than 35,000. The number of naturalised vascular plants in New Zealand now exceeds the number of indigenous plants.

There are growing pressures for New Zealand biosecurity measures to be relaxed in the interests of realising New Zealand's true economic potential. One of HortResearch's science leaders, Dr Ross Ferguson, recently described existing rules for importing new plants as extraordinarily expensive and too strict. He suggested that if we stop importing plants we effectively lose our competitive edge.

This paper will describe biosecurity issues as they relate to protecting New Zealand's indigenous plant life. Issues include knowing what exotic plant taxa are here already, knowing what new plants are arriving and how, evaluating the adequacy of the impact assessment process and finally, assessing the impacts of exported New Zealand indigenous plants on the biota of the importing country.

Will new feed types or biofuels be needed in the future, will they be allowed in and what ecological impacts of these new species on New Zealand's indigenous biota will be acceptable? Is it time to close the borders entirely?

Didymosphenia geminata and New Zealand lotic food webs

Presentation Type: Oral

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The exotic alga, Didymosphenia geminata (didymo), was first reported in New Zealand in 2004. Since then it has colonised a number of rivers in the South Island, at times dominating the periphyton community. As it is highly unlikely that didymo will be successfully eradicated from New Zealand rivers, we examined the potential for it to contribute to lotic food-webs via macro-invertebrate grazing. Three common taxa were found to ingest didymo cells and stalk material when didymo-naive individuals were presented with living mats of didymo. An analysis of invertebrate community structure at paired sites (with and without didymo) indicated that the abundances of taxa that fed on didymo (plus some other taxa) were positively correlated with the presence of didymo. However, the presence of didymo was not related to a consistent shift in taxonomic structure in the rivers studied. On the other hand, data suggest that its presence may correlate more strongly with shifts in macro-invertebrate functional feeding groups. These preliminary findings indicate that didymo can play an important role in lotic food webs and that

invertebrate grazers may potentially limit didymo growth in New Zealand rivers under certain conditions.

Area and isolation affect on parasitoid diversity in urban native forest fragments of different size and degree of isolation.

Presentation Type: Oral

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The theory of island biogeography states that larger and less isolated areas have higher species abundance, richness and diversity than smaller and more isolated areas. Insect communities at higher trophic levels such as parasitoid wasps are thought to be affected by area and isolation to a greater extent then their hosts or the host's plants. The current study investigates whether wasp parasitoid diversity is affected by fragment area, isolation, surrounding residential area (%) and number of plant species per fragment. Our study includes 100 morpho types from the families Ichneumonidae, Pompilidae and Proctotrupidae, collected from nine native forest fragments in the Wellington and Hutt Valley region (New Zealand) during the summers 2002/2003 and 2003/2004. A permutation MANCOVA showed significant relationships for the first year only. All species' abundance had a significant relationship with isolation ($R2 = 0.062$, $p = 0.0134$) and the number of plant species ($R2 = 0.057$, $p = 0.0154$) and ichneumonid abundance had a significant relationship with isolation ($R2 = 0.068$, $p = 0.0028$). Overall parasitoid species richness and diversity were not dependent on fragment area, isolation, percent residential area and number of plant species.

Introduced aquatic weeds reduce the diversity of wetland plant and moth communities

Presentation Type: Oral

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Invasive plants have the potential to reduce the biotic diversity of plant and animal communities. We examined the negative effect of two invasive wetland plants, purple loosestrife (Lythrum salicaria) and reed canary grass (Phalaris arundinacea), on the species richness and diversity of plant and moth communities within 24 wetland study sites in the Pacific Northwest, USA. We hypothesized that as the cover of the invasive species increased, the diversity of the local plant and moth community would decrease. Increasing cover of purple loosestrife and reed canary grass was associated with reduction in the diversity of wetland plant communities irrespective of the diversity measure examined. Moth species richness was positively correlated with plant species richness. Wetland hydrology, soil characteristics, and topography were measured to control for potentially covarying and confounding influences on plant diversity. Temperature, ambient light, and surrounding land-use were measured to control for potentially covarying and confounding influences on moth sampling and

diversity. None of these variables was significantly associated with invasive species abundance. This strengthens the conclusion that the invasive species were the cause of the decline in biotic diversity. These results indicate that invasive plants have the ability to reduce biotic diversity across multiple trophic levels. In addition, management plans may need to consider simultaneous control of multiple plants if diversity is to be maintained in some ecosystems. Therefore, it is imperative that we understand the underlying causes of plant invasion and community dominance if we are to successfully manage plant communities.

What is the potential of the persistent soil seed bank in the recovery of native Australian grassland?

Presentation Type: Poster

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This study investigates the potential role of the persistent soil seed bank in the recovery of native grassland after cultivation. Sampling was carried out in late September, 2005, in four sites in the Northern Plains, Victoria. Sampling at this time allows assessment of the persistent part of the seed bank, as it is at the end of the growing season but before dispersal of the annual seed rain. The species composition and seed density of the seed bank was investigated along chronosequences of time since cultivation. The seed bank was dominated by exotic grass and rush species. All of the native species that were common in the vegetation of the uncultivated sites were absent or rare in the seed banks of all sites, suggesting that these semi-arid grasslands cannot rely on the persistent soil seed bank for recovery. This also suggests that the annual seed rain from the on-site vegetation is an important source of propagules for the persistence of native forbs. Although oldfield succession has been widely researched in the Northern Hemisphere, there have been few studies in Australia, and the results of this study may help to inform the future management of these grasslands.

How New Zealand deals with the recovery of threatened species

Presentation Type: Poster

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Awareness of the threatened state of New Zealand's biodiversity is relatively recent. The first lists of species threatened with extinction were produced in the early 1980's with less than 100 species recorded. The current lists produced by the New Zealand Department of Conservation

record 2,373 species from 14 taxonomic groups. A challenge to managing threatened species has been a lack of biological data; a challenge that is not unique to New Zealand. An analysis has been made of the 56 published Department of Conservation threatened species recovery plans. The analysis shows that the lack of biological data has been a significant hindrance to the effective recovery of threatened species, especially those that are classified as critically endangered. A comparison of New Zealand's single species approach to recovery will be compared to Australia's ecosystem and landscape approaches to recovery of threatened species.

Pattern and process in grazed semiarid rangelands

Presentation Type: Oral

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In semiarid rangelands grazing by cattle can occur on a different spatial scale from that at which important ecological processes operate, such as fine scale interactions between plant tussocks and water/nutrient capture. This disjunct can have far-reaching consequences for vegetation pattern, and water and nutrient cycling. We examined how the spatial patterns of vegetation and important ecological processes varied with grazing intensity around cattle watering points in Australian rangelands. We quantified the spatial patterns of plant functional groups, basal area and biomass along a piosphere gradient and examined the correlation between these vegetation patterns and indicators of ecological processes such as soil moisture and respiration, soil organic matter, mineralisable nitrogen and available phosphorous. Correlation between vegetation patterns and soil properties was high in areas of low cattle grazing intensity. However, spatial patterns of vegetation had been considerably altered in areas subjected to intensive cattle grazing in which we found poor correlation between vegetation patterns and indicators of ecological processes. This disruption to ecological processes has profound consequences for the maintenance of ecosystem function in semiarid rangelands where positive feedbacks between vegetation pattern and resource capture are crucial to the stability of the system.

Not seen or not there? Accounting for incomplete detectibility in estimating patch occupancy of endangered New Zealand skinks

Presentation Type: Oral

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Current models of metapopulation dynamics applied in conservation biology consider the presence or absence of local populations in habitat patches to derive estimates of extinction and colonization rates. Parameterization of metapopulation models assumes there is complete detectibility of the target species. Failure to consider incomplete detectibility may result in underestimates of occupancy and biased estimates of extinction and colonization rates. The endangered New Zealand endemic grand (Oligosoma grande) and Otago (Oligosoma otagense) skinks persist as metapopulations occupying patches of suitable habitat (rock tors) within a matrix of mixed native vegetation and modified agricultural pasture. We apply recently developed techniques that use data from multiple surveys of sampling sites (patches) to model detectibility and to derive robust estimates of occupancy and rates of local extinction and colonization. This is part of a larger study that seeks to derive patch-specific rates of colonization and extinction, and is using GPS tracking technology to investigate the role of predators such as feral cats in limiting skink dispersal between patches. We highlight the marked differences between naÃ¯ve estimates of skink occupancy and model-averaged estimates to stress the importance of deriving robust estimates of metapopulation parameters that take incomplete detectability into account.

Tracking feral and domestic cats using GPS collars: An assessment of accuracy, efficiency, costs, potential bias, and possible analyses.

Presentation Type: Oral

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Once restricted to the study of large mammals, recent technical advances now make it possible to track medium-sized animals using GPS devices that log their location using a network of navigation satellites. For cryptic, shy, nocturnal species, such as introduced mammalian predators in New Zealand, up until now the only option for studying spatial ecology using marked individuals has been VHF radio telemetry and the collection of location data via triangulation. We address the question: How much better are GPS collars over VHF radio tags? Using data from current studies of feral cats in the Upper Waitaki Basin, central South Island, and of

domestic cats in urban Dunedin, we compare the accuracy and relative costs of the two options, and consider some sources of potential bias in, and analyses possible with GPS data.

The challenges of using systematic concepts in regulation

Presentation Type: Oral

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Biologists have long argued about what a species really is. Now lawyers and regulators also need to know! In New Zealand, approvals to introduce exotic organisms can be granted at any taxonomic level, including species.

This paper looks at the challenges inherent in using systematic concepts in regulation, and provides examples from recent applications to import plant and animals into New Zealand.

Remote sensing of vegetation: Effective ground measurements

Presentation Type: Oral

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This paper details a ground data collection framework for a project investigating the potential use of remote sensing technologies to enhance field-based site assessments of vegetation condition. The framework used to collect ground data is designed to integrate data from a variety of sources including:
- Existing ground data, collected using the BioMetric vegetation condition assessment protocol, which is used to characterize vegetation variables within a remnant patch of vegetation;
- Additional ground data, collected within specified spatial areas defined by imagery pixel size; and
- Individual tree assessments, which record data for an object (tree) rather than an area.

Ground data for use with remotely sensed imagery needs to be collected in a manner that addresses issues such as spatial scale, position and site homogeneity. The spatial resolution of the imagery to be classified (pixel size) and the spatial variation of the target variable being measured on the ground are two core factors that are incorporated into the sampling framework design. The framework is designed to allow the effects of spatial scaling and a suite of image analysis techniques to be explored.

Demographic connectivity in marine metapopulations

Presentation Type: Oral

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The offspring of most coastal marine organisms develop in offshore waters for extensive periods of time and potentially travel large distances before returning to nearshore habitats. The extent to which offspring are "lost" from their parental populations and successfully "captured" by more distant populations is a measure of population connectivity. Population connectivity underpins the dynamics and evolution of most species, determines the efficacy of reserve designs, and influences the response of natural systems to perturbations including pollution, invasive species, climatic anomalies, and harvest. Importantly, the exchange of young between distant populations is only one component of population connectivity-for any two populations to be demographically connected, young must not only travel successfully between localities, but also survive in their novel environment. We used otolith LA-ICPMS to reconstruct larval environmental fingerprints of common New Zealand triplefins (Fosterygion lapillum). We identified at least three dispersal "syndromes" (i.e., fish with similar patterns of trace element concentrations across developing larval otoliths), and found that the proportional contributions of these syndromes to discrete recruitment events varied temporally and among sites around Wellington, NZ. Larval quality (total energetic content) also varied spatio-temporally, and experimental translocations of recently settled fish among sites suggest larval quality and site quality interact to determine differential recruitment success among syndromes, and potentially mediate patterns of demographic connectivity among populations. Our study represents one of the first attempts to unify technological advances and ecological theory to substantially improve understanding of the processes that control connectivity and drive metapopulation dynamics.

Characterisation of serrated tussock infestations in native pastures

Presentation Type: Poster

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Serrated tussock (Nassella trichotoma) is a weed of national significance that invades native grasslands (> 600 mm rainfall) in south-eastern Australia. These grasslands are generally found on poorer soils and/or inaccessible areas that make conventional control methods difficult to implement. Enhanced competition from native grasses is a prime option for control of this weed in those areas. Total biomass, the biomass of functional groups, litter biomass, bare ground and green biomass were recorded using BOTANAL procedures for low, medium and high serrated tussock infestations in native pastures dominated by kangaroo grass (Themeda australis) or wallaby grasses (Austrodanthonia spp.). Differences in the biomass of functional groups between high, medium and low infestations and the two grassland types were determined using categorical regression analysis and principal components analysis to

identify those variables associated with high serrated tussock biomass. There was a negative relationship with C4 perennial grasses in some parts of the landscape, suggesting they either resisted invasion or were effective competitors; while a negative relationship with annual grasses suggested that both these groups were competing for a common resource space, possibly as a result of over-grazing removing the initial native perennial grasses.

Do Patch Characteristics Influence Floral Visitation And Plant Reproduction? A Comparative Study Of Three Species In Northern NSW, Australia.

Presentation Type: Oral

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The extent to which plant species may be affected by pollination disruptions in fragmented landscapes is likely to be influenced by breeding system and patch density. Much of our theory however is derived from self-compatible herbs in European landscapes. Here we used three species which differed in their breeding system and life form to investigate levels of floral visitation and fecundity in sparse and dense patches in a fragmented landscape; Dillwynia sieberi (Fabaceae), an obligate outcrossing shrub, Wahlenbergia luteola (Campanulaceae), a facultative outcrossing herb and Thesium australe (Santalaceae) a hemiparasitic herb which displays high levels of selfing. In three populations per species and over two years, visitation rates to flowers varied among species (Ds>Wl>Ta) and were often higher in dense compared with sparse patches. Overall however, floral visitation and fecundity responses were variable across species, populations, densities and years suggesting that local, within population factors are important moderators of fecundity. These results highlight the importance of incorporating species with contrasting life history traits and multiple populations when investigating the effects of habitat fragmentation on plant fitness.

Do they still exist? Evidence for the presence/absence of biological control agents released for the control of Groundsel Bush (Baccharis halimifolia)

Presentation Type: Oral

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Groundsel bush (Baccharis halimifolia) has been a declared noxious weed in Australia for more than 50 years. Biological control of B. halimifolia began in the early 1960s where some 35 species, mainly insects, were considered. Only 14 were approved for release and the following seven have established: Leaf skeletonising moth, Aristotelia ivae (Busck); leaf

mining moth, Bucclatrix ivella (Busck); stem boring moth, Oidaematophorus balanotes (Meyrick); stem boring beetle, Megacyllene mellyi (Chevrolat); gall forming fly, Rhopalomyia californica (Felt); leaf feeding beetle, Trirhabda bacharidis (Weber) and a rust, Puccinia evadens (Hark). Visual damage surveys of the agents were conducted across six sites in Queensland. Leaf damage was scored on a scale from 0-5 where zero implied no visible damage and five was almost complete coverage. Counts were made of the number of galls and stem borer exit holes. Leaf mining was obvious on 96% of plants, however, visual observations, suggest that stem boring is more detrimental effect to the plants. Sampling and identification will continue each season for one year to ensure all seasonal effects are considered. These surveys will be used as a basis for determining whether the agents released still persist and are effective in the distribution of B. halimifolia.

Australian leaf miners and their prevalence within the Myrtaceae

Presentation Type: Oral

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Leaf miners are an endophagous feeding guild that include species in four insect orders; Diptera, Coleoptera, Hymenoptera and Lepidoptera. The larval stages of leaf miners live and feed within layers of leaf tissue and thus create mine-like cavities. There is very little known about the ecology of leaf miners in Australia. We examined patterns of leaf mining in the Myrtaceae, one of the most widespread and important Australian plant families. We sampled 67 plants from all clades within the Myrtaceae, assessed them for leaf miner damage and present an analysis of association between leaf mining prevalence and plant characters including leaf toughness, leaf thickness, specific leaf area, water content, carbon to nitrogen ratio and fibre content.

Improving the management of sarcoptic mange in wombat populations

Presentation Type: Oral

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Sarcoptic mange caused by a parasitic skin mite Sarcoptes scabiei is a cosmopolitan disease affecting a wide range of mammals. It is thought to have spread from humans to domestic animals and then to wild animals. In Australasia, it particularly affects common wombats Vombatus ursinus, which are one of the three species of extant wombats. Sporadic outbreaks occur in southern hairy-nosed wombats Lasiorhinus latifrons and the disease has not been reported in the critically endangered northern hairy-nosed wombat Lasiorhinus krefftii. The disease is thought to have been introduced into Australia by Europeans several hundred years ago and is associated with population declines of common wombats. Outbreaks appear to mostly occur when the disease is introduced into a native population. Management of the disease is ad hoc and often carried out by wildlife carers. Expertise in management of the disease is concentrated within a few individuals. There is potential for expertise in management of

the disease to be more widely disseminated. This may lead to more general scientific interest in the disease and further research to improve management.

Development of an ecological model for chytridiomycosis

Presentation Type: Oral

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Chytridiomycosis is the most significant disease to affect veretebrate diversity. It has led to the extinction of many species of frogs on a global scale. Understanding the ecology of this disease will help in the prevention of its spread as well as help management of the disease where it has become endemic. An important component underlying this research is the development of a theoretical model based on current knowledge of chytridiomycosis and disease theory. It is hoped that this model will ensure that all important aspects of the ecology that relate to management are being addressed and that there is a coordinated and collaborative research effort between researchers and institutions within and between countries. The model uses a causal pathway approach that includes all possible determinants but differentiates between known and unknown causal factors. Important determinants are that this is a waterborne fungal disease that can infect a wide range of amphibian species. The disease is affected by temperature with mortality rates decreasing rapidly as temperature exceeds 27°C. Chytridiomycosis affects population dynamics when it is introduced into native populations and causes severe morbidity and high mortality in adult frogs. Subsequent population dynamics are determined by the level of resistance.

Talking rot!

Presentation Type: Poster

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Decaying logs support large numbers of saproxylic insect species. Many are dependent on particular rotten wood types, which in turn occur at particular stages of the log's decay. This poster explores the decay process in logs of Eucalyptus obliqua, one of the dominant tree species in Tasmania's wet eucalypt forests. Based on sampling logs in a range of decay and diameter classes, a decay model has been developed that can plot temporal changes in volume of logs in different decay and size classes. Its predictions have implications for the maintenance of suitable habitat for saproxylic insects in production forests.

Trans-Tasman old-field restoration

Presentation Type: Oral

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Abandoned farmlands offer a significant opportunity for restoration of native vegetation in the fragmented agricultural landscapes characteristic of Australia and New Zealand. Currently, farm abandonment is not widespread in Australia but is predicted to increase with further soil degradation and as terms of trade decline. In New Zealand, farm abandonment has occurred in some regions since the removal of agricultural subsidies in 1985. However, there are several potential barriers to the natural regeneration of old-fields. We describe the results of a three year study into the barriers to the natural regeneration of old-fields in Western Australia. Here, wheat fields that have been abandoned tend to be dominated by non-native annual grasses, even 30 to 40 years after farming has ceased. In the absence of a comparative data set for New Zealand, we predict which barriers might prevent the natural regeneration of old-fields in New Zealand. We discuss, in general terms, the implications of abiotic and biotic barriers to the restoration of old-fields in Australia and New Zealand.

Seasonal Variation in Food Hoarding of New Zealand Robins (Petroica australis)

Presentation Type: Oral

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Food hoarding behaviour has been attributed to increasing reproductive success, mate advertising, optimizing foraging, and enhancing competitive abilities. Noting the environmental heterogeneity experienced by most hoarders, researchers tend to cite survival of future food scarcity as the predominant advantage. However, recording the natural hoarding behaviour of birds is typically difficult and time consuming. The unusual nature of New Zealand robins make them ideal for observations in the wild. Robins express a range of behaviours within close proximity to observers in an environment that is relatively benign. Thus, the motives for hoarding in robins can be assessed in a wider context. Data were collected from birds inhabiting the Karori Wildlife Sanctuary. Behaviour was quantified by exposing sedentary, paired individuals to a food resource and observing their responses. Variation in food use was correlated with sex and season. Robins mediated their hoarding in response to conspecifics. Males hoarded least intensively during breeding, when energy requirements were highest. Conversely, female hoarding intensity seemed to be constrained year-round by the threat of male pilfering. Birds showed no anticipation of future food scarcity. Instead, food was opportunistically hoarded, apparently as a competitive response to excess food.

Variation in the community structure of urban woodlands, Christchurch, New Zealand

Presentation Type: Oral

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As part of a wider study of the urban plant communities of Christchurch city in the summer of 2005/06 we sampled the compositional and structural variation of 253 woodlands. These comprised woodlands, parklands and linear parklands in private residential gardens, parks, streets and other public places such as schools and cemeteries. We encountered 489 species, 101 of which were native. Despite the appearance that exotic tree species such as oaks and birches dominate the city, 15 of the top 20 woody species encountered were native. These included, in order of occurrence, Pittosporum tenuifolium (#1), Cordyline australis (2), Pittosporum eugenioides (3), and Dodonea viscosa (5). Nine of the top 15 native species were bird dispersed. We used a variety of multivariate analyses to investigate ecological and sociological factors that might account for the variation in woodland composition.

Pukaha - restoration of a New Zealand forest reserve without predator fencing

Presentation Type: Oral

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The Pukaha Restoration Project is based on a regime of intensive pest management over a 942 ha podocarp/hardwood forest remnant in the Wairarapa, south-east North Island. Goats (Capra hircus) and possums (Trichosurus vulpecula) have been controlled to low densities since the mid 1990s, with goats now all-but eradicated. Possums were initially controlled through aerial spread of 1080 baits. Ongoing control of both possums and ship rats (Rattus rattus) is based on a grid of 1057 bait stations (approx 1 ha-1). Toxins (1080, brodifacoum, coumatetralyl, and encapsulated cyanide) are changed over time to minimise the risk of toxin resistance and bait shyness. Mustelids (mainly stoats, Mustela erminea) are controlled using kill traps (DOC 200 and Fenn) at a density of 0.55 ha-1.

Captive or hand-reared kaka (Nestor meridionalis) were reintroduced on a trial basis in 1996; the population has increased to over 80 birds through natural recruitment and further releases of captive bred birds. North Island brown kiwi (Apteryx mantelli) and kokako (Callaeas cinerea) have been reintroduced since 2003 (and ongoing) and both have bred successfully in the reserve, contrary to the situation with unmanaged populations.

The involvement of neighbouring landowners, iwi, regional and local authorities, volunteers and sponsors all form an integral part of the Pukaha Restoration Project. Innovative strategies to build community involvement have included the "sponsor a hectare" scheme, and production of a CD of birdsong and waiata.

Fighting fire with fire: Use of ant pheromones in detection and control of exotic ants

Presentation Type: Poster

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Invasive ants can have devastating effects in their new ranges by disrupting native ecosystems or by enhancing the effects of other pest species present through mutualistic associations. Traditional and current control methods of ants mainly use broad-spectrum insecticides. Ant pheromones provide a way of targeting specific ant pests, thus reducing non-target impacts. A variety of pheromones has been identified from invasive ant species, providing an opportunity for alternative methods of control or surveillance. The application of ant trail pheromones in sensitive areas may be particularly useful. By saturating the environment with ant trail pheromone, the foraging behaviour of the ant can be disrupted, resulting in reduced foraging efficiency, thus controlling population densities of target ant species. If eradication is the goal, pheromones may be employed to entice ants to toxic baits thus increasing bait retrieval by the target species. The early detection of an invasive species is imperative for successful eradication. Species-specific pheromones or general odour-based attractants have the potential to detect invasive ant species in and around ports and transitional facilities, and may be more appropriate for continual surveillance than conventional surveillance techniques. Funding from "Better Border Biosecurity" will enable our team to explore this potential.

Molecular analysis of Amur leopard using fecal samples

Presentation Type: Oral

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Amur leopard Panthera pardus orientalis is among the most endangered leopards of the world. They are mainly distributed in Primorye Krai, Russian Far East, with a few tiny plots in China and North Korea. Primorye Krai is sympatrically inhabited by another endangered feline species, Siberian tiger Panthera tigris altaica. The two precious large feline species are now threatened by numerous negative impacts such as poaching and habitat loss. Currently, conservation and restoration efforts are undertaken to protect the extant population, and understanding the state of the wild population is urgent. Utilization of feces as a DNA resource has many advantages, since there is no risk of injury or death entailed by capturing or handling endangered species.
Distinguishing between leopard and tiger based on the appearance of their feces is ambiguous. Therefore, we developed the species identification method together with sex identification method. These methods were applied to fecal samples collected in the southwestern Primorye Krai, and successfully identified the leopard or tiger and determined the sex of both species. Also, we set individual identification method for Amur leopard's fecal samples using microsatellite markers. These methods enabled us to find out the distribution, population size and sex ratio.

Bringing back the saltmarsh: Restoration at the former Naval Stores, Parramatta River.

Presentation Type: Oral

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Saltmarshes are integral components of estuarine environments of the Parramatta River (Sydney, Australia). At the former Ermington Naval Stores site fronting the river, a remnant 440 m2 narrow strip of saltmarsh was expanded to cover more than 1500 m2 of potential saltmarsh habitat. Following the introduction of RiverCat ferries in 1993, there has been widespread collapse of seawalls, increased erosion and deposition along the riverbanks, as a result of the boat wake. The saltmarsh habitat had been eroded as the seawall along its length collapsed. The boat wake has added to the height and extent of the tidal inundation of the banks. The restoration involved re-establishing saline inundation by removal of restrictions such as soil bunds and dumped waste, conserving and enhancing the saltmarsh strip, translocation of saltmarsh species growing on bunds and construction of a dual seawall. The dual seawall has an outer

wall of loosely packed rocks for saline inundation, energy dissipation and reduction of rubbish deposition. The translocated saltmarsh species had a 70% survival rate for both bobcat mounted tree-spade and excavator translocation methods. Careful management of the saltmarsh with weed removal, gentle soil de-compaction and additional watering has resulted in the expansion of the saltmarsh.

Kiwifruit and palms (warning: Parental supervision required)

Presentation Type: Oral

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The invasion of New Zealand by woody plants is increasing in an exponential manner, fueled by decades of cultivation and long lag phases. Kiwifruit (genus Actinidia, Actinidiaceae) and palms (Arecaceae) are two high profile woody taxa that include recently naturalised species in NZ. Wild plants have been collected of five Actindia species and (at least) four palm species. All are at early stages of spread, when future distributions and impacts are difficult to predict but control is the most feasible and affordable. Wild kiwifruit is now being controlled in the Bay of Plenty, the core of its range, by Environment Bay of Plenty in close collaboration with the kiwifruit industry. In contrast, the Auckland Regional Council's recent suggestion that the four naturalised palms be banned from sale and distribution in the Auckland region has been met with vocal opposition from palm growers. In each case, wild plants and not the existing cultivated plants are the targets.. These species will not be the last high profile woody species with weedy tendencies that naturalise in NZ. A combination of robust documentation of early spread and impacts, combined with effective collaborations with affected user groups, will be required to contain these species.

A tale of two stressors: biodiversity- ecosystem function relationships vary with ambient temperature.

Presentation Type: Oral

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Effects of global species loss on ecosystem function have traditionally been extrapolated from studies which investigate the effect of random species loss or addition. Real species loss is highly patterned and clumped according to trophic position, taxonomic relatedness and interconnectedness with the remainder of the food web. Using pond microcosms, I evoked a realistic pattern of species loss using toxins and warming. Species loss was predictably highly patterned. Influences on ecosystem functions ranged from simple and linear in the case of algal productivity, through to complex and step-like in the case of bacterial decomposition. Impacts on algal productivity were mediated by effects on the rate of grazing by invertebrates. Of particular interest was the finding that the shape of the relationship between biodiversity and ecosystem function altered depending on ambient temperature. These results suggest that the effects of species loss will change as ambient environmental conditions change.

Effects of Pacific rats (Rattus exulans) on tuatara (Sphenodon punctatus) revealed by rat removal

Presentation Type: Oral

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Invasive mammalian predators such as rats are now widespread on islands but their effects are rarely documented. The South-East Asian rat referred to as Pacific rat or kiore (Rattus exulans) has been spread by colonising people through the Pacific and into the New Zealand archipelago. Kiore are regarded as having fewer detrimental effects than other invasive rat species, but circumstantial evidence from islands around New Zealand indicates negative effects on endemic reptiles including tuatara (Sphenodon punctatus). We test predictions about these effects on tuatara by comparing demographic structure and body condition of tuatara populations on three islands before and after removal of kiore and on a fourth where kiore remain. In the presence of kiore, juvenile tuatara comprised on average 0-5% of sample populations, but this increased 3.5-17fold once kiore were removed. Body condition of adult male and female tuatara also increased (sometimes dramatically) after kiore were removed. We compared population structure and recruitment of tuatara on the treatment islands with the population still co-existing with kiore and predict that unless kiore are removed, this population will collapse.

Emergent rules for species conservation: More than just the minimum

Presentation Type: Oral

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We present a novel meta-analysis of minimum viable population (MVP) sizes published since the early 1970s, covering 141 sources and 212 species (after filtering 512 sources and 2202 species). After designing a unique standardization method to make MVPs comparable, we derive a frequency distribution of MVP and provide a method by which conservation practitioners can generalize the MVP range expected for particular species or surrogate taxa of concern when sufficient information is lacking. We develop the novel idea of a 'buffered viable population' (BVP) which avoids the dangerous but common perception that MVP is an adequate conservation target.

Density of the invasive weed, bridal creeper (Asparagus asparagoides) did not influence post-fire successional response of a mallee ecosystem

Presentation Type: Poster

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Bridal creeper, Asparagus asparagoides (L.) Druce, is a Weed of National Significance in Australia and has been targeted for biological control. Previous studies on the impact of this environmental weed have suggested that without further restoration invaded areas could take many years to recover. As fire can be used as a restoration tool to stimulate the regeneration of native Australian plants, this study aimed to determine the response of the native plant community following fire, with or without the presence of bridal creeper. In 1996, following a wildfire, thirty 3 x 3 m plots were established in a mallee remnant near Meningie in South Australia.. In October 1996, bridal creeper was controlled in half the plots using sponge-applied glyphosate. In 2006, there was still a significant difference in the density of bridal creeper ($F=26.28$; $p<0.001$), with 33.4 + 5.0 emerging shoots m-2 in untreated plots compared to 9.1 + 1.2 shoots m-2 in controlled plots. However, there was no significant difference in the native plant assemblages between treatments (ANOSIM $R=0.017$; $p=0.274$). For this site, bridal creeper has had no detectable influence on the early stages of post-fire succession, with acacias and other native trees and shrubs now dominating the site.

Small-scale structure of canopy dominated macroalgal systems on the temperate reefs of South Australia

Presentation Type: Oral

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Science to Manage Uncertainty

Canopy-forming phaeophycean macroalgae often dominate shallow temperate reef environments. An examination of these assemblages in Gulf St Vincent (South Australia), noted that they appeared as a mosaic of patches (1 m scale), each of which comprised a high-density state clearly dominated by a single genus (Cystophora, Sargassum, or Ecklonia), or alternatively a lower density mixed assemblage (Variable Low Abundance, VLA).
Patches in different high-density states rarely abutted one another, but were instead buffered by VLA assemblages. In terms of successional processes, the high-density states appeared to be persistent whereas the VLA state, at least in some systems, was transitory. These findings were supported by the absence of intermediary high-density states (e.g. a mix of Cystophora and Ecklonia) implying that state changes must occur via the VLA state following some form of disturbance, either discrete or ongoing. The above findings are based on a four-year study examining both the adult assemblages and underlying juvenile stand. A transition state model is used to summarise and help explain the field observations under a number of different scenarios including elevated mortality (disturbance)

and the role of recruitment success and failure. This model is also expanded to include a spatial context.

Initial effects of Severe Tropical Cyclone "Larry" on forests in far north Queensland

Presentation Type: Oral

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Severe Tropical Cyclone 'Larry' with a central pressure of 915 Hpa crossed the coast at Innisfail, 90 km south of Cairns, on 20 March 2006 causing extensive damage to forest ecosystems across a 100 km strip of coastal lowlands and uplands. Maximum wind gusts were near 290 km/hour, making Larry the most severe cyclone in the region since 1918. The fast-moving system was still Category 3 (severe) status when it crossed over the Atherton Tablelands some 60 km from the coast.

Adopting a rapid assessment methodology, developed by Unwin et al. (1988) following Cyclone 'Winifred', four categories of initial forest damage were identified from helicopter surveys of the landscape impacted by Cyclone Larry. Category 1 and 2 (severe) forest damage, within 30 km of Larry's path, was found to be more extensive than that caused by Cyclone Winifred which crossed near Cowley Beach with maximum wind gusts near 200 km h-1 on February 1, 1986. Outside the 30 km severe damage zone, Category 3 (moderate) forest damage extended much further north, south and west than that reported for Cyclone Winifred. By comparison, Category 4 (slight) forest damage was found to be less extensive than that reported for Cyclone Winifred. Patterns of forest damage were strongly influenced by location in regard to the cyclone's path, topographic exposure (and shading) and characteristics of the forest type and other site conditions. Larry also appears to have produced tornadic-type features within the cyclone's eyewall that have been linked to isolated patches of catastrophic forest damage.
Reference:
Unwin, G.L. et al. (1988). Proc. Ecol. Soc. Aust. 15, 283-296.

Urban ecology issues in Queensland's Wet Tropics: opportunities and challenges in a World Heritage Landscape

Presentation Type: Oral

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The Wet Tropics Queensland region of Australia is internationally recognised for its outstanding natural heritage values. The region uniquely contains two world heritage areas (WHAs) side by side, the Wet Tropics and Great Barrier Reef that are renowned for their high diversity of species and habitats, with both WHAs being recognized as global biodiversity 'hotspots'. Like other regions of eastern Queensland, the Wet Tropics has experienced widespread clearing for agriculture and urban development, notably along the coastal plain between Mossman and Ingham and on the Atherton Tablelands inland from Cairns. Despite these major land use impacts, the region still contains large tracts of intact forest and wetlands that have been severely fragmented elsewhere in eastern Queensland. In recent decades there has been increasing pressure for further agricultural, urban, peri-urban and tourism development in the Wet Tropics and this

has provided regional planners with both challenges and opportunities for sustainable use of Australia's most biologically complex landscapes. The paper will provide an overview of the current status and trends of these 'contested landscapes' of the Wet Tropics.

Managing wildlife and pests using incomplete exclusion fencing on a virtual island: Tawharanui Open Sanctuary, New Zealand.

Presentation Type: Oral

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Tawharanui Open Sanctuary, 90 km north of Auckland, New Zealand, forms part of the 588 ha Tawharanui Regional Park and is managed as a virtual island, where barrier (c.f. encirclement) pest-proof fencing (Xcluder®) is used to exclude all introduced pest mammals and allow restoration of indigenous biota.

Aerial application of Pestoff Rodent Bait 20R® in 2004 and subsequent trapping removed seven mammalian pests and significantly reduced the abundance of the remaining three pest mammal species. Monitoring was undertaken of seedling abundance, terrestrial invertebrates, coastal lizards, and terrestrial birds to determine benefits of pest removal. Shore skink Oligosoma smithi catch rates increased significantly and both recruitment and habitat use changed markedly immediately following pest removal. In February 2005, bellbirds Anthornis melanura recolonised the park and bred successfully, after an absence of over a century. Results for plants (permanent vegetation plots), invertebrates (pitfall transects) and birds (5-minute counts) are presented. Persistence and spread of mice Mus musculus has proved problematic, with indications that high mouse densities may be reversing some wildlife gains made over the past 18 months.

Cost analyses for building the exclusion fence and ongoing maintenance, surveillance and response are presented. The relative contributions and dependence on volunteer labour are also discussed.

Mechanisms influencing weed avoidance by native lizards

Presentation Type: Oral

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Introduced plant species modify the environment and alter ecological interactions in communities, often to the detriment of native fauna, but the causes driving negative effects on fauna are rarely examined. We used native Australian scincid lizards (Carlia munda and C. pectoralis) and the introduced weed rubbervine (Cryptostegia grandiflora) as a model system to determine possible underlying mechanisms influencing habitat selection by native fauna in a weed-invaded environment. In semi-natural enclosures, lizards discriminated between native and introduced habitat, with 85% of C.. pectoralis and 80% of C. munda choosing native leaf litter over rubbervine, clearly indicating a preference for native habitat. To determine the source of habitat preference, we examined differences in temperature, prey (arthropod) availability and leaf shape of naturally occurring rubbervine and native vegetation. In comparison to native habitat, rubbervine provided a suboptimal environment for litter-dwelling lizards because it had lower temperatures, less prey and reduced available camouflage (dissimilar leaf and lizard shapes). Given this, litter-dwelling lizards may be disadvantaged by rubbervine as it fragments and replaces native habitat. Our study identified three possible mechanisms by which introduced plants can alter the availability of resources in environments, consequently making the weed habitat less attractive to native fauna.

Parasitism in Little Blue Penguins (Eudyptula minor) and correlations with body condition, survival and breeding success

Presentation Type: Oral

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The health of a bird dictates its breeding success and influences how it copes with environmental stresses. There has been evidence suggesting that large parasite loads in blue penguins (Eudyptula minor) may be detrimental to the birds, especially during periods of starvation. To explore blue penguin parasite loads and how levels of infestation correlate with body condition, survival and breeding success, we commenced an investigation into the incidence of ecto-, haemo- and gastro-intestinal parasites in birds on Tiritiri Matangi Island, Hauraki Gulf, New Zealand. Non-breeding season parasite prevalences were explored through examination of penguins on their nightly arrival at the island, and through the necropsy of bird carcasses. Necropsies were also conducted on carcasses from elsewhere when possible, for comparison. Breeding season research (commencing August) comprised; monitoring nest success with and without treatment for nest-associated parasites, examination of chick parasite load, and comparing parasitic loads from different nest types. Examinations of live birds yielded a diversity of ectoparasites, some of which were also known vectors for haemoparasites. Necropsies revealed a

range of intestinal parasites. We will report on these parasite prevalences and the associated bird-host health parameters over the non-breeding period and early breeding season of 2006, May - August.

Ecological health: Key driver of low impact urban design and development (LIUDD)

Presentation Type: Oral

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'Strong Sustainability' promotes the concept that the economy is nested within society and society is nested within the ecosystem. This merges with LIUDD principles making urban form and ecosystem processes co-dependent. The city, instead of destroying the ecosystem, develops within its constraints. Using LIUDD examples, this paper examines ecologically appropriate regional and catchment approaches to facilitating urban growth and revitalisation. Forest and stream restoration projects of adjoining catchments contribute to a mosaic of urban and peri-urban forest remnants increasing in density and connectivity to form regional indigenous forest corridors.
LIUDD principles play an important role at two levels. Firstly at a strategic level, habitat patches can be identified that are critical for retaining sufficient habitat to maintain local ecological functions as well as connectivity throughout the wider landscape, facilitating species movement. This is vital in areas of dramatic land-use change-such as urbanization, which can leave small fragmented habitat patches isolated by surrounding potentially hostile "matrix" habitat(s). Secondly there is development of effective criteria for monitoring and evaluating the success of LIUDD. Concepts including biodiversity, water quality, hydrological regime, habitat complexity, species population are used to assess whether LIUDD is meeting its aim of facilitating development while retaining ecological integrity.

Facilitation is an important plant-plant interaction at high altitudes in Victoria, Australia.

Presentation Type: Oral

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Plant-plant interactions switch from being negative (competitive), in resource-rich areas, to positive (facilitative) when environmental stress increases. At high elevations, harsh conditions generally prevail and non-resource factors (strong winds, extreme temperatures, soil disturbances) may be more limiting to plant growth than resource availability, as occurs at low altitude. At these high elevations, neighbouring plants can buffer each other against scouring winds, temperatures and predation, creating outcomes predicted to be important for plant growth and survival.

Facilitation among alpine plants has rarely been examined in Australia. In this paper, we examine competitive and facilitative interactions across an

elevation gradient of alpine sites. We focused on two critical life-history phases, seed germination and seedling establishment, and planted seeds and seedlings into vegetation-removed and undisturbed plots at sites that differed in their elevation.

We show that facilitation may be the overriding plant-plant interaction at the highest elevations and speculate about the role of abiotic stresses in determining alpine plant community structure and ecosystem function in future decades with a rapidly changing climate.

Effects of gender and life history stage on herbivore responses to a chemically defended red alga

Presentation Type: Oral

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Herbivory is an important selective force that can drive the evolution of complex life histories and dioecy in plants and algae. Seaweeds with heteromorphic life histories have morphologically and physiologically distinct phases, with associated variation in ecological traits that can increase fitness in habitats where conditions vary in space or time. We tested the susceptibility to grazing of the three life history stages and separate sexes of the chemically defended red alga Asparagopsis armata against a wide range of herbivores. Measures of nutrition and secondary metabolite composition of the different stages and genders showed no differences between the two free-living phases (sporophyte and gametophyte). However, male gametophytes had a lower secondary metabolite concentration and a higher nutrient content than females, and the microscopic carposporophyte phase had a high nutrient content and no detectable secondary metabolites. Differences in plant quality and structure correlated with herbivore preferences. The sea hare Aplysia parvula strongly preferred the male to both the female gametophyte and the sporophyte, but favoured the sporophyte over the female gametophyte. Amphipods preferred the filamentous sporophyte to the gametophyte, whilst gastropods and urchins showed no feeding preferences. Because A. parvula is one of the principal herbivores of A. armata, gender-biased herbivory may ultimately influence the adult sex ratio of gametophytes in the field, which we found to be female-dominant.

Managing the emergent bioinvasion of Didymosphenia geminata, a Northern Hemisphere alga threatening the freshwaters of New Zealand

Presentation Type: Oral

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Didymosphenia geminata is a stalked benthic diatom which has spread to over a dozen rivers in New Zealand since it was first discovered blooming in the Waiau River in Southland in October 2004.. Prior to this discovery, there were no validated records of the alga in the Southern Hemisphere. D. geminata blooms in New Zealand have been extreme, with 100% bed coverage up to 20 cm thick along kilometers of river. Humans are considered the predominant vector. A containment programme to limit the spread consists of a national public awareness campaign integrated with controlled areas to regulate the movement of risk goods such as felt-soled waders and other freshwater gear. Studies are underway to determine trophic and ecophysiological effects, which are potentially large if commensurate with biomass levels. Based on habitat characteristics of affected rivers, cool oligotrophic rivers in Australia may also be at risk. Biosecurity New Zealand has strengthened border measures to reduce the risk of future introductions of unwanted freshwater organisms and shared this information with the Australian Quarantine and Inspection Service. All freshwater users, including ecologists and other scientists, need to be aware of the threat and should practice Check Clean Dry decontamination procedures to prevent the spread (see www.biosecurity.govt.nz/didymo).

Restoration treatments in eucalyptus plantations infested by introduced paspalum for the development of native forests in an Australian national park

Presentation Type: Oral

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Sixty hectares of 30-year old Eucalyptus plantations with introduced Paspalum understorey were included in the recent expansion of Bongil Bongil National Park, NSW, Australia. These plantations require restoration to improve biodiversity values. We identified potential biotic barriers to the natural succession of these plantations towards more natural forest: (1) competition from the dense paspalum sward and litter, (2) competition from unthinned eucalypts, (3) the absence of a native seed bank, (4) lack of germination cues for any in situ or persistent native plant

seed bank, and (5) wallaby browsing of woody seedlings. We implemented a strip plot factorial experiment to overcome these biotic barriers. The treatments included canopy reduction of plantation trees and understorey manipulations (i.e. burning, chisel ploughing, herbicide, wallaby-exclusion fencing, and the planting of 11 native woody species). Results for planted seedlings are presented 1 year after treatment imposition. Overall, 51% of seedlings died, and 67% were browsed by wallabies. More seedlings were browsed in unfenced areas, indicating the significance of fencing. The Successional phase factor (pioneers versus a mix of pioneers, secondary and mature), had no effect on planted seedling mortality. The highest mortality was recorded in Acacia longifolia var. sophorae (80%), and Acacia melanoxylon (77%), these being highly browsed, with lowest mortality in Ficus coronata (18%) and Acacia maidenii (25%).

Assessment of risk of biodiversity loss in New Zealand and its application to Land Tenure Review

Presentation Type: Oral

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New Zealand has a highly non-representative reserve network, and loss and degradation of its remaining indigenous habitats is continuing, especially in much reduced and poorly protected environments. A spatially explicit index of risk of biodiversity loss is developed for New Zealand, and its operational application to guiding protection priorities and measuring achievement is demonstrated for the process of Tenure Review of Crown Pastoral Leases in the South Island High Country. Highest priority areas for biodiversity protection on Crown Leases are in dry rainshadow intermontane basin and valley floor environments that are poorly protected and much reduced nationally, that hold the greatest densities of threatened plants, and are at most risk of loss and degradation. Through Tenure Review, the Crown is exacerbating historic patterns of indigenous biodiversity loss by removing historic vegetation clearance constraints from important habitats and ecosystems. Additonal protection for indigenous biodiversity has been achieved mainly in a few, least vulnerable (i.e. most intact, and best protected) high elevation environments. Our data show Tenure Review outcomes for biodiversity are predictable (habitats and species at high risk of loss are likely to be privatised, while those least requiring protection are protected) and are deteriorating as the process continues.

Coexistence, community structure and the distribution of exotic ants in New Zealand

Presentation Type: Oral

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At least 28 ant species have been unintentionally introduced (through trade) into New Zealand over the past 150 years. The majority of these are from Australia. Although awareness of 'potential high risk' invasive ants in New Zealand has increased, very little is known about the exotic ant species currently in New Zealand. Climate modelling shows that the majority of exotic species are restricted to the northern part of New Zealand. Habitat segregation of native and exotic species plays an important role in the ecological partitioning of species. Most common exotic species are found in urban areas, but some species can occur in native habitats, particularly those associated with relatively open canopies (mangroves, scrub). In urban areas, <6 exotic species form a small community which, despite inter-specific competition, appears open to other ant species. Although the exotic species in New Zealand form a 'synthetic community', its structure appears to be based on community structure patterns found in naturally occurring communities overseas. Abiotic (habitat, seasonal activity) and biotic factors (foraging strategy, behavioural dominance) combine to structure this community, enabling species co-existence.

Making a point with Spinifex: Size isn't everything, but is it better than percentage cover?

Presentation Type: Oral

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Ever thought of plants as just habitat? Then you have probably also estimated percent cover for the tricky clump-forming grasses. Here we explore the relationship between estimates of percent cover and the actual size, shape, and abundance of individuals of spinifex, Triodia basedowii, a hummock grass that dominates the vegetation in the dune fields of the Simpson Desert. We were challenged to determine the size of a Spinifex individual to include this species in multivariate analyses, as the abundances of other plant species in fixed quadrats were counted. The opportunity to identify newly recruited Spinifex individuals and understand their population dynamics and spatial interactions has arisen

following extensive wild fires that removed the existing Spinifex. We mapped and measured 1600 Spinifex individuals in 240 5m x 5m vegetation plots in burnt and unburnt vegetation, in three dune zones and across local to regional scales. As expected, the abundance of Spinifex was significantly higher in unburnt vegetation (mean ±SD 10.6 ±6.3 per plot) compared to burnt vegetation (mean = 3.2 ±4.7). Spinifex was three-fold more abundant in swales compared to dune crests, and Spinifex numbers on the crests were highly variable (mean = 2.9 ±4.3). The implications for habitat heterogeneity will be discussed.

Ecology of Lilium formosanum and implications for management

Presentation Type: Oral

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Geophytes are plants whose shoots die off during unfavourable seasons then regrow using resources stored in below-ground organs. In Australia, non-native geophytes are invading native ecosystems. The resources captured in their underground storage organs ensure rapid growth during favourable conditions giving them a competitive advantage over slower growing species. Lilium formosanum (Formosa lily) is an invasive perennial geophyte introduced to eastern Australia from its native Taiwan. It is one of over 218 non-native plant species on Lord Howe Island (LHI). It was introduced to LHI in the 1970s as an ornamental plant. The species' life-cycle traits (e.g. high seed production, wind-dispersed seeds, capacity to sequester and store resources, broad ecological tolerances) have allowed it to spread widely across the island. It takes advantage of natural and anthropogenic disturbances and is frequently found in light gaps in otherwise closed forests. It occurs in virtually all habitat types but is especially abundant in open cliff ledge and dune communities. It poses a threat to the island's many endemic and other native species and unique habitats. Currently, there are few practical management options.

Patterns in slime: Linking biofilm assemblages and flow regimes on four coastal rivers, northern NSW

Presentation Type: Oral

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Detecting the effects of altered flow regimes in regulated rivers can be difficult in ecological systems that are spatially and temporally heterogeneous. On the Nymboida River, northern NSW, water extraction for hydroelectric power generation alters flow volume and variability downstream of the weir. Biofilm, the slimy assemblage of algae, bacteria, fungi and detritus on rocks, will respond to local hydraulic conditions and may therefore be a useful indicator of biological change in response to flows.
The survey component of this project links patterns in biofilm assemblages

with differences in flow regimes at sites upstream and downstream of the weir on the Nymboida River. These patterns are compared with longitudinal changes in 3 similar ('reference') rivers that do not have a weir or water extraction. Within each site, habitats with different water velocities (edge, riffle, pool) were sampled for biofilm dry mass, organic matter content, chlorophyll a and algal taxonomic composition. Longitudinal change in dry mass on the Nymboida was significantly higher in riffle and edge habitats ($p<0.01$) than longitudinal change on 'reference' rivers. Patterns in algal composition on the Nymboida also suggest a community response to flow regime. Experimental manipulation of flows will further investigate links between these patterns and mechanisms regulating biofilm response.

The adaptive significance of temperature-dependent sex determination in a short-lived lizard

Presentation Type: Oral

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Why do nest temperatures determine offspring sex in many reptiles? The differential fitness model poses that temperature-dependent sex determination (TSD) can enhance maternal fitness if offspring traits affect fitness differently for sons versus daughters, and nest temperatures either determine or predict those traits. We used a short-lived Australian lizard (Amphibolurus muricatus, Agamidae) with TSD to test this hypothesis. Eggs were incubated at a range of temperatures, and the resultant hatchlings were released in field enclosures where they were monitored for nearly three years. Our experiment revealed that incubation temperature influences the timing of hatching, and that the optimal timing of hatching may differ between sons and daughters. Thus, these findings are consistent with the differential fitness model. Based on our results, we made an additional prediction that mothers should choose nest sites with specific thermal regimes that would allow offspring sex to be matched with their optimal time of hatching. To address this prediction, we obtained temperature and sex ratio data from over 40 nests in the field. Maternal nest-site choice will be evaluated by comparisons of nest temperatures versus temperatures from random sites. The role of maternal nesting behaviour in the evolution of TSD will be discussed.

What ecological and environmental conditions facilitate the establishment and persistence of the weed Lachnagrostis filiformis (G. Forst.) Trin. in western Victorian Lakes?

Presentation Type: Poster

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Lachnagrostis filiformis (Fairy Grass) is an emerging weed native to Australia, New Zealand and New Guinea. Its detached mature panicles lodge against fences, railway lines, and other obstacles initiating social problems due to the fire hazard and general nuisance. Florets become toxic to livestock when infected with the bacterium Rathayibacter toxicus resulting in economic loss. When established outside its natural distribution it out-competes and posing a major environmental threat to native vegetation. Since current control methods only provide short-term solutions- it is essential to identify an economically viable long-term solution to the problem. Current control methods will be reviewed, modified and assed as well as the potential of long-term management solutions will be developed. Plant abundance and soil physio-chemical parameters will be measured on four undisturbed dry lakes, in western Victoria to investigate the demography of the grass. Effects of herbicide, burning, slashing, controlled grazing and seed dispersal on vascular plants will be monitored over three years. Knowledge gained from this study will have direct applicability to its control nationally and internationally and may assist in the development of control for other similar weed species.

Rapid recovery of an insect-plant interaction following habitat loss and wetland restoration: conservation threats to the 'world's thinnest caterpillar'

Presentation Type: Oral

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Restiad peat bogs are threatened ecosystems in northern New Zealand, yet several areas of bogs are still being mined commercially. This study examined the impact of wetland habitat loss and isolation on an insect-plant interaction, and the subsequent rate of recovery of the interaction following experimental habitat restoration. We compared herbivore colonisation rates and herbivory damage by done by an undescribed stem-mining moth ('Batrachedra' sp.; Lepidoptera) on experimentally placed potted Sporadanthus ferrugineus (Restionaceae) plants at increasing distances (up to 800 m) from an intact habitat (the source population). These tests showed that even a moderate degree of isolation (i.e. greater than 400 m) from the intact wetland habitat caused an almost complete failure of 'Batrachedra' sp. to colonise potted S. ferrugineus plants, at least in the short-term. The number of eggs and larvae of colonising 'Batrachedra' sp., as well as average larval size and the

proportion of S. ferrugineus stems damaged all decreased logarithmically with increasing distance from the intact habitat, presumably due to dispersal limitation of the herbivore. Subsequently, to test whether the interaction can recover following habitat restoration, we surveyed herbivore colonisation rates and herbivory damage on naturally regenerated S. ferrugineus plants on experimentally restored 'islands' at increasing distances (up to 800 m) from an intact habitat. The rate of recovery of the interaction was surprisingly rapid (i.e. between 196 and 308 weeks). The degree of difference in the density of eggs and larvae, and the proportion of stems damaged with increasing isolation from the intact wetland, gradually diminished over 196 weeks. After 308 weeks there was no significant difference in the insect-plant interaction between the intact wetland sites and any of the experimentally restored sites up to 800 m away. These results suggest that some insect-plant interactions can recover rapidly from habitat loss with restoration management.

Spatial patterns of recruitment in relict populations of halocarpus biformis (pink pine), near Dunedin, New Zealand

Presentation Type: Poster

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The poster summarises a study of the distribution and dynamics of isolated relict populations of Halocarpus biformis (pink pine) in the Mt Cargill-Pigeon Hill area, near Dunedin (South Island, New Zealand). Halocarpus biformis populations were studied in two vegetation types: 'montane conifer-broadleaved forest', and 'manuka-pink pine low forest'. The objectives the study were:(1)to describe the spatial structures of populations,(2)to describe the spatial patterns of recruitment,(3)to describe how the spatial patterns of microtopography, ground cover, understorey and canopy-trees determine the regeneration niche, and (4)use the information on the regeneration niche and spatial patterns of recruitment to consider the future prospects of Halocarpus biformis in the Mt Cargill-Pigeon Hill area.

The reintroduction biology of New Zealand lizards: An investigation of current strategies and monitoring methods

Presentation Type: Oral

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This project aims to promote the recovery of native reptiles into New Zealand restoration areas by investigating current strategies and monitoring methods. Previous post- release monitoring studies within New Zealand have provided important information on species' survival rates and social organisation, however are heavily avian biased. This is of great concern where such high densities of reptile populations on many mammal- free islands are indicative of their important role in New Zealand ecological communities. It is further more alarming, that of the 40 + spp. of protected geckos in New Zealand, none are considered in any current recovery plan. The objectives of this research are to determine the suitability of habitat for native reptiles at Tawharanui Open Sanctuary (TOS), Tiritiri Matangi and Motuihe Islands within the Auckland region

(New Zealand). Building on information being gathered in an on-going post release survey of forest and green geckos at TOS, this project will further investigate other aspects of the behavioural ecology of New Zealand geckos through use of captive populations, examine the use of artificial refuges and tracking tunnels as monitoring tools and investigate the potential threat of mice in an otherwise mammal free environment (TOS).

Nature's bounty:Maori plant harvesting in the western Waikato region of New Zealand.

Presentation Type: Poster

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Plant harvesting and use is one of the fundamental connections of humans with the environment. This study was an initial attempt to identify plant species that may be culturally important to Maori living in the western Waikato region. We asked seven research participants in detail about the plants they harvested. We also quantified data from plant collecting permits issued by DOC for the years 2000-2006. Fifty-eight species were identified by participants as plants they used, or that had particular significance, with 21 species identified on average by each participant. Of the 13 species identified by 50% or more of the participants, six are used medicinally. Weaving species were also sought after, including kiekie and pangao. Weaving, dyeing and carving plant species were reported by participants as difficult to access.. These also formed the bulk of species collected from conservation land, with kiekie being the most common. Participants frequently accessed plants in urban areas, especially for medicinal use. Participant concerns included the spraying of species such as kumarahou, particularly in rural areas; ecosystem destruction; access to windfall trees; and the planting of commercially hybridised species. We recommend that harvesting requirements are considered in future urban planning to foster and maintain the links between local communities and the environment.

The use of habitat models to predict distribution changes of alpine peatlands under climate change in the Victorian Alps

Presentation Type: Oral

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The peatlands of the Victorian Alps represent a rare and restricted vegetation type. They also provide ecosystem services, and are of critical importance to overall catchment health. It has been postulated that approximately 50% of peatlands have disappeared since European settlement, and that rising global temperatures are likely to reduce their occurrence further. Habitat models were developed from data collected on the Bogong High Plains; they were then used to predict the distribution of peatlands on the Mount Buffalo Plateau. Two modeling methods were used: generalized additive models (GAMs) and Boosted Regression Trees (BRTs). Model evaluation indicates that both modelling methods

performed well and were equally successful in predicting the distribution of peatlands. However the BRT out-performed the GAMs in that it explained a greater amount of the variation in the hold-out sample of the data, it produced more ecologically realistic modeled responses, and identified the presence and nature of interactions between the variables. The BRT model has been used to predict distribution changes under rising temperatures by manipulating the climate-related predictor variables. The results have been used to identify areas of peatland that are likely to be the most vulnerable to climate change, and which may need to be prioritized for management and rehabilitation purposes.

The future of whio in Fiordland National Park: Is linear stoat trapping sufficient to ensure persistence?

Presentation Type: Oral

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The blue duck (whio - Hymenolaimus malacorhynchos Gmelin) is a unique riverine waterfowl species that is endemic to New Zealand. Whio were once widespread throughout both the North and South Islands but are now restricted to fragmented populations, mostly in the headwaters of rivers in the central North Island and western South Island. These declines have been largely attributed predation by introduced mammals and they are currently listed as "nationally endangered". A six-year study was conducted by the Department of Conservation in Fiordland National Park to investigate the productivity and survival of whio and assess the impacts of predator control. Whio populations in the Clinton, Arthur and Cleddau catchments were surveyed and time-lapse video cameras were used to monitor disturbance and predation events on nests in valleys with and without linear stoat trapping. Nest failure was strongly associated with stoat predation in the absence of trapping. Eggs, ducklings and adult females were all susceptible to predation. Deterministic population modelling indicates that the persistence of these populations depends on low female mortality, only presently occurring in trapped valleys.

Home-range and vegetation use by adult female kakapo (Strigops habroptilus) on Whenua Hou / Codfish Island: Correlations with breeding success?

Presentation Type: Oral

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The kakapo (Strigops habroptilus) is a critically endangered, flightless parrot endemic to New Zealand. The population currently consists of 86 individuals that have been transferred to predator-free islands. Whenua Hou (Codfish Island) is home to fifty-four kakapo and is the only breeding population. Increasing the population of kakapo is difficult, considering their extremely low reproduction rate. Breeding occurs at intervals of two to five years, coinciding with the mast fruiting of their favoured foods. But even in mast years not all females will attempt to breed. During the last breeding season only ten of the twenty-one adult female kakapo nested. In a species where every egg counts, it is important we try to understand what influences variation in female breeding success. Supplementary feeding does not allow all female kakapo the ability to breed. Perhaps natural food sources within their foraging home-ranges are more important than we

had previously thought? The purpose of this research was to estimate the foraging home ranges of adult female kakapo and the vegetation types they occupy. Comparisons will be made between individuals and any correlations with breeding success discussed.

160 years of vegetation change in Melbourne's south eastern suburbs

Presentation Type: Oral

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Prior to the 1920's the south eastern suburbs of Melbourne were a favourite excursion ground for the Field Naturalist Club of Victoria. They visited the area to enjoy floral displays of the 'heathgrounds" and to collect specimens. Using 34 published historical accounts, over 1800 early herbarium specimens and environmental data I have re-constructed the pre-European vegetation of the area. Comparisons with recent vegetation surveys indicate that 3.25% of the original vegetation remains. Compared to other vegetation types, in particular grassy woodlands and wetlands, the "heathgrounds" have been relatively well preserved. At least ninety species have gone locally extinct in the 160 years since settlement. Analyses suggest that species from the Asteraceae, Orchidaceae and those inhabiting fertile grassy communities are particularly susceptible to local extinction due to urbanisation.

Impact of Pinus radiata invasion in Australian Eucalypt woodland

Presentation Type: Oral

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Pinus invasions are considered major ecological problems in New Zealand and South Africa where wildlings are beginning to dominate natural areas and suppress native vegetation. We investigated the impact of Pinus radiata, the most common plantation species in Australian Eucalypt woodland. A comprehensive field survey of P. radiata plantations in New South Wales was conducted to determine the extent of spread and investigate the influence of vegetation and soil type, direction from wind and propagule pressure influence on pine invasibility.
Pine spread was most severe in the world heritage listed Blue Mountains region where pine densities reached up to 1000 individuals per hectare in areas adjacent to the plantation and isolated pines were recorded up to 4 km from the source. Invaded areas are subjected to three fold increases in canopy cover and substantial pine needle fall rates equivalent to those recorded in plantations (1800kg/ha). The influence of litter and reduced light levels on native and pine establishment was investigated in the field and glasshouse. Pine germination and survival rates in Eucalypt woodland and evidence of self reproduction by wildlings suggest that in the absence of adequate control measures pines may become established invaders in the Australian landscape.

Modelling the spread of hawthorn in montane Canterbury

Presentation Type: Oral

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Hawthorn (Crataegus monogyna) is a widespread bird-dispersed invasive tree in eastern montane South Island shrublands. We modelled its spread to assist in evaluating its threat to indigenous communities. We sampled a population where the founding trees were identifiable and the total spread of the invasion could be delineated. Tree age was determined from age-height relationships derived from ring counts and tree locations were recorded using a GPS. The associated vegetation and land form was classified from field observations and aerial photographs.
Beginning from founding trees, now 80 years old, the pattern of spread suggests very slow early establishment of outlying loci, largely within the present total extent of approximately 5 km2. Land-use changes in the last c.40 years resulted in the spread of the spiny native matagouri (Discaria toumatou) which provided perching sites for birds and protection from grazing for hawthorn. The hawthorn population has subsequently exploded rapidly, resulting in dense areas of hawthorn scrub and low forest. This offers nesting sites for blackbirds in a previously treeless landscape, so that as the naturalised hawthorn increases, so do its naturalised primary dispersers, an example of "environmental meltdown".

Efficient monitoring and better environmental outcomes using Bayesian decision theory

Presentation Type: Oral

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A central role of monitoring is to inform management aimed at continuous improvement, by iteratively updating information about the effectiveness of actions or the magnitude of their impacts. However, monitoring is expensive and there is little evidence that current approaches to monitoring have led to better environmental outcomes, timely remediation of environmental impacts or improved management efficiency. Monitoring has largely failed to influence management in the way it should because of a failure to implement a decision framework that explicitly links monitoring results to management decisions.

Bayesian decision theory provides a natural way to update beliefs and management strategies with monitoring data, to communicate uncertainty and to incorporate uncertainty in decision making. I'll present two cases studies that highlight the value of Bayesian decision theory in the design of monitoring strategies. The first case study identifies optimal strategies for monitoring and logging yellow bellied glider habitat when faced with uncertainty about the state of the population, the magnitude of logging

impacts and population growth rates. The second case study illustrates an optimal strategy for allocating resources to monitoring and managing a cryptic species when its population status is unknown. Similar models for monitoring bio-invasion and restoration success will be discussed.

Does surrounding vegetation influence species composition of habitat islands?

Presentation Type: Oral

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Most explanations for why plant species composition and species richness vary among habitat islands are based on habitat island properties (e.g. environment, size, successional status) and proximity to similar habitats. The influence of surrounding vegetation (or matrix) has received less attention. To understand how both outcrop properties and matrix vegetation influence habitat island composition, we sampled vegetation of montane rock outcrops and their matrix on Banks Peninsula. We use these data to address two hypotheses: 1) removal of adjacent forest has made outcrop vegetation less distinct from its matrix; 2) invasion by exotics has made outcrop vegetation less distinct from its matrix. The outcrop flora represents 33% of the regional flora although outcrops comprise only 5% of the area. 77% of the outcrop flora is native. >80% of the outcrop flora is shared with the matrix. Similarity to the matrix varies among outcrop sites and increases as the proportion of the matrix in grassland increases and as vegetation height on the outcrop decreases. The exotic flora is more similar between outcrops and their matrix than is the native flora. Our work implies that surrounding vegetation must be managed appropriately to achieve a desired composition in this type of habitat island.

Using elasticity values from matrix models to develop management strategies for fluctuating populations of stoats in New Zealand

Presentation Type: Oral

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Elasticity analysis decomposes the population growth rate (1) into contributions made by different vital rates (i.e. survival and reproduction). Elasticity analysis thus offers an opportunity to focus management on the vital rates with the highest impact on 1. However, directions for population management derived from elasticity analyses may be erroneous if the variation in vital rates and population growth rates is extensive. We developed age-specific matrix models for naturally fluctuating populations of stoats (Mustela erminea) in New Zealand beech (Nothofagus spp.) forests. The dynamics and productivity of stoat populations in this environment are related to the 3-5 year masting cycle of beech trees and its consequent effects on the abundance of rodents. The growth rates of stoats in our study areas varied substantially among years. The variation in

population growth was a consequence of cohort effects driven by the high reproductive success of females mating in seedfall years combined with the low survival through their first year of young stoats born in post-seedfall years. When we combined annual matrices into cycles 3, 4 and 5 years long we found that elasticities depend on both the phase of the cycle and its duration. We discuss the management implications of our results.

Diet of moa at Daley's Flat, Dart River Valley, western Otago : Preliminary results from a study of coprolites.

Presentation Type: Poster

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In February 2005 an expedition led by Otago Museum recovered moa bones from a c.60 hectare area of rockfall deposit at Daley's Flat, Dart River Valley, western Otago. Bones of at least 12 moa were recovered (8 Pachyornis elephantopus, 3 Dinornis robustus, 1 Megalapteryx didinus), as well as a significant number of desiccated moa droppings (coprolites), from dry sites beneath large boulders. Analysis of plant remains (seeds and leaf fragments) in 81 of the coprolites revealed that the moa were not feeding beneath a beech (Nothofagus spp.) forest canopy, as currently exists on the rockfall, but inhabited the site soon after the rockfall event, prior to regeneration of the forest. Plant species represented in the coprolites are characteristic of early successional vegetation found on rockfalls in the western Otago region (Mark 1977), and include Ranunculus spp, Lagenifera pumila, Muehlenbeckia axillaris, Pratia angulata, Gaultheria crassa, Leucopogon fraseri, Coriaria plumosa, Wahlenbergia pygmaea, Urtica incisa, Carex sp, Carmichaelia sp. and Coprosma sp. cf. petriei. The presence of divaricate, prostrate, spiny and toxic plant species supports the hypotheses that these traits coevolved with moa. Ancient DNA analysis of the coprolites is planned, and will provide data on the species of moa which deposited them.

Mark, A.F. 1977. Vegetation of Mount Aspiring National Park, New Zealand. National Parks Scientific Series number 2, National Parks Authority, Wellington. 79pp.

In the heart of a New Zealand desert: Reconstructing the late Holocene, semi-arid ecosystem of the Cromwell Gorge, Central Otago, South Island, New Zealand.

Presentation Type: Oral

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Cromwell Gorge, between Alexandra and Cromwell, is the driest area on the New Zealand mainland, with a mean annual rainfall of <400mm. The current flora and fauna of the gorge is highly modified, with most of the natural woody vegetation having been removed by Polynesian fires c.700 years ago. Currently, introduced weeds such as briar and thyme are widespread, and few native bird species remain. Plant and animal remains (including insects, coprolites, wood, leaves, seeds, feathers and bones) preserved in dry sediments from several rock-overhangs and pitfall deposits throughout the c.30km long gorge allow reconstruction of the ecosystem present there during the late Holocene. The subfossil plant remains represent an open woodland community that included many

species now rare or absent in Central Otago. Dominant woody taxa included several species of Coprosma and Olearia, Corokia cotoneaster, Myrsine sp., Plagianthus regius, Pseudopanax ferox, Sophora sp. and Pittosporum tenuifolium. Lianes, including Muehlenbeckia spp. and Rubus spp. were also an important component of the vegetation. Around Alexandra, the woodland was interspersed with small areas of saltpan and grass-dominated vegetation. Subfossil remains of at least 26 bird species (half of which were flightless, including 5 species of moa, 3 rails and kakapo), bats, tuatara and skinks are also known from late Holocene deposits in the Cromwell Gorge area.

Where do all the seeds go? Estimating dispersal distances from pigeon movements and seed retention times

Presentation Type: Oral

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We are using recent advances in modelling approaches to estimate seed dispersal distances generated by the NZ fruit pigeon (Hemiphaga novaeseelandiae). This method combines detailed data on pigeon movement patterns and seed retention times.

We radio-tracked 24 individual pigeons over 43 tracking days, from populations in Taranaki and on Banks Peninsula. Pigeons in Taranaki were radio-tracked during January and March. Banks Peninsula pigeons were tracked during February and from late March to early April. We followed each individual continuously for up to eight hours, collecting data on residence times and locations visited. A small number of seed retention times was recorded from wild pigeons during radio-tracking. We also offered native fruits to captive pigeons and recorded seed retention times.

Pigeon movements were highly variable, ranging from distances of a few meters to over a kilometre in a single flight. The longest time recorded at one location was five hours. Seed retention times were also variable, ranging from 20 minutes to more than five hours. Wild seed retention times are consistent with times recorded for captive pigeons.

The costs and benefits of being big: Mast seeding and insect pollination in Aciphylla (Apiaceae)

Presentation Type: Oral

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Aciphylla spp (wild spaniards) are an iconic component of the Australasian high country flora, but their reproductive system is enigmatic. Aciphylla spp are insect-pollinated dioecious mast seeders (synchronous highly variable seed production), which seems maladaptive. The resource supply to pollinators is highly variable, yet dioecious plants are dependent on pollinators, and dioecious masting requires male and female plants to flower synchronously. Floral display in Aciphylla is relatively large, with tall inflorescences bearing thousands of flowers, suggesting that plants would not have the resources to produce such large stalks every year. But why do they have such huge inflorescences in the first place? I tested

whether pollinator attraction is providing an economy of scale which favours intermittent production of very large inflorescences by manipulating floral display size during a high-flowering year, and measuring insect visitation rates and seed set. Using space-for-time substitution and selective removal of male inflorescences, I also tested whether female seed set was affected by distance to flowering male plants (i.e. changes in local pollen availability) to see if flowering asynchrony would reduce pollination success. Supplementary pollination was done to test for pollen limitation and bags were used to exclude pollination by insects and test for wind pollination. Results showed seed set rate was higher for taller inflorescences but also increased with a reduction in flowers on the inflorescence, and pollen supplementation only marginally increased seed set rates.. This suggests that the pollinator-attraction benefits of such a large floral display are in a dynamic trade-off with the resource costs involved in reproduction and may provide selection for masting in Aciphylla.

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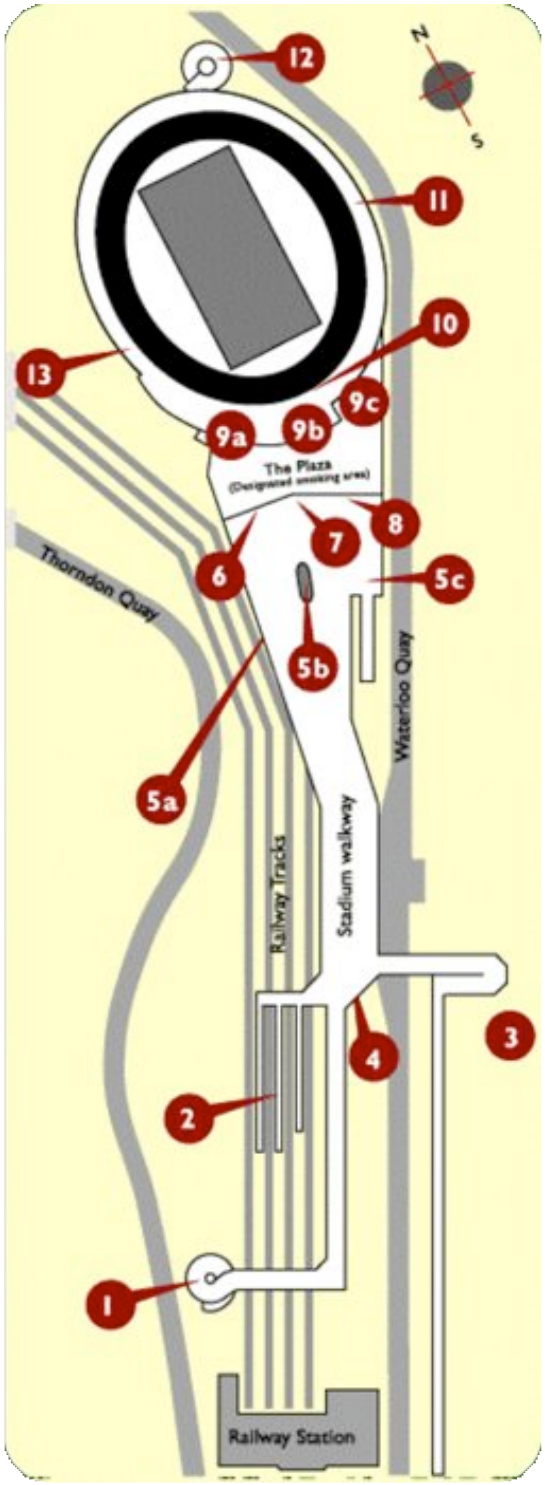
Conference dinner venue — Westpac Stadium



1. The main pedestrian access to the Stadium walkway is from the north end of Featherston Street, near the bus terminal on the west side of the railway station.

2. Train passengers can reach the Stadium walkway directly from the platforms.

3. Serves as pedestrian access from the port and Lambton Harbour areas.

4. Entrance to the Stadium carpark from Waterloo Quay.

5. (c) Taxi and shuttle set down area **Entry to Functions Carpa**r**king,** half way up the main ramp, signed with an overhanging sign 'Functions Carparking'. **Parking is $4.00 per day (even after hours)**, a Wilson's pay and display machine is available on this level. **To avoid an expensive fine or being towed please ensure you display a parking voucher at all times.**

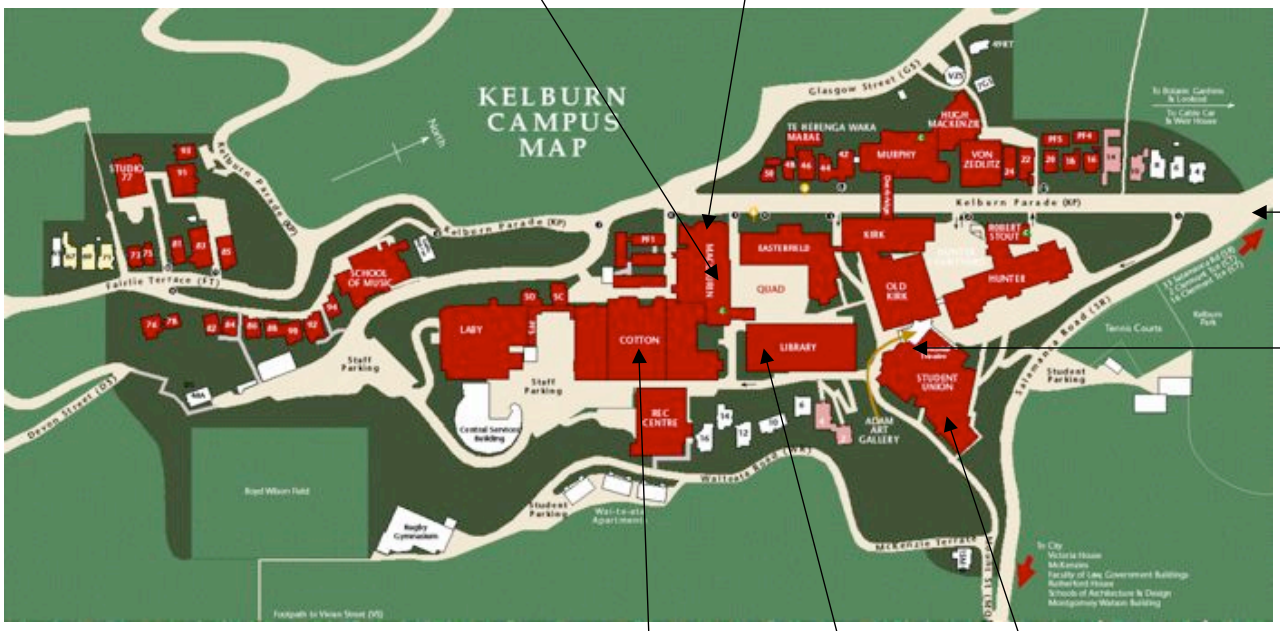
5. (b) Take the stairwell from the Functions carpark to the Stadium walkway.

8. Enter through the right hand ticketing gates, you will see the "Functions Centre Entrance" sign.

9. (b) Functions entrance for guests and corporate box holders. **In the Level 1 foyer there will be directions to your room.**

12. Emergency exit only at the northern end behind the replay screen.

Kelburn Campus



Conference Evaluation Form

Please tell us how you feel about this year's conference. Your feedback will be used by future conference organisers. All responses will be entered into a draw for one year's **free membership** of the NZ Ecological Society.

What did you enjoy most about this year's conference?
What did you enjoy least about this year's conference?

Please provide comments or suggestions for improvement of:

Quality of information before the event (e.g. website, online registration)
Organisation at the event (e.g. registration process, venue)
Scientific programme
Posters
Field trips
Social events
Any other suggestions or thoughts about this conference?
Are there any topics or activities that you would like to see included in next year's conference?

For entry into the draw for one year **free membership** to the NZES:
Your name _____ (we have your contact details)
Please return evaluation form to the box on the registration desk by Friday.