49th Annual Conference of the
International Association for Vegetation Science

New Zealand:
New home; new habitat! new ideas?

Book of Abstracts

Edited by R.A. van Essen

Palmerston North, New Zealand: 12 - 16 February 2007
“Te manu kai i te miro nōna te ngahere. Te manu kai i te mātauranga nōna te ao.”

“The bird who eats of the miro tree owns the forest. The bird who eats of the tree of knowledge owns the world.”
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Welcome!

Dear delegate,

Welcome to New Zealand! We are proud to present to you the 49th Annual Conference of the International Association for Vegetation Science.

The theme of the conference is **New Zealand: New home; New habitat! New ideas?** New Zealand was one of the last places on Earth to be inhabited by humans, and study of the effects of those immigrants on the land and vegetation can teach us much about our world. As well as papers relevant to the conference theme, the conference also includes papers on a wide range of vegetation science topics from around the world, and we are sure that everyone will find something of interest.

We would like to take the opportunity to thank IAVS for the opportunity to host this conference and Massey University and its Institute of Natural Resources for hosting it. Thanks also go to those who have helped in the organisation of the conference and its many excursions (see committee list below).

I hope you make the most of your trip to New Zealand and enjoy your experience here.

Dr G.L. Rapson  
Chief organiser

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**Conference Organising Committee**

<table>
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<td>Isabel Castro - Massey University</td>
<td>Fauna advisor; excursion guide</td>
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<td>Ian Henderson - Massey University</td>
<td>Mid-conference excursion guide</td>
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<td>Barbara Just - Massey University</td>
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<td>Vivienne McGlynn - Dept. of Conservation</td>
<td>Department of Conservation liaison</td>
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<tr>
<td>John Ogden - University of Auckland</td>
<td>Pre- and mid-conference excursions guide</td>
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<tr>
<td>Jill Rapson - Massey University</td>
<td>Chief organiser; Programme committee</td>
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<td>Sarah Siebert - Massey University</td>
<td>Conference Manager</td>
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<td>Glenn Stewart - Lincoln University</td>
<td>Co-proposer</td>
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<td>Peter van Essen - Massey University</td>
<td>Excursion guide</td>
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<td>Rosemary van Essen - Massey University</td>
<td>Conference assistant; Programme committee</td>
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<tr>
<td>Susan Wiser - Landcare Research</td>
<td>Programme committee</td>
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<tr>
<td>Bastow Wilson - University of Otago</td>
<td>Adviser</td>
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**Sponsors**

We are very grateful for the financial support or support in kind of the following organisations who have generously contributed to the success and well-being of the conference.

New Zealand Automobile Association
http://www.aa.co.nz/index.html

Biolab New Zealand
http://www.biolabgroup.com/nzhome.asp

Blackwell Publishing
http://www.blackwellpublishing.com

Department of Conservation, Auckland

Department of Conservation, Canterbury Conservancy

Department of Conservation, Palmerston North

Department of Conservation, Waipoua

Destination Manawatu
http://www.manawatunz.co.nz

GNS Science
http://www.gns.cri.nz

Hubbards Foods Ltd
http://www.hubbards.co.nz

Massey University
http://www.massey.ac.nz

Manaaki Whenua Landcare Research
http://www.landcareresearch.co.nz

Manaaki Whenua Press
http://www.mwpress.co.nz

Royal Society of New Zealand
http://www.rsnz.org

Tongariro Natural History Society
http://www.tongariro.org.nz

Opulus Press
http://www.opuluspress.se
### 49th IAVS Conference Overview

Check the programme (page 24) for exact starting times and more details.

#### Early morning
- **Sun**
  - North Island field excursion concludes about 4pm

#### Early afternoon
- **Monday**
  - 1: New Zealand in the context of vegetation science (AH1)
    - Chair: Bill Lee
    - Org: Jill Rapson
  - 2: Islands and forests (AH1)
    - Chair: Bruce Clarkson
    - Org: Dieter Mueller-Dombois
  - 3: Herbivory-driven ecosystems (AH1)
    - Chair: Alastair Robertson
    - Org: Sandra Díaz
  - 4: Posters, drinks, nibbles session (AgHort Foyer)

#### Late morning
- **Tuesday**
  - 5: Invasions - Setting the scene (AH1)
    - Chair: Peter Williams
    - Org: Peter Bellingham & Peter Williams

#### Early afternoon
- **Wednesday**
  - 6: Invasions - Specific ecosystems (AH2)
    - Chair: Peter Bellingham
    - Org: Peter Bellingham & Peter Williams
  - 7: Global change (AH3)
    - Chair: Martin Zobel
    - Org: Martin Sykes
  - 8: Global change (AH2)
    - Chair: Peter Bellingham
    - Org: Peter Bellingham & Peter Williams
  - 9: Urban vegetation (AH3)
    - Chair: Ken Thompson
    - Org: Ken Thompson & Stefan Koz
  - 10: Urban vegetation (AH2)
    - Chair: Anke Jentsch
    - Org: Martin Sykes
  - 11: Urban vegetation (AH3)
    - Chair: Ken Thompson
    - Org: Ken Thompson & Stefan Koz
  - 12: Bioinformatics - databases and software (AH2)
    - Chair: Bob Peet
    - Org: Susan Wiser & Bob Peet
  - 13: Bioinformatics - Large scale data syntheses (AH2)
    - Chair: Susan Wiser & Bob Peet
    - Org: Susan Wiser & Bob Peet
  - 14: Agricultural land use changes (AH4)
    - Chair: Angelika Schwabe-Kräsch
    - Org: Angelika Schwabe-Kräsch, Robert Wolfhagen
  - 15: Agricultural land use changes (AH3)
    - Chair: Angelika Schwabe-Kräsch
    - Org: Angelika Schwabe-Kräsch, Robert Wolfhagen
  - 16: Agricultural land use changes (AH2)
    - Chair: Angelika Schwabe-Kräsch
    - Org: Angelika Schwabe-Kräsch, Robert Wolfhagen
  - 17: Agricultural land use changes (AH3)
    - Chair: Angelika Schwabe-Kräsch
    - Org: Angelika Schwabe-Kräsch, Robert Wolfhagen
  - 18: Agricultural land use changes (AH4)
    - Chair: Angelika Schwabe-Kräsch
    - Org: Angelika Schwabe-Kräsch, Robert Wolfhagen

#### Late afternoon
- **Thursday**
  - 19: Agricultural land use changes (AH2)
    - Chair: Angelika Schwabe-Kräsch
    - Org: Angelika Schwabe-Kräsch, Robert Wolfhagen
  - 20: Agricultural land use changes (AH3)
    - Chair: Angelika Schwabe-Kräsch
    - Org: Angelika Schwabe-Kräsch, Robert Wolfhagen
  - 21: Agricultural land use changes (AH4)
    - Chair: Angelika Schwabe-Kräsch
    - Org: Angelika Schwabe-Kräsch, Robert Wolfhagen
  - 22: Agricultural land use changes (AH1)
    - Chair: Angelika Schwabe-Kräsch
    - Org: Angelika Schwabe-Kräsch, Robert Wolfhagen
  - 23: Agricultural land use changes (AH2)
    - Chair: Angelika Schwabe-Kräsch
    - Org: Angelika Schwabe-Kräsch, Robert Wolfhagen
  - 24: Agricultural land use changes (AH3)
    - Chair: Angelika Schwabe-Kräsch
    - Org: Angelika Schwabe-Kräsch, Robert Wolfhagen
  - 25: Agricultural land use changes (AH4)
    - Chair: Angelika Schwabe-Kräsch
    - Org: Angelika Schwabe-Kräsch, Robert Wolfhagen
  - 26: Plant diversity patterns (AH1)
    - Chair: Bryan Foster
    - Org: Meelis Pärtel
  - 27: Plant diversity patterns (AH2)
    - Chair: Bryan Foster
    - Org: Meelis Pärtel
  - 28: Plant diversity patterns (AH3)
    - Chair: Bryan Foster
    - Org: Meelis Pärtel
  - 29: Plant diversity patterns (AH4)
    - Chair: Bryan Foster
    - Org: Meelis Pärtel
  - 30: Plant diversity patterns (AH4)
    - Chair: Bryan Foster
    - Org: Meelis Pärtel
The IAVS is an International Association for all individuals interested in vegetation science. Its aims are:

- to promote research and education in vegetation science;
- to promote the publication of research results in vegetation science;
- to facilitate scientific and personal contacts among vegetation scientists of all countries; and
- to promote applications of vegetation science; to increase awareness and to disseminate knowledge about vegetation.

APPLICATION FORM FOR NEW IAVS MEMBERS

Name -- including title(s):

Address -- including post code and country:

Tel. -- work; otherwise private:    Fax -- work; otherwise private:

Email:        Website:

Date:

Journal -- Journal of Vegetation Science and/or Journal of Applied Vegetation Science:

Signature:

For those who would like to become a member without subscribing to a journal, the annual membership fee (20 euro) has to be paid to the account number of the IAVS: Account no. 92.15.29.023 of IAVS, Wes Beekhuizenweg 3, Renkum, Netherlands. Use BIC/Swiftcode: SNS BNL 2A, IBANcode: NL40 SNSB 0921 5290 23. Take care of banking costs!

Members who would like to subscribe to a journal do not have to pay this annual fee, since membership is included in the journal subscription. Journal subscribers have to contact Solveig Bodare, Opulus Press, Gamla vägen 40, 770 13 Grangärde, Sweden. Tel.  +46 240641250, Fax  +46 240640880, E-mail admin@opuspress.se.

Website: http://www.iavs.org

Please send this form to:
Joop Schaminée, Secretary General
c/o Alterra, P.O. Box 46, NL6700 AA Wageningen, The Netherlands.
Email: Joop.Schaminee@wur.nl

Or to:
Nina Smits, Administrator,
Wes Beekhuizenweg 3, 6871 VJ Renkum, The Netherlands;
E-mail: n.a.c.smits@bio.uu.nl
General Information

Health and Safety
In case of emergency call 111. If on a University phone, dial 1 first to get out of the University system, i.e. 1-111.

Evacuation – If you hear a continuous alarm bell or siren, you need to evacuate the building. (The usual reason for evacuation is fire drill.) Emergency exits will unlock. If you are in the AgHort Building make your way through the nearest exit and meet out by the duck pond to the north of the building, away from the rest of the buildings. If you are in the Ecology Building then leave through the nearest exit and make your way around to the front to the building; the meeting area is at the corner of University Avenue and Orchard Road.

Earthquakes – If you are inside during an earthquake, take shelter under a desk, bed, or doorway to protect yourself from falling debris, and try to keep away from windows or other glass, which may shatter. If you are outside, keep in the open, well away from buildings, trees, powerpoles, or anything else that might fall on you. Once the earthquake has finished, move outside in case of fire, building collapse, or aftershocks.

Doctors – For dire emergencies, such as the chopping off of a limb, go to the hospital. Otherwise, go to City Doctors.

Palmerston North Hospital
50 Ruahine St
Telephone (06) 356 9169

City Doctors
22 Victoria Ave
Telephone (06) 355 3300

City Health Pharmacy
22 Victoria Ave
Telephone: (06) 355 5287

Name badges
We ask that you wear your name badge throughout the conference and social events. It serves as proof that you're part of the conference and prevents you from being thrown out. It's also necessary for entry into some events, such as lunch. No badge, no lunch.

Registration desk
The registration desk will be manned throughout the conference. Should you require any information or assistance, please do not hesitate to visit the registration desk and speak to Sarah Siebert, the Conference Manager.

Computers, email, photocopying, faxes
There are computers available in AH5 in the AgHort Lecture Block where you can access the web, check your email, do word processing, and tweak your Powerpoint presentations. Photocopying can be done in the Library and some of the machines are coin-operated. The cost is 10c a page.

The conference usercode to get access to the computers in the AgHort lecture block is
Username: iavs2007
Password: sophora

Mobile phones/cellphones
Please turn these off or put them on silent mode while you are listening to presenters. It's only polite. There are payphones available around campus as marked on your campus map. If you need phones cards they are available at the MUSA shop or Bennetts.

T-shirts
Conference t-shirts are available at the sales table. There are limited numbers – first in, best dressed.
Smoking
Smoking is not permitted within 10m (30 feet) of University buildings except where there is a designated smoking area.

Food and Drink
Morning and afternoon tea will be available all meeting days of the conference in the foyer of the AgHort Lecture Block. For information on finding shops and the lunch venue, see the section below on “Getting around Massey University’s Turitea Campus”.

Lunches
The conference lunches (held Monday, Tuesday, Thursday, and Friday) will be held at the far end of the Dining Hall on the Concourse and you will need your name badge to get in.

To get here from the AgHort Lecture Block, go out the main doors and turn left, walking past the Vet Pond (with all the ducks) on your left and the Science Towers on your right. When you’ve passed the Science Towers turn right and walk along the concrete area between the Library and the Science Towers. This brings you to the head of the main Concourse. Go down the steps and into the large, glass-fronted building to the right which is filled with dining tables. Go to the back of the room and you will see the area where we will be sitting off to your left. Flash your name badge for entry.
Advice for Presenters

Talks

The duration of your talk should be obvious from the programme. Most speakers have a 20 minute slot, which means that they have 15 minutes for their talk, 3 minutes for questions, and 2 minutes for moving around between lecture rooms, and changing speakers. Please time your talk so that you can stick to this timetable. The session chairs will cut you off if you try to overrun. In particular, please ensure you leave time for questions and brief discussion.

Powerpoint users, please include your session and talk numbers at the head of your filename, to make it easy to organise all the ppts! E.g. a name like 27b_MansonA.ppt, is most convenient for us to file correctly.

If you have sent your talk Powerpoint in advance, then check it has been loaded correctly, and is functioning properly before your talk. There will be computers in the conference venue where you can do this. Please try to do this a few hours at least before your talk, so you have time to ask us to try to deal with your problem!

If you haven’t sent your Powerpoint presentation in advance, it should be handed in at least one day before it is to be presented so that we can check that it runs properly on our system. The lecture theatre computers use Windows, so Mac users need to make sure their presentation is saved in PC format.

Please use the break before your talk to meet with the session chair, and assure him/her that you are a) present, b) ready, and c) have everything you need to give your talk. Also ensure you have tried and tested the AV facilities, and can run the presentation from the front computer.

If you are not using Powerpoint, then you will find the lecture theatres have overhead and slide projectors, and also whiteboards. You might like to bring your own whiteboard pens, though they should be provided. Please advise Rosemary in advance if you want these or other special facilities, such as video projection.

Posters

The formal poster session is scheduled for the first day of the conference so that folk can meet the poster presenters early, and then have the rest of the conference to make further contacts, or follow up on the poster information. Posters will be displayed in the foyer of the conference venue for the duration of the conference.

Posters should be put up in the designated slot (see lists at the conference venue) during the morning or early afternoon of Monday. Display boards are designed to use velcro fasteners, and it is sensible to bring your own. Pins are not needed. Poster presenters are asked to stand by their poster for the duration of the late afternoon Drinks, Nibbles and Posters session, to offer guided tours of the poster’s highlights, and defend any ideas. Drinks and nibbles will circulate, so presenters shouldn’t miss out! So please ensure that you are present for this late afternoon gathering.
Guidelines for Session Chairs

Many thanks for kindly consenting to help us make the conference a success. We appreciate your efforts!

Below are some guidelines to keep the sessions running smoothly.

Preparation
• Check the correct session lists are on the door of your lecture room, and showing in the room itself.
• Take the time to meet up with the speakers in your session before the session actually starts, by being in the lecture room 10 minutes before the start of the session.
• Learn a factoid or two you can use to introduce your speakers (keeping within 20 seconds!)
• Ensure your speakers have all loaded their ppts or have organised any other equipment they need before the session begins.
• Make sure your speakers are familiar with their timetable and know how to run the AV equipment before their session.
• There will be someone in the lecture room to help with equipment if needed.

Running the session
• Keep people within time!
• Start sessions on time, regardless of whether people are still arriving, and make sure speakers finish precisely on 15 minutes. We’re relying on you to keep everything running smoothly. Give warnings at 12 and 14 minutes (for most speakers). Leave time (3 mins) for a discussion session, and then 2 minutes for changing speakers etc..
• There will a computer set up to the side of the lecture theatre, facing the speaker, with a countdown showing timetabled for each speaker. This should help them keep to time. This computer will be synchronised with the other theatres so make sure you all keep the sessions in sync.
• If a speaker finishes early, don’t start the next talk. Invite questions on previous talks until it’s time for the next speaker.
• Thank you for your help!

Awards

The award ceremony will be after the final talks on Friday.
Awards on offer include:
• Blackwell prizes for talks
• IAVS – best three student presentations

Judges are needed. Please let Jill or Rosemary know if you are willing to help here.
**Finding your way about Palmerston North**

**Campus**
Massey University’s Turitea Campus can be accessed from several directions. Coming from Palmerston North, you leave the city via Fitzherbert Avenue (the southerly road from the Square) and cross the Manawatu River via the Fitzherbert bridge. Ignoring the first turn off (to your left), you go under the overhead bridge and follow the road (now Tennent Drive) around a gentle S bend. There are signs to indicate the Massey turn-off, so follow these and take the left lane. Ignore the small Bledisloe Park carpark entrance, cross the Turitea Stream and take the first left turn immediately after the stream. This brings you into the Main Drive, the main entrance to the campus. If you miss this turn then keep driving. Ignore the first gateway on the left (this is no entry) and go up the hill. Half way up the hill on the left is the Monro Hill entrance, which will bring you onto University Ave (the Ring Road).

On foot the path is essentially the same; there are footpaths on either side of the road (pedestrians tend, though not always, to walk on the left side of the road, but may walk in either direction). The walkways are shared by pedestrians and cyclists (usually on the right hand side of the footpath), and have some underpasses. Cyclists use these footpaths between the edge of the city and campus, though generally you may not bike on the footpath in New Zealand. Those that can be used for bicycles are clearly marked.

If you are coming from the south (Wellington and Shannon way), following State Highway 57 will take you towards the campus on your right. As you approach the campus complex of buildings, take the Prendergast Rd on the right rather than going down the hill; follow this road as it turns left, right, and then left. This will bring you down the hill to where you can turn left onto Albany Drive which quickly takes you to University Avenue. If you turn right on the flat, you can access the back of the large carpark. If you miss the Prendergast Rd turnoff and you hit the bridge over the Manawatu River (easily identifiable since it’s the only river bridge for miles) then you know you’ve gone too far. Turn around where you can and follow the instructions above.

Coming from the north (from Auckland, Taupo, etc) you come through Palmerston North and so can follow the instructions above. If you’re coming from Napier way and therefore through Ashhurst or Woodville you can get to Massey without entering Palmerston North. Stay on the Napier side of the Manawatu River, and follow the Fitzherbert-East Road through Aokautere and towards Palmerston North. Just past the Pacific College and the new shopping centre under construction, you can either take Old West Rd on the left, and then turn right into Albany Drive, or you can go down Summerhill Drive and turn left before the overhead bridge, taking the road which merges with Tennent Drive, which will bring you to the main entrance of campus as described above.

**CBD**
The Central Business District, where you can find all the shops and cafés you could want, is centred around the Square. This is a small, mostly grassed area (becoming overgrown with concrete) with a duckpond and trees, and makes a good place to start from. Anybody will be able to give you directions to get to the Square. In the middle of the Square is the i-site, the main information centre.

**Police station**
(In case of emergencies dial 111.) The Police Station is on Church Street near the Princess Street end (ph: 351 3600). If you are coming from the Square then it is on your right. It’s big, blue, well-signposted and hard to miss. In New Zealand police are friendly, helpful and unarmed.
**Transport in Palmerston North**

**Taxis** usually can't be flagged down from the sidewalk; instead you can call one, either by phoning one of the taxi companies or by going to a taxi stand. There is a taxi stand just outside the Palmerston North airport terminal - there is no public transport from the airport. Those confident at driving in New Zealand can hire **rental cars** for travel around Palmerston North, but, more economically, there are regular **buses** that run out to the Massey campus from the centre of town as well as around parts of Palmerston North.

Taxis:
- Palmerston North Taxis
  - Ph: 06 355 5333
  - Ph: 0800 355 5333
- Manawatu Taxis
  - Ph: 06 355 5111
  - Ph: 0800 355 5111

**Overview map of Palmerston North**
Overview maps of Palmerston North

Main airport routes

Palmerston North International Airport

Map provided by Palmerston North International Airport
Phone  (06) 351 4415
Fax    (06) 355 2262
Email  pmair@pmaairport.co.nz
Central business district and Square
Finding important locations around Massey University's Turitea Campus

Refer to the Turitea Campus map on page 15. Number-letter combinations in brackets refer to map references.

Getting to the campus
From Fitzherbert Ave, head out south of the city. Cross the bridge over the Manawatu River and follow the road (now Tennent Drive) around a gentle S bend. There are signs indicating Massey University here; take the left lane. This brings you to Main Drive, the main entrance to Massey University. (See page 9 for more details.)

University Ave
University Avenue (known locally as the Ring Road because of its shape) is the main road on campus and from here you can get anywhere. It joins up with itself, so if you don't see what you're looking for on the first time through you can always just go around again. The speed limit is 30km/hr.

AgHort Lecture Block (F10)
This is where the presentations will be held. To get here follow University Ave until you see Riddet Rd. Walk down Riddet Rd past two buildings on the left and a carpark and a building (being rebuilt) on the right. You will see a building ahead at the end of the road (one of the four Science Towers), and a grassy area to your left with the Vet pond and Veterinary Science Tower beyond. Go left, along the path across the grass, and onto the concrete. Ahead and slightly to your left will bring you to the AgHort Lecture Theatre building on your right at the head of the Vet pond.

Ecology Building (E11)
This is where the Welcome Function will be held as well as many of the evening business meetings. Located on the corner of University Ave and Orchard Rd, the main entrance is off University Ave but there are multiple doors in. There is a white sign outside on the Ring Road so you should be able to spot it, as well as signage above the main door. At night only the main door will be open.

The Welcome Function will be held in the courtyard and staffroom. Coming in the main entrance, walk straight forward and through the glass door into the courtyard. The Staffroom looks out onto the courtyard. Toilets are found near the main entrance and behind the staffroom.

Library (E8)
The only door to the library building is on the Concourse. You can get here by many routes, depending on where you start. Coming off Turitea Rd (E7) on foot, go under the Registry and onto the Concourse, with the library to your right. Alternatively you can come up Library Rd (G6) and go either way around the building to the door.

Student Union (E8)
This is where the conference lunches will be held, in the building labelled Cafeteria on the map. Finding your way onto the Concourse (which can be reached via many routes), find the building with a large, two-storey glass front, opposite the library. This is the main cafeteria. When you enter you can buy food to your right; where we will be sitting is to the back of the room and off to the left.

Parking
There is a huge carpark out the back of the campus (E12), with minimal charges. Turn away from the hub of the Ring Road at Orchard Road past the red brick building of the Ecology Group. Drive slowly over the road spikes, and you then have a choice of the Gym park, the main carpark, or driving past the back of the buildings and onto the Ring Road again. You can also access and leave the carpark from Albany Drive, the back route into the campus. Most other parks are allocated to staff, so use this one! Parking around University Ave is all time-restricted.

This is paid parking and you have to buy a ticket to get out past the barrier arms. Your NZ$2 ticket to get out of the carpark can be used three times during the day (but only works on the day of purchase). A smaller carpark, run on the same principle, is on Collinson Rd (G11), but up a hill and therefore up a whole lot of steps.
Bike parking
Purple areas on the map are bike parks, the main areas being in D6, E7, and E8. Be sure to chain your bike if you don’t want it to demonstrate a disappearing act.

Green Bike Trust (G10)
The Green Bike Trust is a free service that lends out bicycles. It is found up a short driveway off University Ave. Please give them a donation to help them maintain this service. There is only a limited number of bikes available, so it's a case of first in, first served. You will need to show your name badge to prove you’re part of the conference.

Shops and cafes
The Commercial Complex (E6) includes a café and a bookshop. The Student Centre (E8) on the Concourse has a cafeteria and dining hall. The MUSA shop is on the Concourse next to the Student Centre and sells mostly snack foods. There is a little shop on University Ave (D10) which sells a few quick foods.

Money machines (ATMs)
There is an ATM next to the Registry building, at the foot of the Concourse (E8), outside and available at all hours. Another ATM is outside Science Tower (E9), on the south-east side. There is also a branch of the National Bank open on campus (E8), located on Concourse opposite the library and beside the cafeteria.

Bus stops
The main bus stop is in the centre of the campus (E9), with smaller bus stops at C7, D10 and G8. There should be timetables in the shelters (see also http://www.horizons.govt.nz/images/Transport/Massey%20Summer%20Timetable%200607.pdf); wait here for your bus. Ticket cost is about NZ$2.

Bus Timetable

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<th>Departs Main St Terminal</th>
<th>Route</th>
<th>Arrive At HC</th>
<th>Arrive At IPC</th>
<th>Arrive At Massey</th>
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KEY:
Massey - Massey University’s Turitea Campus
HC - Hokowhitu Campus
IPC - International Pacific College
AgHort Lecture Theatre

Rooms are numbered AH...

The A/V facility has computers for loading powerpoints and accessing the internet.
Council Meeting

Sunday 11th February 2007
At 7.00 pm
To be held in EB(C), Ecology Building, Massey University

Preliminary Agenda

1. Opening
2. Approval of the minutes of the last meeting
3. Report of the Executive committee
   - financial report
   - report of the Publication Officer
   - reports of Working Groups and regional Sections
   - report of the Chair of the editors of JVS and AVS
4. Administration of membership
5. Election of the next IAVS Council
6. Publication issues (Relationship between IAVS and Opulus Press, contract with the publisher, editors of JVS and AVS, etc.)
7. IAVS Activities of the coming years (symposia, working group workshops, etc.)
8. Closing

Editors’ Meeting

Monday 12th February 2007
At 6.30 pm
To be held in EB(C), Ecology Building, Massey University
Annual General Meeting

International Association for Vegetation Science

Notice of 49th Annual General Meeting

Thursday 15th February 2007
At 5.30 pm

To be held in AH1, AgHort Lecture Block, Massey University
Mid-Conference Excursions (Wednesday 14 February)

All participants are welcome to book a mid-conference excursion, if not already done so, and preferably by the end of the first day of the conference. However, places for those who have not yet booked can no longer be guaranteed! If you would like to book, or see if it is possible to change your booking, please see Rosemary to do so.

All trips depart from the Ring Road just outside the Ecology Building.

Egmont National Park  Surcharge NZ$50
Guides: Peter van Essen, Cleland Wallace and Yvette Cottam.
Examine the Mt Taranaki altitudinal gradient on this perfect volcanic cone of Egmont National Park.

Logistics: Your overnight and tramping gear will leave at noon on Tuesday in a van, so ensure you check it in before then! The trip departs Tuesday evening (5.45pm) from the Ring Road outside the Ecology Building, Massey University, for an hour's drive by bus to Wanganui, where participants can buy their own takeaways for tea. A further 2 hours of driving will take you to the Plateau carpark. Participants will then have a 25 minute walk to the Lodge in the dark (bring a torch!), up a gravel road and along walking tracks across the Manganui Monster (a steep gully with an avalanche path at the base) to the Manganui Ski Lodge, which will provide the night's accommodation. Your gear will have travelled across by flying fox. The Lodge has bunkrooms, so you will need to have a sleeping bag and towel. Breakfast and food to make the next day's lunch will be supplied. If you dillydally on the mountain you'll probably end up buying more takeaways on the way home.

Pre-trip meeting: Monday 4.30-4.40pm in AH3.
Gear: overnight and all-weather remote-country outdoor gear needed
Leave: 5.45pm Tuesday 13th February. Please arrive 10 minutes before this time.

Tongariro Crossing  Surcharge NZ$50
Guides: Ian Henderson, Paul Barrett, Alicia Henderson and the Tongariro Natural History Society.
Take a walk through this premier volcanic landscape, weather permitting. Fitness is needed as it is a 17 km walk with an 800m ascent and a 1200m descent.

Logistics: The trip departs Tuesday evening (5.45pm) from the Ring Road outside the Ecology Building, Massey University for a 1.5 hour drive by bus to Taihape, where participants can buy their own takeaways for tea. From there a 1.5 hour drive will take you round the mountain to Whakapapa, where you will be staying overnight in a ski lodge. You will need to bring a sleeping bag and towel. Breakfast and food for making lunch the next day will be supplied. Return will be by van to Palmerston North via a 3 hour drive. If you dilly-dally on the mountain you might want to buy takeaways for tea again in Taihape. If the weather precludes a safe crossing, you will instead have the opportunity to undertake several small walks of 30 minutes to 4 hours each in the vicinity of Whakapapa.

Pre-trip meeting: Monday 4.30-4.40pm in AH3.
Gear: overnight and all-weather remote-country outdoor gear needed
Leave: 5.45pm Tuesday 13th February. Please arrive 10 minutes before this time.

Kapiti Island  Surcharge NZ$30
Guides: Isabel Castro and Vivienne McGlynn.
Visit this predator-free island nature reserve (the first New Zealand island from which all mammalian predators were eliminated), to see many rare birds in the wild and inspect the varied regenerating podocarp forest and coastal scrub recovering from burning by European settlers and the earlier Maori settlers.

Logistics: Trip departs 8am Wednesday 14th February from the Ring Road outside the Ecology Building, Massey University. A 1.5 hour drive by bus is followed by a 15 minute ferry crossing (weather permitting). Then there will be an introduction by resident wardens to the ecology of the island after which participants can wander at will around the landing area and on the coastal or summit tracks. There are "long drops" (composting toilets) and a rain shelter near the landing area, but no other facilities are available to visitors. Sturdy footwear and moderate fitness are needed for the longer walks. Smoking is allowed only on the stony beach. Return trip as per arrival. If the ferries cannot sail, participants will be taken to Mt Bruce Bird Sanctuary instead (for details see the Accompanying Persons' Excursion programme).

Gear: light boots are preferable, though trainers/sneakers are acceptable; outdoor (sun and wet) gear. Swimming gear if you fancy a cold dip on a stony beach! Bring extra water.
Leave: 8.00am Wednesday 14th February. Please arrive 15 minutes before this time.
Mt Ruapehu altitudinal gradient

Guide: John Odgen, Tarnia Hodges, Shaun Nielsen and John Flenley.

A tour up the altitudinal gradient of Mt Ruapehu, along the Turoa skifield road, with some short walks.

Logistics: The trip departs by bus at 8.00am on Wednesday 14th Feb from the Ring Road outside the Ecology Building, Massey University. There will be a 2.5 hour drive to Ohakune at the base of the mountain (700m altitude) where we will stop for half an hour in podocarp forest. There will be toilets at this stop. The bus will then make 3-4 stops along the 12km road to the Turoa skifield (at 1600m), where parking permits. At each stop participants will be able to plunge into the trackless bush. Lunch will be eaten at one of the upper carparks or in the shelter of the Massey University Alpine Club hut. Depending on weather, participants may be able to walk around the fell field vegetation above the skifield facilities, and also take a half hour walk along the Round the Mountain track to a tarn called Rotokawa. The return trip involves the reverse of the above. If you’ve dilly-dallied on the mountain you might want to buy takeaways at Taihape on the way home.

Gear: Light boots are preferable, though trainers/sneakers are acceptable and rainjacket and sun gear.

Leave: 8.00am Wednesday 14th February. Please arrive 15 minutes before this time.

Manawatu dunes

Guide: Jill Rapson.

We will inspect coastal vegetation of several small reserves on the Manawatu sand dunes, part of the most actively prograding parabolic dune field in the world.

Logistics: The trip departs by bus at 8.30am on Wednesday 14th Feb from the Ring Road outside the Ecology Building, Massey University. We will start with a 50 minute drive to Tangimoana before spending two hours looking around the reserve there. A 20 minute drive will take us to Round Bush coastal dune forest where we will spend an hour walking into and through the forest (tracks are "limited"). A short drive will take us to Foxton Estuary where we will spend time puddling around. A further brief stop concludes the day's excursion.

Gear: light outdoor gear (rainjacket and sunhat); sneakers/trainers are find!.

Leave: 8.40am Wednesday 14th February. Please arrive 15 minutes before this time.

Manawatu lowland forest restoration

Guides: Mike Greenwood, Dave Havell and Jessica Costall

On this trip you will inspect the restoration ecology of several local native lowland podocarp/broadleaved forest remnants, and examine pioneering techniques for repairing vegetation.

Logistics: The trip departs by bus at 8.30am on Wednesday 14th Feb from the Ring Road outside the Ecology Building, Massey University. The first stop is 10 minutes’ drive to Keeble’s Bush, where about 3 hours will be spent walking around the various patches of the bush. Then a brief look at Greenwood’s bush nearby before a 15 minute drive to Ashhurst for lunch at the Domain. A 30 minute drive will then take the van to Fielding and Kitchener Park. An hour can be spent exploring Kitchener Park before returning to Palmerston North.

Gear: Sneakers/trainers and a light raincoat and sunhat.

Leave: 8.30am Wednesday 14th February. Please arrive 15 minutes before this time.

Turakina podocarp remnants


Visit the hinterland of Wanganui, up the Turakina Valley, to examine reserves showing a range of stages in podocarp forest dynamics, including almost pure podocarp stands.

Logistics: The trip departs by bus at 8.30am on Wednesday 14th Feb from the Ecology Building, Massey University. A 1 hour drive will take you to Pryce’s Rahui Bush, where there are some glorious podocarps. A half hour drive then takes you on to Sutherland’s Mangahoe Bush, which has a charming loop track to view a pole stand. A short drive takes you to Sutherlands Turakina Bush for lunch and a walk into the Maori pits. Another 30 minute drive will take you to McPherson’s Bush near Marton for a brief look at tawa’s role in forest dynamics. The day concludes with an hour’s drive back to Palmerston North.

Gear: trainers/sneakers or light boots; rainjacket and sunhat.

Leave: 8.30am Wednesday 14th February. Please arrive 15 minutes before this time.
Accompanying Persons’ Excursions

All trips depart from the Ring Road outside the Ecology Building. Please check the departure time carefully. If you wish to make a booking for one of these trips, please see Rosemary as soon as possible.

Mon 12th Feb – Te Papa, Wellington
Guides: Jessica Costall and Logan Brown.
Drive to the heart of Wellington for a morning at Te Papa Tongarewa, New Zealand's national museum, which features New Zealand and international displays. You will be able to buy lunch in the pleasant cafe. Then take an afternoon visit to Otari native plant gardens, New Zealand's only botanic garden to feature exclusively native plants, which also offers several half-hour walks in the adjacent Wilton’s Bush. Trip details: 2 hour drive each way.

- **Cost**: NZ$ 50 per person (lunch not provided).
- **Gear**: Light travelling and walking gear and raincoat.
- **Leave**: 9am Monday 12th February. Please arrive 10 minutes before this time.

Tues 13th Feb – Mt Bruce bird breeding centre
A day at the Mt Bruce Wildlife Sanctuary, a research and breeding centre for rare New Zealand bird species in a native bush setting. The rare birds are kept in large aviaries linked by well-maintained walkways. A number of birds also live wild in the native bush that surrounds the aviaries and stretches up the hill behind. There are also rare tuatara "lizards" (*Sphenodon* sp.) on display, and a kiwi (*Apteryx* sp.) nocturnal house. Eels (*Anguilla* spp.) in the river are fed about 1.30pm and kaka (*Nestor meridionalis*) about 3pm - both events are worth attending. Trip details: 1.5 hours driving each way. Entrance fee is included, but we will leave you to select your own lunch from the on-site cafe.

- **Cost**: NZ$ 50 (lunch not provided).
- **Gear**: Light travelling and walking gear and rainjacket.
- **Leave**: 9am Tuesday 13th February. Please arrive 10 minutes before this time.

Wed 14th Feb
Mid conference excursions can also be booked by accompanying persons. See page 19.

Thurs 15th Feb – Bridge to Nowhere, Whanganui River
Guide: Peter van Essen.
Jet boat up the Whanganui River, New Zealand's longest navigable river with a rich Maori history, then take a short walk to the Bridge to Nowhere, an access bridge built to service now abandoned farmland, and currently completely surrounded by bush. There will be an opportunity to kayak back down part of the river. Trip details: A 1 hour drive to Wanganui will be followed by another hour along the winding Whanganui River road to the jet boat landing for your excursion. You could well get wet, so come prepared! A picnic lunch will be provided. Return journey as above in reverse.

- **Cost**: NZ$ 200 per person (lunch provided). There is no discount for children, and the trip is unsuitable for children under 12.
- **Gear**: Old, comfy clothes, a change of clothes, a sunhat, sneakers/trainers and a rainjacket.
- **Leave**: Probably 7-7.30am. Check before Tuesday.

Fri 16th Feb – Cape Kidnappers’ Gannets
We will visit the gannet colony at Cape Kidnappers. Thousands of pairs of gannets nest on the headland, which can be reached by an 8km drive along a sandy beach via tractor-trailer. The journey passes under stratified mudstone cliff faces, past nesting black-backed gulls and white-fronted terns, and provides lots of interesting geological features. Trip details: 2.5 hours driving each way, plus an hour’s tractor ride. Timing is dependent on the tides and so departure from Palmerston North will be at 7am. Lunch will be at the Clearview Winery, which has lots of activities for kids. Return to Palmerston North about 4pm.

- **Cost**: NZ$ 120 per person (lunch provided).
- **Gear**: Comfy clothes, a change of clothes in case, a sunhat, sneakers/trainers and a rainjacket.
- **Leave**: 6.00am Friday 16th February. Please arrive 15 minutes before this time.
Pre- and Post-Conference Excursions

Pre-Conference Excursion (North Island)

Sorry, you’ve missed out on this but we had a great time!

Extra Kapiti Trip
Leader: Isabel Castro
An extra trip to Kapiti Island has been booked for Saturday 17th February for those people not going on the post-conference excursion, because the island is not easy to access, even for kiwis. For details see the Mid-Conference Excursion programme (page 19). If weather does not permit the ferry to sail, visitors will have the option of instead visiting Mt Bruce (see information in Accompanying Persons’ Excursion, page 22). There is a fee of NZ$100 to cover bus, permit, a packed lunch, and ferry fares. If you wish to join this trip, please enquire with Rosemary.

Cost: NZ$100 per person.

Gear: light boots are preferable, though trainers/sneakers are acceptable; outdoor (sun and wet) gear. Swimming gear if you fancy a cold dip on a stony beach! Bring extra water.

Leave: 8.00am Saturday 17th February from the Ring Road outside the Ecology Building.

Post-Conference Excursion (South Island)

The post-conference excursion will travel by air from Palmerston North to Nelson and then by vans around the South Island, finishing in Christchurch after 15 days. It will visit a range of lowland and alpine sites, in both wet and dry conditions, and cover most major southern vegetation types, offering both long and short walks to explore interesting vegetation. The trip finishes on Saturday March 3rd and the next day the vans will return overland and by ferry to Palmerston North (spaces are available on request).

Pre-trip meeting: Thursday 15th February at 5.30 - 5.45pm in the Ecology Building.

Leave: Saturday 17th February (probably) 6am for Palmerston airport. Please report at 5.30am (note this is a charter flight).
### 49th IAVS conference – Talks Programme

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<th>Time</th>
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<tr>
<td>8.30 - 10.30am</td>
<td>1: New Zealand in the context of vegetation science (AH1)</td>
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<td>11am - 12.20 / 1.10</td>
<td>Lunch (1.10 – 2.30pm)</td>
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<td>12.20 - 2pm</td>
<td>2: Islands and forests (AH1)</td>
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<td>2.00 / 2.30 - 3.40 / 4.30pm</td>
<td>3: Herbivory-driven ecosystems (AH1)</td>
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<td>4.00 / 4.30 - 5.20pm</td>
<td>4: Posters, drinks, nibbles session</td>
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**Monday**

#### 1: New Zealand in the context of vegetation science (AH1)
- **Chair:** Bill Lee
- **Chair:** Bill Lee
- **Co-ordinators:** Bill Lee, Liz Johnston, Robert Rees
- **Org:** Sandra Díaz

1. **9.00am (1a):** Peter Wardle - New Zealand: An isolated archipelago with remarkably varied vegetation.
2. **9.45am (1b):** Hans-Jürgen Link - New ideas from new habitats - How Pacific vegetation inspired modern vegetation science.

**2: Islands and forests (AH1)**

1. **10.30am (2a):** Dieter Müller-Dombois - New Zealand and PABITRA island forests: Successionally impoverished and now in danger of becoming overgrown?
2. **10.45am (2b):** Bruce Clarkson, BR Clarkson, JO Juvik & LR Walker - Primary succession to forest on some island and continental Pacific volcanoes.
3. **11.30am (2c):** Jim Juvik, BR Clarkson & BD Clarkson - Stochastic vs. deterministic primary succession in *Metrosideros* (Myrtaceae) dominated colonization of recent lava flows in Hawai'i and New Zealand.
4. **12noon (2d):** Marika Tuiwawa - Vegetation ecology in PABITRA island forests: Species-area curves and the importance of stochastic processes.
5. **12.20pm (2e):** Gunnar Keppel - Prehistoric and historic invasions of non-native forest in Samoan PABITRA sites.

**3: Herbivory-driven ecosystems (AH1)**

1. **2.30pm (3a):** J. Lee - Consequences for vegetation of avian dominance in New Zealand terrestrial ecosystems.
2. **3.10pm (3b):** Sandra Díaz - Evolved to be eaten? Plant traits, herbivory history and biogeochemistry.
3. **3.50pm (3c):** Francisco Azcárate, P. Manzano & B Peco - Factors conditioning the seed size of Mediterranean grassland communities: the importance of seedling death and climate

**4: Posters, drinks, nibbles session (starts 4.30pm; AgHort foyer)**

- **Room numbers follow the session title in brackets, e.g. 2: Islands and forests (AH1) where AH1 is the room. Session 2 is to be held in AGHort.**

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**Registration**

- **8.30 - 10.30am:** North Island field excursion concludes about 4pm.
- **11am - 12.20 / 1.10:** Registration
- **12.20 - 2pm:** Registration concludes about 4pm.

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**Welcome reception:**
- **5-7pm:**; Council meeting:
- **7.00pm:**

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**Tours**

- **Sun:** North Island field excursion concludes about 4pm.
- **Monday:**
  - **7.30am:** Registration (AgHort foyer)
  - **8.30am:** Opening (AH1)
  - **9.00am:** New Zealand in the context of vegetation science (AH1)
  - **12noon:** Lunch
  - **2.30pm:** Posters
  - **4.30pm:** Posters

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**Excursions**

- **Pre-trip meeting for Tongariro Crossing and Egmont excursions:** 4.30-4.40pm (AH3)
- **Editors’ meeting:** 6.30pm

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**Editors’ meeting:**

- **6.30pm:**
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker(s)</th>
<th>Title</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.00pm</td>
<td>Global change (AH2)</td>
<td>Martin Sykes</td>
<td>Large-scale factors affecting European biodiversity</td>
<td>Egmont</td>
</tr>
<tr>
<td>2.20pm</td>
<td>Global change (AH2)</td>
<td>Lauri Laanisto, M Piëtlet &amp; SD Wilson</td>
<td>Links between soil heterogeneity and global vegetation change</td>
<td>Egmont</td>
</tr>
<tr>
<td>3.00pm</td>
<td>Global change (AH2)</td>
<td>Anke Jentsch, C Beierkuhnlein</td>
<td>A new generation of climate change experiments: Events, not trends</td>
<td>Egmont</td>
</tr>
<tr>
<td>3.20pm</td>
<td>Global change (AH2)</td>
<td>Jonathan Lenoir, JC Gegout, PA Marquet, P De Ruffray &amp; J-F Dhôte</td>
<td>Spatial and temporal patterns in the vegetation of Central European springs</td>
<td>Egmont</td>
</tr>
<tr>
<td>3.40pm</td>
<td>Global change (AH2)</td>
<td>Paulina Pinto, J-C Gégout &amp; J-C Hervé</td>
<td>Western European forest plant species move up in response to climate change</td>
<td>Egmont</td>
</tr>
<tr>
<td>4.00pm</td>
<td>Urban vegetation (AH3)</td>
<td>Ken Thompson</td>
<td>Nature conservation in urban areas: Lessons from plant diversity studies</td>
<td>Egmont</td>
</tr>
<tr>
<td>4.20pm</td>
<td>Urban vegetation (AH3)</td>
<td>Martin Hermy</td>
<td>New habitats: importance for plant species diversity and society</td>
<td>Egmont</td>
</tr>
<tr>
<td>4.40pm</td>
<td>Urban vegetation (AH3)</td>
<td>Alina Stachurska-Swakon</td>
<td>The role of subalpine species in recent plant diversity of the Carpathians</td>
<td>Egmont</td>
</tr>
<tr>
<td>5.00pm</td>
<td>Urban vegetation (AH3)</td>
<td>Dieter Ramseier, RM Smith, JG Hodgson, PH Warren &amp; KJ Gaston</td>
<td>Composition and diversity compared with dry forests in Kenya</td>
<td>Egmont</td>
</tr>
<tr>
<td>5.45pm</td>
<td>Urban vegetation (AH3)</td>
<td>Nancy Golubiewski</td>
<td>outgoing Broccoli forest or urban jungle?</td>
<td>Egmont</td>
</tr>
</tbody>
</table>

**Tuesday**

5: Invasions - Setting the scene

6: Invasions - Specific ecosystems

7: Global change

8: Global change

9.50am: Kate McAlpine, CJ Howell & JA Terry: Are invasive species functionally distinct? A case study of New Zealand’s 330 environmental weeds.


9: Offered papers (AH3)

Chair - Elgene Box

11.00am (8a): Akira Miyawaki & S Meguro: Mechanism of biodiversity and growth dynamics at tropical rain forests in Southeast Asia and Amazon

11.00am (9a): Kazue Fujiwara, D Abdoulaye & T Furukawa: Is the tall savanna forest in Senegal one type of dry forest? – Its species composition and diversity compared with dry forests in Kenya.

11.00am (10a): Norbert Müller: On the role of alien plants in some large cities of Europe and North America.

11.00am (11a): Dieter Ramseier & B Kahler: Can flat roofs be improved to enhance plant species diversity?

11.20am: Akira Miyawaki & S Meguro: Mechanism of biodiversity and growth dynamics at tropical rain forests in Southeast Asia and Amazon

11.20am (9b): Kazue Fujiwara, D Abdoulaye & T Furukawa: Is the tall savanna forest in Senegal one type of dry forest? – Its species composition and diversity compared with dry forests in Kenya.


11.40am: Akira Miyawaki & S Meguro: Mechanism of biodiversity and growth dynamics at tropical rain forests in Southeast Asia and Amazon

11.40am (9c): Jem Bjemdalen: The calcareous riddle in a Fennoslovakian context in relationship to the species pool concept.

11.40am (10c): Reinhard Böcker: Neophytic plant species in Central European urban greenspaces.


12noon: Akira Miyawaki & S Meguro: Mechanism of biodiversity and growth dynamics at tropical rain forests in Southeast Asia and Amazon

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>12a</td>
<td>Welcome (13a) - John Gribble, Chair - Susan Wiser, Program Chair - Janet Franklin</td>
</tr>
</tbody>
</table>
| 12b | Donald A. Burgin: Demography and ecology of the upper timberline in malli (Schlumbergera) forest in the Negev desert of Israel. Also, Michael J. Franklin: Patterns in carbon dioxide exchange rates in a semi-arid grassland ecosystem. Also, Carol C. Franklin: The influence of soil ingestion by seeds on seedling establishment in a semi-arid grassland ecosystem. Also, John R. Franklin: The influence of seedling establishment on plant community composition in a semi-arid grassland ecosystem. Also, George W. Franklin: The influence of plant community composition on soil ingestion by seeds in a semi-arid grassland ecosystem. Also, Janet Franklin: The influence of soil ingestion by seeds on seedling establishment in a semi-arid grassland ecosystem. Also, Susan Franklin: The influence of seedling establishment on plant community composition in a semi-arid grassland ecosystem. 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<th>Time</th>
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<tbody>
<tr>
<td>13a</td>
<td>Overview of progress in biogeography (13aa) - Lubomír Tichý, Chair - Susan Wiser, Program Chair - Janet Franklin</td>
</tr>
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</table>

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<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
</table>
| 14a | Forestry dynamics (AH3) - Jarošík, P Pyšek, O Hájek, I Knollová, L Tichý & J Danihelka: Patterns of plant species richness and turnover in the New Zealand forest: Results from new methods of community analysis.

<table>
<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>15a</td>
<td>Agricultural land use changes (AH2) - Rainer Waldhardt &amp; GL Rapson, Chair - Helga Bültmann, Org: Helga Bültmann</td>
</tr>
</tbody>
</table>
| 15b | 4.00pm (15b): Discussion on future directions in bioinfomatics: Leader - Susan Wiser. Also, 4.00pm (15a): Demonstration of software: OPTIMCLASS. Also, 4.00pm (15b): Discussion on future directions in bioinfomatics: Leader - Susan Wiser. Also, 4.00pm (15a): Demonstration of software: OPTIMCLASS.
### Thursday (contd.)

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker(s)</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>20:00</td>
<td>Stephen Bonser, B Ladd &amp; DA Pepper</td>
<td>Mechanisms of competitive ability in Eucalyptus seedlings across a rainfall gradient.</td>
</tr>
<tr>
<td>22:00</td>
<td>Michael Forster &amp; SP Bonser</td>
<td>Sclerophyllous response to complex environments in the heterophyllous species Acacia implexa (Benth.)</td>
</tr>
<tr>
<td>23:00</td>
<td>Mari Moora &amp; M Zobel</td>
<td>Mycorrhiza and facilitation.</td>
</tr>
<tr>
<td>24:00</td>
<td>I Caballero, JM Olano, A Escudero &amp; Javier Loidi</td>
<td>Which factors shape seed rain in a mediterranean environment?</td>
</tr>
<tr>
<td>25:00</td>
<td>S Sridharan</td>
<td>Ecological status and regeneration of some medicinally important and threatened plants in Alagar Hills, Tamilnadu, India.</td>
</tr>
</tbody>
</table>

### Friday

<table>
<thead>
<tr>
<th>Time</th>
<th>Speaker(s)</th>
<th>Title</th>
</tr>
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<tbody>
<tr>
<td>08:30</td>
<td>On the importance of species size in patterns of assembly and diversity in vegetation.</td>
<td>Lonnie Aarssen</td>
</tr>
<tr>
<td>09:00</td>
<td>The interaction of soil fertility, disturbance and propagule pools in regulating plant diversity: a synthesis of sowing experiments from North American grasslands.</td>
<td>Bryan Foster &amp; GR Houseman</td>
</tr>
<tr>
<td>09:30</td>
<td>Plant diversity relationships in tropical and temperate regions: the role of evolutionary history.</td>
<td>Meelis Pärtel, LAanisto &amp; M Zobel</td>
</tr>
<tr>
<td>10:00</td>
<td>What is the potential role of dispersal limitation in generating general patterns of plant diversity?</td>
<td>Hank Stevens</td>
</tr>
<tr>
<td>11:00</td>
<td>Relationship between productivity, small scale and large scale species richness in herbaceous vegetation.</td>
<td>Martin Diekmann, D Viciani &amp; A Chiarucci</td>
</tr>
<tr>
<td>11:20</td>
<td>Changes in small-scale species richness and evenness in a fine-scaled grazing gradient: the dynamic equilibrium hypothesis revisited.</td>
<td>Pablo Manzano, B Peco, C Levassor &amp; JE Malo</td>
</tr>
<tr>
<td>12:00</td>
<td>Long-term dynamics of species-rich meadows and species coexistence.</td>
<td>Leos Klimeš</td>
</tr>
<tr>
<td>12:30</td>
<td>Patterns and importance of clonal plants across biomes in China.</td>
<td>Ming Dong, M Song &amp; R Li</td>
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</tbody>
</table>

### Conference

**25: New Zealand and new ideas - overview (AH1)**

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<tr>
<th>Time</th>
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<tbody>
<tr>
<td>14:00</td>
<td>Bastow Wilson</td>
<td>Six problems in the NZ vegetation: revisited.</td>
</tr>
<tr>
<td>14:40</td>
<td>Angela Moles</td>
<td>What would a kiwi know about the future of vegetation science?</td>
</tr>
<tr>
<td>15:15</td>
<td>Discussion on future of Vegetation Science.</td>
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<tr>
<td>15:30</td>
<td>Prizes and plaudits</td>
<td></td>
</tr>
</tbody>
</table>

### South Island Excursion

- **Saturday**
  - Conference BBQ: 6:30 – 8:00 pm
  - South Island Excursion departs 6am; extra trip to Kapiti departs 8am; everyone else goes away
ABSTRACTS

49th Annual Conference of the International Association for Vegetation Science

New Zealand:
New home; new habitat! new ideas?

Palmerston North, New Zealand: 12 - 16 February 2007
Talk abstracts (p. 31) are arranged in the order that they appear in the conference programme.

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Session 2: Islands and forests  p33
Session 3: Herbivory-driven ecosystems  p38
Session 4: Posters, drinks, and nibbles session  Posters
Session 5: Invasions – Setting the scene  p42
Session 6: Invasions – Specific ecosystems  p46
Session 7: Global change  p50
Session 8: Global change  p55
Session 9: Offered papers  p59
Session 10: Urban vegetation  p63
Session 11: Urban vegetation  p68
Session 12: Bioinformatics – Databases and software  p72
Session 13: Bioinformatics – Large scale data syntheses  p77
Session 14: Bioinformatics – Data syntheses across time  p81
Session 15: Forest dynamics  p86
Session 16: Agricultural land use changes  p90
Session 17: Agricultural land use changes  p95
Session 18: Agricultural land use changes  p99
Session 19: Offered papers  p104
Session 20: Population ecology  p108
Session 21: Population ecology  p113
Session 22: Plant diversity patterns  p117
Session 23: Plant diversity patterns  p122
Session 24: Plant diversity patterns  p126
Session 25: New Zealand and new ideas – overview  p131

Poster abstracts (p. 135) are arranged in alphabetical order by presenter surname (not necessarily first author).

If you are looking for a certain author, see the Author Index (p. 197)
New Zealand - an isolated archipelago with remarkably varied vegetation

Wardle, Peter
Landcare Research, PO Box 69, Lincoln, Canterbury, New Zealand
Email: wardlep@paradise.net.nz

Abstract: New Zealand supports native and adventive vegetation of comparable extent and taxonomic richness. The former is largely, possibly totally, derived from ancestors that arrived by transoceanic dispersal after the mid-Oligocene.

Native forests are generally evergreen, and fall into two broad types. In mixed broadleaved forests a subtropical aspect is imparted by physiognomy and taxonomic relationships. They usually have an overstorey of tall conifers, especially Podocarpaceae. *Nothofagus* forests grow mainly at higher altitudes and in the south, but in extensive areas where *Nothofagus* is absent, mixed forests grade to dense scrub that extends to tree limit.

A rich alpine flora has pan-temperate, Australian and Andean antecedents, but in less than two million years many strikingly unique plants have evolved. A belt dominated by tall *Chionchloa* tussocks intervenes between true alpine vegetation and the native tree limit, but is susceptible to invasion by hardy introduced trees.

At lower altitudes, especially in the eastern rain shadows, there were extensive grasslands, fernlands, shrublands and swamps. Most of this established after Maori colonization 700 years ago, and in turn has been largely displaced by adventive species since European settlement.
New ideas from new habitats - How Pacific vegetation dynamics inspired modern vegetation science

Boehmer, Hans Juergen
Technical University of Munich, Department of Ecology, Landscape Ecology (LOEK), Am Hochanger 6, D-85350 Freising, Germany
Email: neobiota@web.de

Abstract: The study of terrestrial Pacific ecosystems has brought about new ideas as well as modifications of traditional concepts of vegetation dynamics, thus altering and inspiring modern vegetation science. To illustrate this hypothesis, four aspects of modern vegetation dynamics research can be pointed out: the concept of succession from a Pacific point of view, natural disturbance as an important driving force of vegetation dynamics, effects of climate change on vegetation dynamics, and the long-term consequences of alien species invasions.

The traditional concept of vegetation succession describes succession as a progressive process. This is understandable from a European and North American point of view, where vegetation succession takes place predominantly on young, post-ice age soils. In contrast, continuous soil development in the Pacific region has gone on for much longer periods. Here, landscape change due to geomorphic aging, and associated soil aging, causes marginal site syndromes that lead to frequent natural retrogressions in vegetation.

In recent decades, natural disturbance has increasingly been recognized as a principal factor controlling structure and dynamics of plant communities. Major input for the success of this concept can be derived from studies of the dynamics of Nothofagus forests. At a landscape scale, Nothofagus forests often show a patchwork mosaic of different structure and species composition that results from natural disturbances. This impressive application of the disturbance regime concept has helped for a better understanding of vegetation dynamics in many ecosystems world-wide.

The increase of extreme climatic fluctuations due to climate change has profound effects on the structure and dynamics of vegetation in the Pacific area, and beyond. The phenomenon of stand-level dieback in forests, formerly interpreted as a local symptom of a disease or a pest attack, is nowadays understood as a complicated combination of biotic and abiotic factors that include generic levels as well as climatic triggers. As a secondary effect, declining forests become more vulnerable to biological invasions. The increase in forest invasibility due to widespread canopy decline makes invasive alien species capable of completely changing structure and species composition on the long term.
New Zealand and PABITRA island forests – successionally impoverished and now in danger of becoming overgrown?

Mueller-Dombois, Dieter  
Botany Department, University of Hawai`i at Manoa, 3190 Maile Way, Honolulu, Hawai`i 96822, USA  
Email: AMDHAWAII@aol.com

Abstract: New Zealand is an ancient continental island area while the PABITRA (Pacific-Asia Biodiversity Transect) islands are mostly oceanic and more recent in origin. Yet, the effects of disturbance, remoteness, and isolation appear to have produced functional similarities in their indigenous forests. Original island forests appear to be impoverished of successional species. Whenever disturbed, the same slow growing pioneer species seem to eventually resume dominance by processes known as “autosuccession”, “direct succession” or “cyclic succession”. Among their original species, there appears to be a dearth of successional species. Primary island forests typically lack “secondary forests”. However, the island isolation barrier has been broken by human introduction of species. Many of the introduced tree species have become invasive. In spite of successful control efforts, a new natural and non-stoppable forest dynamic is evolving on account of invasive species introduced by humans. New questions arising are: Will this result in island forests becoming overgrown with alien species? This scenario would invoke replacement of original island forests by “secondary forests.” Or will species invade the original forest with successionally functional types? This scenario would invoke a tendency from “direct” to “normal” or “replacement succession” and development of a chronological polyculture of tree species following major disturbances. In brief, what can we predict about the forest dynamics of island vegetation under global change?
Primary succession to forest on some island and continental Pacific volcanoes

Clarkson, B.D.1*; Clarkson, B.R.2; Juvik, J.O.3; Walker, L.R.4
1: Centre for Biodiversity & Ecology Research, University of Waikato, Private Bag 3105, Hamilton, New Zealand
2: Landcare Research, Private Bag 3127, Hamilton, New Zealand
3: Geography & Environmental Studies, University of Hawai‘i-Hilo, 200 W. Kawili St. Hilo, Hawai‘i 96720, USA
4: Department of Biological Sciences, Box 454004, University of Nevada, Las Vegas 89154-4004, USA
* Presenting author. Email: b.clarkson@waikato.ac.nz

Abstract: We have directly measured or spatially inferred primary forest succession following destruction by volcanic eruptions in a wide range of Pacific locations. Settings vary from extremely isolated islands (Hawai‘i) to moderately isolated islands with a continental heritage (New Zealand), to Pacific Rim continental sites (North America). A continuum of successional pattern is apparent. “Direct” succession is characteristic of sites with a limited flora, excessive isolation or extreme habitat conditions (including intermittent continuing disturbance). “Normal” succession is characteristic of sites where a larger species pool is available, disturbance return times greatly exceed the life span of late successional species, or habitat conditions are within tolerance ranges of a suite of tree species. Lack of certain functional types in the species pool or their failure to invade can delay development of more complex “climax” forests. Alien plants have locally enhanced some early or mid succession functional types, but have not prevented later dominance by native trees. Alien animals, however, have locally altered composition and abundance of mid and late successional native trees. New Zealand overall has characteristics intermediate to true island syndrome forests or continental forests.
Stochastic vs. deterministic primary succession pathways in *Metrosideros* (Myrtaceae) dominated colonization of recent lava flows in Hawai`i and New Zealand

Juvik, J.O.¹*; Clarkson, B.D.²; Clarkson, B.R.³
1: Geography & Environmental Studies, University of Hawai`i-Hilo, 200 W. Kawili St. Hilo, Hawai`i 96720, USA
2: Centre for Biodiversity & Ecology Research, University of Waikato, Private Bag 3105, Hamilton, New Zealand
3: Landcare Research, Private Bag 3127, Hamilton, New Zealand
* Presenting author. Email: jjuvik@hawaii.edu

**Abstract:** We have monitored plant colonization on recent (150-300 year old) lava flows of similar basaltic composition and substrate morphology (a`a) on Rangitoto Island, New Zealand (1980-2002) and Mauna Loa, Hawai`i (1990-2002). The floristic similarity between colonizing species at the two sites is greatest during early succession when severe substrate and environmental conditions restrict the potential pool of invading species. On Rangitoto, plant succession proceeds in a deterministic fashion with the initial establishment of *Metrosideros* trees that then function as “nurse plants”, beneath which other species later aggregate. Data suggest that increasing clump size rapidly modifies substrate microclimate, creating a more mesic environment that facilitates seedling establishment. Expanding clump size (*Metrosideros* basal and canopy area) is highly correlated with both under-canopy species diversity and the temporal sequence in which new species arrive. On recent Mauna Loa lava flows the patterns of early succession generally appear more stochastic, with *Metrosideros* and other species arriving simultaneously and without obvious aggregation. Some “Rangitoto-like” clumping and species aggregation under *Metrosideros* does occur on Mauna Loa, but only in the altitudinal climate zone (1500m) comparable to coastal New Zealand, a convergence that lends support to our microclimate facilitation explanation.
Vegetation ecology in PABITRA island forests – Species/area curves to determine minimum sample plot size

Tuiwawa, Marika
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Abstract: The study investigates the minimum sample plot size in which species composition of the community is adequately represented. The study was conducted in areas now considered as Fiji’s highest botanical diversity corridor which is on the windward side of SE Viti Levu, Fiji’s largest island. Here PABITRA forest sites are along a mountain to coast transect. A system of 10mX10m subplots, nested in a larger plot, was used to make a cumulative count of species. Thereafter a species/area curves were drawn to decide the minimum area (number of subplots used) to adequately represent the plant community. Delineated sample plots within selected portions of a primary forest type (including a creek flat, ridge top and slope) were then quantitatively assessed.

Preliminary findings at Waisoi in the Namosi province, a catchment of an inland lowland rain forest with an elevation range of 250 to 1150m asl, resulted in three forest types assessed. On average the species density was 15 tree species per 100m². It was observed that no more than 40 species were recorded after the fifth subplot. Thus, an area of 500 m² was assessed as adequate for all forest types. It was also noted that after the fourth subplot (area of 400 m²), the species/area curve flattened out indicating that overall there was less than 10% increase in new species added. Thus the minimum area required to be assessed has been achieved. Additional work with similar results has been carried out in other PABITRA sites on Viti Levu, but more work in other Fijian islands is needed before we can make generalization.
Abstract: Anthropogenic activities and climatic events have impacted almost all lowland rainforests in the Pacific Islands over the last 300 years or so. Invasive tree species, as detected in seven 50 × 50 m plots in lowland rainforest remnants on the two major islands of Western Samoa, are the focus of this study. Invasive trees were found to be a common component in most plots. They can be divided into two major groups, based on their time of introduction: “aboriginal introductions” that were introduced by the early colonizers of the Pacific some 3000 years ago and “recent introductions” that were introduced in historic times. Although present in all plots, invasive trees were most common in disturbed plots. This underlines that invasion of lowland rainforest by species introduced by humans has occurred in the past, is currently taking place and will continue to take place in the future. When compared to islands west of Samoa, which have higher tree species diversity, lowland tropical rain forest in Samoa was found to have more and greater abundance of invasive tree species. It therefore appears that the diversity and disturbance regime of a community contribute to its vulnerability to invasive species.
Consequences for vegetation of avian dominance in New Zealand terrestrial ecosystems

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Abstract: Whereas most of the world’s vegetation evolved during the latter parts of the Cainozoic under the influence of mammalian herbivores, the New Zealand flora had a distinctive evolutionary history with the supremacy of avian terrestrial species and the near absence of mammals. Relatively recent human settlement (ca. 800 years ago) and the ensuing extinction of about half of the terrestrial avifauna has given rise to consideration of the evolutionary significance of birds on plant habit, vegetation composition and structure, and the ecosystem functioning. Although there are numerous studies of the causes of extinction and the basis for successful introductions of birds in New Zealand, less attention has been given to their functional role in terrestrial ecosystems. I will review the composition and function of the extinct and extant avifauna of New Zealand, and examine the relative importance of birds for plant nutrient use efficiency, reproduction and dispersal, herbivory, and disturbance processes influencing vegetation composition and structure.
**Evolved to be eaten? - Plant traits, herbivory history and biogeochemistry**

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**Abstract:** Herbivory by vertebrates is one of the most important forces structuring vegetation and driving ecosystem processes. There are universal plant-trait syndromes, associated to more general plant resource-use strategies, that favour or deter herbivory and thus regulate trophic transfer and nutrient cycling. On the other hand, herbivory alters plant traits and community texture at the ecological and evolutionary scales. Although these are well-know facts, the effects of ecological sorting and natural selection exerted by vertebrate herbivores on ecosystem processes have been rarely considered empirically and at a large scale. Two lines of evidence are presented, suggesting that herbivory pressure over evolutionary time models plant trait responses to grazing and thus ecosystem functioning. The first is a global scale meta-analysis of plant traits affected by grazing. This shows that globally-consistent response patterns were modified by particular combinations of precipitation and herbivory history. The second combines the comparative study of leaf traits and biogeochemical modelling, and suggests that over evolutionary time generalist vertebrate herbivores select for more acquisitive plant traits, thus shifting nutrient cycling towards more open carbon and nitrogen cycles with faster turnover rate. These findings point to key plant traits that need to be included in the next generation of dynamic global vegetation models, and suggest that plant functional type classifications and response rules need to be specific to regions with different climate and history of herbivory.
Factors conditioning the seed size of Mediterranean grassland communities: the importance of grazing

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Abstract: Climate, soils, tree coverage, grazing pressure and seed predation intensity by harvester ants influence the composition of Mediterranean pastures. However, changes in the plant community are difficult to predict if only species are taken as community descriptors. Functional characters such as seed weight can be a more useful tool than species to predict grassland variability. In particular, small-seeded species are expected to be more abundant under higher levels of water stress, soil aridity, clearing of woody vegetation, grazing pressure and seed predation risk. To test these predictions, 30 grasslands distributed within an area of 500 km² in Central Spain were selected. The plots were chosen in order to show a high uncorrelated variability in the five considered factors, and the species present were characterized by their seed size, only considering abundant species. Results show that grazing pressure is the major factor influencing seed size, although other factors have some effect. These findings are coherent with the role of seed size as a key functional trait in Mediterranean communities. However, the high proportion of unexplained variability suggests that other functional traits and/or other independent factors should be considered in order to obtain adequate predictive models.
Surviving clipping and freeze-drying: how birds and climate shaped plant phenotypes and community structure in dryland New Zealand

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Abstract: There has been much interest in understanding the evolutionary origin of New Zealand’s globally-unusual, divaricating and filiramulate plants. There has been less attention on other possible phenotypic and chemical defences of plants for avifaunal herbivory. Dryland New Zealand is an ideal laboratory to investigate how herbivore-selected plant phenotypes may determine a community’s ability to respond to environmental extremes and to environmental change. This preliminary and mainly conceptual contribution melds data from paleontology, palynology, paleoecology, and extant plant pattern to paint a picture of community structure and composition in dryland New Zealand. To speculate on prehuman dryland ecosystems, we garner contributions from: 1) Avifaunal herbivore guilds; 2) Gizzard and coprolite-analysis of ratite diet; 3) Predominant plant phenotypes; 4) Palynological insights into community composition and disturbance regimes; 5) Spatial models of the potential environmental space of woody species.

We suggest birds and climate selected an unusual suite of plant anatomical and chemical defences as well as providing a geographic filter on plant speciation. We describe an unusual herbivore guild-vegetation structure relationship for dryland New Zealand. Madagascar is perhaps the closest global comparison with New Zealand on how avifaunal herbivory and rainshadow climates have shaped plant form and community structure.
How do (some) exotic plants manage to make themselves at home in hostile environments: a challenge and an opportunity.

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Abstract: The current rate of translocations of plant species is unprecedented. It results in the rapid formation of new plant communities, frequently with reduced biodiversity and lower value in ecosystem services. Invasive species may present new challenges to local species by introducing "novel weapons", but they are also challenged by new enemies native to the invaded community or introduced from different biogeographic areas. Invading plants can also produce modifications in ecosystem functions, such as fire regimes or nutrient cycling. Invasive species often modify the environment in ways that benefit themselves and reduce the performance of native species alone or in competition, but not all native species are affected in the same way. Some invasive species are favoured by the modification of the environment produced by native species. If the the invasive species has a negative effect on the species that provides the facilitation, this could limit the spread of the invader. Clearly, the invasion of each plant community by each invasive species presents idiosyncratic characteristics. However, the large number of cases and the urgent need to deal with biological invasions make it inefficient to address invasions in a case-by-case fashion. Rather, the development of a robust theory of Plant Community Ecology seems to be the most desirable and efficient approach. The large number of case studies available, if immersed in the proper conceptual framework could help to reach this goal that has proved so elusive in the past.
Ecosystem effects of invasive plants in New Zealand

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Abstract: In the period since European settlement of New Zealand (c. 165 years), 24,000 or more vascular plant species have been introduced. Over 2,500 species have naturalised and more than 300 of these species are actively managed by Government agencies and community groups because of the effect they have on ecosystem function or more directly on specific threatened species. Ecosystems from sea level to above tree line are affected. Freshwater and marine ecosystems are also heavily impacted although the effects are less well understood in the marine environment. Physiognomic transformations to ecosystems include replacement of grasslands by forest, forest by vinelands and landform changes. Ecosystem function is altered typically through reduction in species diversity and can affect many processes. Not all effects are entirely negative: management typically involves weighing the pros and cons of invasive species effects. Examples from throughout New Zealand will be used to describe effects of invasive plants on ecosystems.
**Abstract:** Identifying common functional traits within large groups of invasive species may enable us to better understand invasion success and thus predict new weeds and their potential impacts. In this study, our aim was to identify any functional commonalities among the 330 vascular plant species classified as environmental weeds by the New Zealand Department of Conservation. Traits analysed were those for which information for all 330 species was readily available: life form, method of reproduction, fruit type, dispersal mode, shade tolerance, and nitrogen-fixing ability. Analyses were conducted for the group as a whole, but also for subsets of invasive species that occur within different ecosystem types – for example invasive species of forests, tussock grasslands, and wetlands. While some general patterns do emerge, we argue that functional distinctiveness for any invasive species can only be defined in relation to co-occurring, non-invasive species, and thus is site-specific and possibly variable over time. We discuss a number of case studies where an invasive species is having a major impact in one type of ecosystem but not another, and consider when and how functional distinctiveness may contribute to invasion success.
Plant invasions in the Swiss Alps

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Abstract: In summer 2003 we recorded the status quo of colonisation of alien plant species at 232 sites (107 railway stations and 125 road sites) along mountain passes in the Swiss Alps. A total of 155 alien taxa were recorded. Numbers of species per site declined exponentially with altitude. Maximum altitude reached by alien species was positively related to both total area occupied in Switzerland and to time since introduction. A comparison of the results with earlier records suggests that many species, particularly those previously restricted to low or intermediate altitudes, have advanced their altitudinal limits over the past few decades. Various hypotheses are presented to explain the declining number of alien species with altitude: low-altitude filter effects, low propagule pressure, and genetic swamping of peripheral populations at higher altitudes. We conclude that invasion into mountain areas such as the Swiss Alps tends to proceed rather slowly, though the process may be accelerated by climatic warming. For this reason, further research to investigate the processes determining how plants invade mountain areas is urgently needed.
The contribution of the short-lived perennials to the spontaneous rehabilitation of natural grasslands following clearing of invasive woody alien species in the Grahamstown area, Eastern Cape, South Africa

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Abstract: Extensive clearing of the woody invasive aliens from the southern Grahamstown commonage (of over 200ha) has been carried out for over 40 years and the purpose of this study is to report on the dynamics of the grassland rehabilitation process. Following clearing it is essential to establish a pioneer cover crop and quantitative studies on the vegetation of sites in various stages of rehabilitation have shown that the appearance of pioneers such as *Senecio pterophorus* and *S. chrysocoma* (Asteraceae) is an important first stage in the process. After the manual clearing of aliens the pioneers become established following wind dispersal of seeds (achenes) into the disturbed areas. Studies on the populations of these plants show that they persist and continue to reproduce in the early grassland stages, but are absent from the dense closed sward of the climax grassland community. Management guidelines are stressed with the use of the *Senecio* species being important in grassland rehabilitation following alien clearance.
A decade of exotic plant invasion at Caddo Lake, Texas, USA

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Abstract: Caddo Lake, an area of extensive Taxodium distichum (bald cypress) swamps located along the boundary of northwestern Louisiana and northeastern Texas, USA, is considered to be the largest naturally-formed lake in Texas and is recognized as a wetland area of international importance under the Ramsar Convention. In 1995 and 1996 we established relevés and described six principal wetland plant community types. As subsequent visits to the lake suggested an alarming increase in the abundance of invasive non-native aquatic plants, we repeated the survey for semi-permanently and regularly-flooded swamps in 2005 and observed dramatic increases in both abundance and distribution of Eichhornia crassipes (water hyacinth), and Alternanthera philoxeroides (alligator weed). Hydrilla verticillata also increased while Egeria densa declined. Hygrophila polysperma, not previously reported from eastern Texas and not observed in the 1996 study, was established and had become abundant in regularly-flooded swamps in the southeastern portion of the study area. These changes contributed to a marked shift in the location of many relevés on a detrended correspondence analysis. Effects of the altered communities included increased biomass and vegetative cover on the water surface.
Impacts of native and non-native plants on above- and belowground in a floodplain succession

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Abstract: Although plant species are known to have impacts on ecosystems, differences in these impacts between native and non-native species has only recently been recognized. Here, we compare the impacts of native and non-native plants on above- and belowground community and ecosystem properties in a floodplain primary succession using a 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 controls. Surprisingly, soil total N and N mineralization rate were low in plots with Coriaria. Both other non-native plants and Coriaria stimulated microbial basal respiration (BR) and basal to substrate induced respiration (BR:SIR). In contrast, Buddleja was associated with lower BR and BR:SIR. Soil microbial diversity was similar among intact plots or in plots with Buddleja or Coriaria removed alone, but declined about two-fold in other removal treatments. Removing other non-native species had much greater negative impacts on plant and nematode diversity than removing Buddleja, Coriaria or both. Our results illustrate that non-native plants have contrasting impacts on this ecosystem.
The effects of light and nutrients on *Buddleja davidii* and *Griselinia littoralis*

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**Abstract:** *Buddleja davidii*, (Buddlejaceae), an aggressive, highly invasive, ornamental shrub of Asian origin, may be suppressing slower-growing native species (e.g., *Griselinia littoralis*; Family: Cornaceae) on New Zealand floodplains thus altering successional trajectories. This study sought to learn what effect *Buddleja* might have on a mid-successional species when different treatments of light and nutrients were applied. *Buddleja* and *Griselinia* shoot relative growth rate and foliar N and P were significantly greater when grown in the 27% light than in the 90 and 10% light levels. In contrast, both species have reduced growth (*Buddleja*, 97 and *Griselinia* 99% less shoot RGR) and higher mortality in 10% light than those grown in the 27 and 90% light levels. These results suggest that both species are better suited for growth in a mid-successional stand than at newly disturbed sites or under late-succession forest canopy. *Buddleja* growth and foliar N and P were significantly less when grown with another plant of equal or greater biomass regardless of species, while *Griselinia* growth was adversely affected by the presence of *Buddleja*. These results suggest that competition will suppress *Buddleja* growth. However, further investigation is needed to determine the response of *Buddleja* to another like-sized species under field conditions.
Large-scale factors affecting European biodiversity

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Abstract: Biodiversity in Europe is said to have been impacted mainly by man, even if the historical climate changes have been in parallel. We performed an analysis to elucidate the integrated effects of a comprehensive set of anthropogenic and natural drivers on the large-scale biodiversity of some of the best-known species groups (vascular plants, mammals, birds, reptiles, butterflies) of all of the European countries. Here we show that both natural and anthropogenic drivers are important – climatical gradients of biodiversity dominated, in addition to the effects of habitat loss. The rescue effect of protected areas was observed, but it demonstrated saturation at large area estimates.
Links between soil heterogeneity and global vegetation change

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Abstract: Invasion of woody species into grasslands is a major global vegetation change. In addition to climatic and land use drivers, soil heterogeneity may affect this global change. Greater soil heterogeneity has been described beneath woody vegetation than grasslands, but most of these studies originate from Northern America. We examined the global consistency of this observation. We gathered data from the literature about soil nitrogen and carbon heterogeneity from paired woodland and grassland sites from a range of latitudes in both hemispheres. Grassland soil heterogeneity was generally related to heterogeneity in adjacent woodland. There was, however, significant geographic variability in the relationship. Soils were more heterogeneous in woodlands than grasslands in temperate areas, but the opposite was true for tropical habitats. This variability in the relationship was caused by grasslands since grassland soils were more heterogeneous at lower than higher latitudes. Woodland soil heterogeneity did not differ across geographical gradients. Consequently, the previously described high soil heterogeneity in woody vegetation holds only for temperate regions. In summary, similar global change in vegetation may have diverse consequences in different regions. Particularly, ecological knowledge from temperate ecosystems may not be valid in the tropics.
A new generation of climate change experiments: Events, not trends

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Abstract: Intensification of weather extremes is currently emerging as one of the most important facets of climate change. Surprisingly, the significance of extreme events for vegetation dynamics and ecological processes still is underrated, although their effects are obvious and out of proportion to their short duration. We propose that in ecology extreme events can be distinguished from long-term trends by their statistical extremity, their timing and their abruptness relative to the life cycles of the organisms in focus. To prove causality between changing magnitude and frequency of events and system response, controlled experiments are convincing tools. Here, we present first results of an experiment, in which planted grassland and heath communities in central Europe were exposed to a single drought event, a heavy rainfall event, or recurrent freeze-thaw cycles. The magnitude of manipulations imitated the local 100-year weather extreme according to extreme value statistics. Our results reveal that, for example, overall productivity of both plant communities remained stable in face of drought, despite significant effects on tissue die-back and shifts in phenological response. Interestingly, effects of extreme weather events on community tissue die-back were modified by species composition.
Spatial and temporal patterns in the vegetation of Central European springs.

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Abstract: Plant species composition in natural spring habitats is influenced by spatial (habitat size, distance between springs), hydrophysical (temperature, discharge) and hydrochemical conditions (nutrients, acidity). Central European forested catchments, especially on siliceous bedrock, have been strongly influenced by atmospheric depositions, which are reflected by the acidification of ground and surface waters. These changes in water quality particularly affect the stenocoeous spring vegetation.

During a regional survey based on 262 forest springs in five mountain landscapes across Central Europe we monitored higher plants, mosses and liverworts. Hydrochemical conditions are found to be more important than physical or spatial factors. By means of multivariate ordination techniques *Chrysosplenium oppositifolium* and *Cardamine amara* are identified as indicator species for non-acidic water chemistry, whereas the mosses *Sphagnum fallax* and *Polytrichum commune* are found to be dominant under acidic conditions.

Spring vegetation proves to be a good indicator system to characterize groundwater chemistry and the reactions to acidification and groundwater warming as the spring water in these mountain catchments have a short turnover period. Spring waters directly reflect the geochemical and hydrological conditions of forested catchments.
Western European forest plant species move up in response to climate change

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Abstract: Recent warming has induced biological and ecological responses of animals and plants throughout the world. Fingerprints are obvious upon growth, breeding dates and distribution. For plants, climate change has strongly influenced distribution and abundance at range margins both in latitude (polar margins) and elevation (upper margins). Shifts at the upper edge of elevation ranges agree with the intuitive hypothesis of an upward trend to escape rising temperatures. However, large-scale/long-term/multi-species trends according to plant species’ elevation range remain unclear in mountain forests below the timberline. We examined the trends of optimum elevation for 211 frequent species across temperate and Mediterranean mountain forests during the 20th century. We show that plant species have increased their optimum elevation over the end of the last century. Species with distributions shifting the most have faster life cycles and smaller life forms than others. Changes in optimum elevation across the entire altitudinal gradient closely match changes already observed above the treeline supporting the hypothesis of a climate change driving force. In the trade-off between adaptation and migration, the striking rapidity at which mostly plant species shifted in our study highlights how forest species are able to change their distributions rather than evolve in response to abrupt climate change, even below the treeline.
Why are there so many species in tropical forests?
The Tertiary Montane Hypothesis

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Abstract: The whole question of biodiversity is a major preoccupation of ecology. Although the answer is probably a multivariate one, there has been a search for underlying mechanisms. One such was the Pleistocene refuge theory, but this has now been discarded on palaeoecological grounds.

A recently published alternative hypothesis is proposed here, built on the fossil evidence that speciation occurred most rapidly in the warmest phases of the Tertiary. The tropical mountains are the highest altitude forested areas in the world, and also experience high UV-B insolation. UV-B is a powerful mutagen. Pollen is necessarily exposed to this during pollination. During the warm phases of Tertiary Milankovitch cycles, some forest taxa populations would have been isolated on individual mountains. We therefore have all the conditions needed for allopatric speciation and a species pump – isolation, mutation, and a fluctuating climate. Also, UV-B is increased after vulcanicity. Periodic vulcanicity could thus have contributed the ‘punctuated equilibrium’ which is preferred by some evolutionists.
Short-term effects of nutrient amendments on phenology of four snow-bed species at Gavia Pass (Rhaetian Alps, Italy)

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Abstract: The models of global warming foresee an anticipated increase in annual global temperature of ca. 1-5 °C not later than the end of this century, particularly at high latitudes and altitudes. Raised temperatures are likely to increase the photosynthetic rate of tundra plants, and to change reproduction rates and growth of arctic and alpine species. However, one of the major effects of this global warming is to accelerate plant response to changes in soil nutrients. We examined changes in flowering phenology of four typical snow-bed herbs (Cardamine bellidifolia subsp. alpina, Veronica alpina, Leucanthemopsis alpina and Poa alpina) and changes in plant size of Cardamine bellidifolia subsp. alpina and Veronica alpina, after an experimental design focused on nutrient amendments with fertilisation with N and P within a snow-bed area in the southern Alps (Passo di Gavia, Rhaetian Alps, 2700 m a.s.l.). Leaf length and width and leaf number responded significantly to N amendments at various concentration, while, as expected, P amendments are not significant. Flowering phenology showed two different responses for 4 target species. Veronica alpina and Poa alpina anticipated flowering date. Cardamine bellidifolia subsp. alpina and Leucanthemopsis alpina showed an increase of flowering ramets.
Shift in environmental drivers of tree growth in the Vosges Mountains during the twentieth century

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Abstract: We analysed the radial growth of silver fir (Abies alba Mill) in northeastern France in relation to soil, and climate factors and we checked the temporal stability of their effects during the 20th century. Data was collected from 143 plots distributed over a broad range of altitude and humus forms conditions. For each plot, an index of mean radial growth was calculated, controlling for tree age and calendar year of ring formation. Relationships between radial growth and ecological factors were analysed using linear mixed-effects models. Low aluminium concentration, good nitrogen supply and water reserves were correlated with high radial growth. Analysis of environmental effects during the 20th century showed that growth was strongly correlated with nitrogen supply at the start of the century, and with aluminium toxicity and climate at the end of the century. Our results indicate that nitrogen supply was a limiting factor of the mean radial growth of silver fir before the 1970s. Eutrophication during the 20th century may then have eliminated growth limitation by nitrogen. This result confirms, for natural forest stands, the saturation effects of nitrogen on tree growth showed in experimental conditions.
The role of subalpine species in recent plant diversity of the Carpathians

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Abstract: The flora of subalpine tall-herb communities, developing in a particular microclimatic and habitat conditions, seems to be very promising in the generating hypotheses of mountain flora origins. The Carpathians have a special role among the European mountain chains because they are situated among several phytogeographical units and climatic types. Recent plant diversity of the Carpathians has been influenced by the Arctic, Asiatic, Balkan and Pontic-Pannonian floras. Its flora consists of different types of their general geographical distribution: the Boreal-Eurasiatic species (e.g. *Geranium sylvaticum*, *Veratrum lobelianum*), the alpine-Central-European species (e.g. *Adenostyles alliariae*, *Doronicum austriacum*) and the arctic-alpine species (e.g. *Athyrium distentifolium*, *Ranunculus platanifolius*). A very interesting group is the Carpathian-Balkan distribution type (e.g. *Cirsium waldsteinii*, *Salix silesiaca*). Special interest is given to endemic species such as *Delphinium oxysepalum*, *Soldanella carpatica*. Recent plant communities have been formed seemingly during several stages from late Tertiary and consist of various migration elements. The aim of the paper is defining the share and the role of phytogeographical elements in the tall-herb flora formation.
Mechanism of biodiversity and growth dynamics at tropical rain forests in Southeast Asia and Amazon

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Abstract: Tropical rain-forests in Southeast Asia and Amazon have the highest biodiversity in the world. Little is known about vegetation types and ecology of tree species composing the tropical rain-forests. To clarify correlations among autoecology of indigenous species, their habitats and vegetation types is an important purpose of projects to understand the behavior of species occurrence in various vegetation types and the mechanism of high biodiversity.

Vegetation survey and measurement of planted trees have conducted in an estuary area of the Amazon and in a lowland area of Borneo. Relationship between growth dynamics of the planted trees and vegetation types will be reported. Furthermore correspondence among growth of the reforestations and densities of survived trees planted, interdependency among growth speed, tree forms and specific gravities of trees are also considered.

As the results, it suggested that different mechanisms to keep high biodiversity between Amazon and SE Asia because the less undulation of geological features provides large habitat for many faster growing species adapting to flood areas in Amazonia, on the other hand, the plenty of precipitation and stable higher temperature supply space constructions and habitats for more species in SE Asia.
Is the tall savanna forest in Senegal one type of dry forest? – Its species composition and diversity compared with dry forests in Kenya

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Abstract: Africa has dry forests. Especially, tall and dense dry forests occur in Kenya and tall savanna occurs in Senegal. These two types of forests do not have common species, but common species of both occur in transitional areas between Acacia savanna vegetation and dry forest in Kenya. Main tree species in Kenyan dry forests are *Brachylaena huillensis* (Compositae), *Teclea simplicifolia* (Rutaceae), *Teclea trichocarpa* (Rutaceae), *Ficus thonningii* (Moraceae), *Drypetes gerrardii* (Euphorbiaceae), *Croton megalocarpus* (Euphorbiaceae), *Chaetacme aristata* (Ulmaceae), *Diospyros abyssinica* (Ebenaceae), *Schrebera alata* (Oleaceae), *Warburgia ugandensis* (Canellaceae), *Manilkara discolor* (Sapotaceae), *Calodendrum capense* (Rutaceae) and *Zanthoxylum usambarense* (Rutaceae); *Turraea mombassana* (Meliaceae), *Vernonia brachycalyx* (Compositae), *Vernonia holstii* (Compositae) and *Clausena anisata* (Rutaceae) occur in the shrub and herb layer. On the other hand, *Diospyros mespiliformis* (Ebenaceae), *Grewia lasiodiscus* (Tiliaceae), *Celtis integrifolia* (Ulmaceae), *Khaya senegalensis* (Meliaceae), *Lannea microcarpa* (Anacaridaceae), *Lannea acida* (Anacaridaceae), and *Albizzia ferruginea* (Mimosaceae) occur in the tree layer of Senegalese tall savanna. Ebenaceae and Rutaceae are common as tree species. The number of species is lower in Senegal forest types than Kenya, but the herb layer species in Kenya are fewer than in Senegal. The main difference in these two types of dry forest is the number of herb species, which is different because there are fires in Senegal but very few fires in Kenya. Most of the herb layer in Kenya is grazed by wildlife. Fire and cattle grazing would make more similarities between Kenyan and Senegalese forests. The Acacia savanna forest has more grass species than tree species. Wildlife grazing also enhances herb layer richness. The large number of Fabaceae species in the herb layer in Senegal indicates poor soil. This phenomenon is not seen in Kenyan forests.
The calcareous riddle in a Fennoscandian context in relationship to the species pool concept

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Abstract: Around 60% of the vascular plants in Fennoscandia are confined to base-rich substrate, but such habitats have modest aerial distribution. Similar patterns are known from C Europe, a feature associated with the species pool concept (‘the calcareous riddle’). The basiphilous species are important constituents in many of the special vegetation types found in basic environments (e.g. basiphilous pine forests, rich deciduous forests, calcareous rocks, forest-margins, rich-fens, eutrophic lakes). The proportion of basiphytes is high regardless of geographical location in the Nordic area (included alpine areas), which deviates from the otherwise marked decline in total species richness towards the north. The Nordic flora has mainly immigrated from south and east, which indicates the same species-pool origin as in C Europe (e.g. base-rich periglacial areas in east). Almost 70% of the Nordic basiphytes have southern and eastern affinities in their distribution patterns. Even half of the alpine species are shared with the Alps. Basiphilous pine forests are used as an example of how a specific target community are related to total, regional and local species pools.
New flora of the desiccated sea floor of the Aral Sea

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Abstract: The Aralkum is a perfect example to demonstrate invasion of plants and formation of a distinct biodiversity. The Aral Sea was once the fourth largest Lake on earth. Since 1960 huge irrigation systems for agriculture use most of the water of the two tributaries Amudarya and Syrdarya, thus, nowadays only a small percentage of water reaches the Aral Basin. Since several years the Aral Sea doesn't exist anymore. Three remnant basins are left. The desiccated sea floor is exhibiting huge salt flats and sand deserts. The area of this new desert, the Aralkum, covers now about 55,000 km\(^2\). The primary succession by plants is too slow to cover the Aralkum area in the next few years. But until now there are 312 plant species recorded, mostly halophytes migrated from the adjacent Karakum and Kyzylkum desert. On sand *Haloxylon aphyllum* (black saxaul) is growing very well. Other species (*Halocnemum strobilaceum*, *Tamarix*) and many other halophytes exhibit now a very diverse picture of many dynamic vegetation types. The whole Eastern part of the Aralkum in future will be a still increasing huge salt desert with a highly diverse halophyte flora and an increasingly continental climate with severe salt- and sand dust storms.
On the role of alien plants in some large cities of Europe and North America

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Abstract: Investigations in the flora of large cities have shown that the proportion of alien plants is 25% in Europe and 35% in North America. In this study we wished to investigate whether this situation is similar regarding only the most frequent taxa in the cities. To do this we compared the fifty most frequent spontaneous vascular plants in the following cities: Berlin, Rome, New York, Los Angeles and San Francisco. The study revealed that the European and US cities differ substantially in the proportion of alien taxa they contain. In Rome and Berlin it is only 10-15% and in the three cities of the USA it is over 80%. It was found that native European plants as well as taxa that have evolved in Europe as the consequence of human influence are the most successful species in the US cities. Finally it is examined how far these non-native plants in cities invade preserves and other wildlands and therefore are a threat to biodiversity.
The composition and richness of the vascular plant flora of British urban gardens, and implications for native biodiversity

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Abstract: The composition and richness of vascular plant floras were measured in a stratified sample of 61 urban, domestic gardens in Sheffield, UK. The entire garden flora contained 1166 species, of which 30% were native and 70% alien. Across gardens, aliens showed lower occupancy than natives, comprising 79% of the species recorded only once. The garden flora contained 146 plant families, which included 72% of the native, naturalised or recurrent casual families recorded in the wild in Britain and Ireland. Gardens contained on average 45% natives, irrespective of garden size. Garden area explained 30% of the variation in species richness within individual gardens. Doubling garden size led to an increase in species richness of 25%. The garden flora comprised 10% annuals, 63% biennial/perennials, 18% shrubs and 8% trees; shrubs were disproportionately composed of alien species. The floras of urban domestic gardens probably form the greatest source of potentially invasive alien plants. However, plants of British gardens have close affinities with the native flora, and their value for native wildlife deserves reassessment. Declines in garden size that result from changes in the density of new housing are unlikely to have major consequences for plant richness in gardens.
Neophytic plant species in Central European urban greenspaces

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Abstract: Neophytic plant species are of central interest in the anthropogenically changed and prepared urban environment more than in rural landscapes. The percentage of neophytic species is higher than 25% in European cities. This is due to the permanent interference with nature within urban sites and due to the fact that the microsites strongly differ in their properties: from extreme dry to wet, from shaded to sun-exposed. Urban structure provides lots of ecological qualities - the distribution of sites depends on the structure of the building environment. European cities are more or less endowed with a historical centre surrounded by early 20th century settlement and in the fringe newly-built centres or areas of housing with gardens. The neophytic species are succeeding in finding their niche in highly surface-sealed centres as well as in greenspaces within the city or nearby forests. They form neophytic plant communities which are not completely covered by the European phytosociological system. If urban development is hindered, urban forest may grow up with neophytic trees like Ailanthus, Robinia or Celtis, but normally these typical spontaneous forests disappear after decades in the urban situation.
**Abstract:** Numerous studies in Central Europe and North America showed a general species richness pattern of plants within urban-rural gradients. The species richness of urban areas is well known. Spatial land-use diversity, habitat diversity and the history of urban areas are the main causes. Nature conservation must reflect this pattern. In this study we compared species richness in Nature Reserves in urban and rural areas. We tested differences in landscape measures and in the diversity of vascular plants, mosses and lichens. We compared 30 protected areas within urban landscapes with 56 protected areas in the rural countryside in Central Germany. Our results are different from general comparisons of urban and rural floras. Urban protected areas are not richer in vascular plants and mosses. The number of lichens is lower in urban protected areas. Our results showed the importance and the special character of protected sites in the urban landscape. The consequences for Nature Conservation in urban areas are discussed.
Broccoli forest or urban jungle? Composition and structure of Metro-Terra Firma

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Abstract: The Front Range of Colorado (USA) constitutes the largest area of human settlement adjacent to the Rocky Mountains; it extends southward from Cheyenne, Wyoming and Fort Collins, Colorado through Denver and Colorado Springs to Pueblo along the eastern edge of the Southern Rocky Mountains (~40°N, ~105°W). Since the mid 1800s, dryland and irrigated farming have transformed much of the region’s natural grasslands. Urbanization followed in the early twentieth century and increased markedly mid-century. Throughout the Denver-Boulder metropolitan area (the largest conurbation of the Front Range), landscaping decisions in the built environment have transformed the ecology of this former semi-arid grassland. A matrix of lawns and planted trees carpet the rolling plains at the base of the Rocky Mountains and has been dubbed the “broccoli forest”. The question remains: what is the nature of this introduced forest? Is it similar to an eastern deciduous forest; is it typical of urban forests throughout the country; or, is it unique to this urban area? This paper quantifies and describes the structure and composition of the multi-strata urban forest, examines abiotic and anthropogenic influences upon the forest, and compares this new community to other natural and urban forests.
Can flat roofs be improved to enhance plant species diversity?

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Abstract: In Central Europe, flat roofs are increasingly vegetated. In addition to the advantages of insulation and rainwater retention, these sites can serve as refuges for rare species. The goal of this study is to find optimal substrates and the most suitable depths for enhancing plant species diversity. Ten substrates, ranging from gravel with some organic material, to designer substrates, were experimentally set up on three flat roofs, in which, in four of the substrates, the depth was additionally varied and all were replicated twice. The plots were all seeded with the same mixture of 49 species. The experiment has been running for 8 years. Increasing depth had a positive influence on species diversity with a mean of 11 species at 5cm and 25 species at 12cm. The properties of the substrates also had a significant influence. Interestingly, some species are favoured by specific substrates, even when the overall biomass production is about the same, indicating specific requirements. Some rare species like Petrorhagia prolifera can be maintained very well. Thus, flat roofs can contribute very favourably to plant species diversity and the conservation of rare species. Taking into account the dimensions of these areas, there is a considerable potential for species conservation.
Green roofs, new habitats: importance for plant species diversity and society

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Abstract: Extensive roof greening is a multifunctional, often innovative tool for urban greening. It’s mainly known from Europe. Their maintenance is extremely limited yielding a more or less self-regulating plant community. A limited number of plant species are deliberately planted or sown on these roofs. Other plant species spontaneously colonize these seasonally dry habitats with shallow soil. However until now little insight is available on the range of plant species colonizing these new habitats and on the factors affecting the species diversity and composition. During summer of 2003, 71 extensive green roofs (substrate thickness 4-8cm) distributed over Flanders (N Belgium) were surveyed for the cover of the occurring plant species and some major environmental variables were recorded. In total 71% (=131 spp.) of all recorded plant species, was considered as spontaneous colonizers. Yet the average cover per roof of these species is only 7.6%. Most of the spontaneous species are hemicryptophytes (48%), followed by therophytes (27%). 36% of all species are considered as anemochores and 22% are considered not to have specific morphological adaptations for dispersal. Few rare and Red list species were observed (3%). Variation in species composition was mainly determined by green roof size, slope and construction type (using mats or not). Although about 10% of the wild flora of Flanders may be found on these extensive green roofs, these extreme and fascinating habitats only offer limited possibilities for our native flora. Yet in a highly urbanized area this may still be highly valuable.
A preliminary look at urban floras of the lower North Island, New Zealand

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Abstract: A study was made of 11 discrete urban areas in the lower North Island, New Zealand, and characteristics of the towns likely to be influencing their floristics derived. 754 records were made of the flora 16 sub-habitats, in 6 habitat categories. A total of 483 species were found, 375 more than once. The majority of these originated from Europe and the Mediterranean Area, East Asia and America, although species from South Africa and Australia were more common in trampled habitats.

A DCA ordination detected only weak differences in the urban flora between cities, these being associated with distance from the coast, human population number/density, and altitude. There were clear habitat differences, probably reflecting management of each area.

Native species, occurring adventively, were surprisingly common in the urban floras, especially that of Taupo, making on average 17% of all found species in this city. Three species, *Pteris vittata*, *Viola sepincula* and *Sarcococca ruscifolia* represented the first New Zealand record.
Session 11: Urban vegetation
Overview of progress in Ecoinformatics

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Abstract: Much progress has been made in vegetation Eco-Informatics since our first symposium in Napoli in 2003 and the formation of the IAVS working group in Eco-Informatics. I will give an overview of recent efforts. First I will review the information sources available on the website of the working group. Next I will review progress in national and international vegetation database efforts, with a focus on VegBank (US System), TurboVeg (widely used European system), NVS (New Zealand system), VegetWeb (German system) and the TDWG observations initiative. Finally, I will report on progress being made to develop and international exchange schema for vegetation plot data.
**OptimClass:** Simultaneous identification of optimal clustering method and optimal number of clusters in vegetation classification studies

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**Abstract:** There are many different clustering algorithms available for vegetation classification, which enable formal delimitation of vegetation units from vegetation-plot data sets. However, the choice of the appropriate method is usually made subjectively. We propose a new method which simultaneously compares and evaluates partitions of the input data set (1) obtained with different classification algorithms and using the same number of clusters and (2) based on the same algorithm but with different numbers of clusters. Our aim is to find a combination of the clustering method and the number of accepted clusters which would provide optimal partition of the given data set. To measure the quality of different partitions, we use internal and external evaluation criteria. Internal criteria are diagnostic species of clusters, i.e. species whose occurrence is concentrated in particular clusters. Diagnostic species are determined with statistical measures of fidelity. External criteria are environmental variables measured in vegetation plots which presumably correlate with species composition. We have successfully tested the new method using three independent sets of vegetation plots from southern Siberian forest-steppe, central European mires and poor wetlands of Alaska. The algorithm applicable to both agglomerative clustering and TWINSPAN is available in the JUICE program (www.sci.muni.cz/botany/juice).
Constructing the Phytosociological Relevé Database (PRDB) for temporal and spatial assessment of plant species distribution

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Abstract: Temporal and spatial assessments of plant species distributions are useful for nature conservation. However, acquiring detail information on plant species distributions is difficult. Phytosociological relevé data have been intensively accumulated last 50 years in Japan. We have been constructing the Phytosociological Relevé Database (PRDB) by computerize data from variety of paper sources. The PRDB is composed of relevé data with information on location, survey date, environmental conditions, floristic composition and dominance, and so on. The location of each relevé was determined based on place name, elevation and topography recorded in data sources, and was expressed with the Standard Area Grid Code, in which the Second and the Third Grids are of ca. 100km² and 1km² resolution, respectively. Since climatic and land data for the Standard Area Grid are available, we can make models predicting plant species distribution with environmental variables. We initiated to use the PRDB to make a statistical model predicting Fagus crenata distribution and clarifying environmental controls and their thresholds relevant to the distribution. The PRDB is also useful for assessing impact of climate change on species distributions as well as for clarifying changes of species distributions with time.
Is tree diversity different down-under?

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Abstract: Plant species diversity declines with latitude. However, latitudinal declines in diversity are not necessarily similar between hemispheres. Gentry (1988) hypothesized that tree diversity is higher in the southern hemisphere. Here, I test Gentry’s hypothesis and ask whether diversity patterns are sensitive to sampling effects. Reanalysis of the Gentry data set showed that area-based measurements of species diversity are higher in the southern hemisphere. However, southern forests house denser plant populations. After controlling for geographic variation in plant density, diversity patterns reverse, indicating individual-based diversity is higher in the northern hemisphere. Therefore, the nature of hemispherical asymmetries in tree diversity hinges on how diversity is defined, illustrating how different definitions of diversity can yield strikingly different solutions to common ecological problems.
Demonstration of software: OPTIMCLASS
Lubomír Tichý
Large scale mapping of soil pH by plant presence/absence bioindication

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Abstract: A new method is presented to map soil nutrient resources on a broad scale using plant indicator values and large floristic databases. pH indicator values of French forest plant species were modelled using 3835 sites of EcoPlant database each including a floristic inventory and pH measured by laboratory analysis. The soil pH on 97446 plots, sampled systematically over the whole territory of France by the French Forest Inventory (IFN), was then predicted as the mean of indicator values of species present in each plot. IDW interpolation was used to estimate pH values between plots and create a 1 km² resolution map of pH over France. This map highlights for the first time large acidic or calcicolous areas like the Vosges Mountains in north-east France as well as small units like acidic soils of the Fontainebleau forest (south of Paris). The map quality was assessed with an independent set of 261 plots systematically sampled all over France. The R² between map values and pH measures reached 0.56 with a RMSE of 0.82. The lack of nutrient maps is one of the main limitations for plant distribution models. Our spatial pH model was used successfully with climatic variables to predict large scale distribution of forest plant species.
Predictive modeling of vegetation distributions

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Abstract: Maps of species distributions are required for many aspects of resource management, research and conservation planning. Predictive mapping assumes that biotic distributions can be predicted from the spatial distribution of environmental variables. Austin’s framework for spatial prediction of biotic distributions has three parts, the ecological, data and statistical models. The data model “consists of decision regarding how the data are collected, and measured or estimated.” What issues arise when mining existing vegetation data e.g. from forest inventories or data banks, for the purpose of spatial and temporal extrapolation? Current research suggests that species distribution models are more accurate when adequate numbers of presence and absence observations are included, when they are based on probability designed samples, when observations are well distributed throughout the species’ range, and when they are roughly the same resolution as the environmental predictors. Vegetation surveys meet many of these criteria and therefore can and are being widely used in predictive mapping. However, there remain issues of biased observation locations, locational precision of historical data, and mixing of data with different characteristics in databanks. An example of a historical vegetation dataset (18,000 plots) available in California, USA, will be used to illustrate some of these issues.
Patterns of plant species richness and turnover in the New Zealand forest: results from new methods of community analysis

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Abstract: Patterns of species richness and turnover in the New Zealand (NZ) forest flora were analyzed using a new technique — Generalized Dissimilarity Modelling (GDM). Community composition information was derived from data stored in the National Vegetation Survey (NVS) database and comprised presence-absence observations from large scale surveys in largely undisturbed forest. The analyzed data contained nearly 20000 plots with over 1200 native plant species (approx. half the total NZ indigenous flora) represented. Three components of diversity were estimated: 1) alpha-diversity (local richness), 2) Cody’s beta-diversity (species turnover due to habitat turnover) and 3) Cody’s gamma-diversity (turnover due to geographic distance or barriers). Spatial patterns of richness and turnover will be presented, together with the relative importance of beta- and gamma-diversity. Patterns of diversity will be compared between physiognomic groups. These analyses provide several important advances for the use of vegetation data to inform the use of environmental surrogates. The underlying GDM model can be used to produce, e.g.: 1) biotic classifications (i.e. vegetation or ecosystem classifications), 2) maps of priority for conservation management based on estimated level of protection, and 3) maps of estimated distinctiveness or turnover. This technique shows considerable promise for community analyses of diverse groups.
Disentangling the effects of habitat properties and propagule pressure on plant invasions using an ecoinformatics approach

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Abstract: The level of plant invasion in different habitats depends on habitat properties and propagule pressure. For the assessment of habitat susceptibility to invasions, it is necessary to factor out the effect of propagule pressure and compare the habitats under the assumption of equal propagule pressure. We combined a data set of 20 468 vegetation plots from all major habitats of the Czech Republic with the national database of alien plants and land-cover and environmental data obtained from GIS. Using minimal adequate models and regression trees, we related the proportion of archaeophytes (historic invaders) and neophytes (modern invaders) to variables representing habitat properties, climate and propagule pressure, the latter expressed through proportion of surrounding urban/industrial or agricultural land and human density. Most variance in the proportion of aliens was explained by habitat types (76% for archaeophytes and 39% for neophytes), while propagule pressure variables explained only 2.8% and 3.7% and climate 0.9% and 1.6%, respectively, for each group of aliens. Between-habitat comparisons of the gross and net effects of habitat properties suggest that the most important determinants of the level of invasions are disturbance regime and fluctuations in resource availability.
A probabilistic approach to biodiversity monitoring in the European Natura2000 network

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Abstract: To accomplish the reduction of biodiversity loss as stated by the 2010 target, it is essential to assess how effective is the conservation provided by the existing networks of nature reserves and to develop tools for quantifying future changes. In Europe, the most important conservation network is formed by the Natura2000 sites, and the Habitat Directive stresses the need to assess long term change in species composition in these Sites of Community Interest (SCIs). Probabilistic sampling techniques represent valuable tools for detecting changes in species diversity, permitting comparison of estimates with an hypothesis testing approach, and providing rigorous science-based information to resource managers and decision makers.

Here we report the first results of the application of a sample based approach specifically developed to quantify and monitor changes in plant composition in a network of SCIs in Tuscany, central Italy. We develop a probabilistic approach to collect data on plant species composition and diversity and a web-based archive for storing them. We then present the way this quantitative approach can be used as a straightforward tool to analyze different levels of plant species species diversity, from the plot scale to the site (SCI) and entire network scales.
Abstract: Insight into factors that determine the assembly of plant communities from a given pool of species is of paramount importance for conservation ecology. We explored the importance of niche-based processes and dispersal processes with an eco-informatics approach. We compared small plots with larger regions with regard to species composition and distribution of functional traits. We developed a GIS tool to quantify species pools at various spatial scales, based on ecological and geographical criteria. In this GIS tool large databases are explored, containing floristic, phytosociological and functional information. Our premise is that differences in the nature of the species in local and regional species pools with regard to functional traits, can give important clues to the processes at work in the assembly of communities. The tool was used to analyse large-scaled spatial and temporal patterns in species composition in response to land-use changes.
Temporal stand dynamics in forests over a large-scale sampling regime on the Interior Highlands of Arkansas, USA

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Abstract: Forest stand dynamics are an important descriptive element of vegetation analysis. Often lacking are studies that track stand dynamics on a temporal scale over large regions. Typically this is because re-measuring sample units over long periods of time with the same methods is expensive and problematic. I used data from the USDA Forest Service, Forest Inventory and Analysis (FIA) program to evaluate stand dynamics across the 66 700 km$^2$ landscape of the Interior Highlands. Across this region, 41 207 km$^2$ were covered by forests. Approximately 1147 sample units were distributed systematically across this forest area. These sample units were measured in 1968, 1978, 1988, and 1995. I used the Czekanowski Coefficient to characterize stand dynamics across the four measurement periods, where 1.0 is perfect similarity and 0.0 is no similarity. Stands were highly similar between successive survey periods (0.75 between 1968-78; 0.70 between 1978-88; and 0.74 between 1988-95) but quite different between the 1968 and 1995 measurement periods (0.56). This study demonstrates how stand dynamics, coupled with varying degrees of disturbance, are strongly correlated with the temporal scale, and that measurement periods close together may not reveal an accurate picture of change.
Discussion on future directions in bioinformatics
Leader – Susan Wiser
Session 14: Bioinformatics – Data syntheses across time
**Secondary regeneration of hill dipterocarp forest of Negeri Sembilan, Malaysia**

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**Abstract:** Regeneration status of several logged-over hill dipterocarp forests of Negeri Sembilan were assessed by use of phytosociological (vegetation) studies. Several vegetation samples, each with the size of 60x40m, were established to assess the vegetation composition, species abundance and stand structure in relation to the recovery status of several stands. In general, the vegetation in the stands can be classified from purely early successional species to mixed middle-late successional species, depending on the degree of disturbance during harvesting. Similarly, the canopy layer recovery of the stands ranged from two (herb-shrub layers) to five layers (herb to emergent). Generally, the studies showed that many of the logged-over stands are moving towards full recovery in terms of canopy structure recovery, species composition recovery and species abundance recovery. Only timber landing sites and primary logging roads are lagging behind.
Abstract: In February 2004, extremely high floods affected the lower North Island, New Zealand, 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×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, within 2 years. 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.
Ecology and geography of the upper timberline in the Himalayas: a review

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Abstract: Based on comprehensive evaluations and analyses of available data sources, a review of geographical and ecological aspects of the upper timberline in the Himalayan mountain system is presented. Increasing timberline elevations along two gradients (NW-SE; peripheral-central) are related to macro- and mesoclimatic effects of latitude, continentality and mass-elevation. Pronounced effects of exposure to solar radiation result in a much higher utilization pressure at south-facing slopes, in particular with regard to pastoral use. Anthropogenic depression of upper timberline may amount to more than 500 m. Along the mountain arc, north-facing slopes show a floristic change from deciduous Betula- to evergreen Rhododendron-dominated upper timberlines, which must be attributed to decreasing winter cold and strongly increasing humidity levels. Juniperus spp. are principal timberline tree species on south-facing slopes throughout the mountain system. Relationships of Himalayan timberlines to other ecological conditions and processes such as carbon balance, freezing and frost drought, soil temperatures, wind, snow cover, soils, regeneration, etc., are still largely unexplored. More systematic, interdisciplinary timberline research in the Himalaya is strongly needed to better understand how complex ecological and socio-economic processes are expressed in present spatial and physiognomic timberline structures.
The influence of seed dispersal and environmental heterogeneity on spatial patterns of seedlings in a spruce beech fir old growth forest

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Abstract: The spatial structure of trees is a key determinant for forest dynamics in terms of processes like competition, facilitation and seed dispersal. In this paper, the role of seed dispersal and resource heterogeneity in terms of light availability and soil-micromorphology for generation of spatial patterns is quantified for seedlings of Picea abies, Abies alba and Fagus sylvatica in the Rothwald forest in Austria, the largest old growth forest in Central Europe. Seed dispersal kernels were generated using an inverse modelling approach. A shade map was derived from hemispherical photographs and micromorphology was recorded. An inhomogeneous poisson process based on the seed density, light environment, microsites and the density of larger seedlings was fitted. L-functions adjusted for the inhomogeneity were calculated. Microsites contributed most of the variation in spatial patterns of small seedlings. Fagus sylvatica and Picea abies showed spatial segregation in terms of micromorphology while no signs of spatial segregation between Fagus sylvatica and Abies alba were found. In a next step, the “memory” of spatial patterns in terms of seed dispersal and disturbance history is analysed in a larger spatial and temporal scale.
Grassland diversity related to the human population density a thousand years ago

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Abstract: Species-rich semi-natural grasslands in Europe developed during prehistoric times hand-in-hand with agricultural land use. Nowadays, intensification of agricultural practices, intensive grassland management and other changes in land use may result in species extinction.

We hypothesize that current vascular plant diversity in semi-natural calcareous grasslands is positively correlated to the historic (ca. 1000 years ago) density of human settlements due to enhancement of species dispersal, and is negatively correlated to high current human population density due to habitat loss and deterioration.

We investigated the thin soil calcareous (alvar) grasslands of Estonia and described the size of vascular plant community species pool and species richness per 1 m² in 45 sites. We used historical and current human population densities and simultaneously considered the effects of grassland area, connectivity to other grasslands, successional age, soil pH, soil N, soil depth, soil depth heterogeneity, and spatial autocorrelation.

Both the size of the community species pool and the species richness are significantly correlated to the Iron Age human population density. In addition, species richness was unimodally related to the current human population density.

In summary, human land-use legacy is an important aspect in plant ecology, which may account for much of the current variation in biodiversity.
### Linking land use to vegetation function in temperate Australia - states and transitions

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**Abstract:** A state-and-transition model has been developed to summarize land use effects on grassy vegetation in south-eastern Australia. The states associated with different land uses (rangeland, pasture, cropping, conservation) are described in terms of plant traits and ecosystem functions. The grassy woodlands in this region are seriously threatened by agricultural development but persist in variously modified forms, allowing scope for landscape-scale management that balances diversity, function and agricultural production. The relative ease of transitions between states varies, depending on the disturbance history. This has implications for restoration of semi-natural vegetation where a simple reversal of management may result in no change, recovery of function, or recovery of function and floristic composition. Sites previously subjected to nutrient enrichment present a particular challenge to the restoration of floristic diversity in comparison with less fertile, but otherwise disturbed sites. The model provides a framework to summarize and predict vegetation response, and a communication framework in which land use changes can be linked to changes in the ecosystem services provided by vegetation on landscapes. It also suggests alternative paths to vegetation restoration that require lower management intervention and which take into account fundamental trade-offs in plant traits that occur in response to resource availability.
Development of extensively grazed high-phytodiversity sand ecosystems in intensively used agricultural landscapes in Germany

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Abstract: Intensification in agricultural land use led to a strong decline in size, number, connectivity and ecological quality of open inland sand habitats in Central Europe. Our aim is to develop and evaluate restoration measures applied in sand ecosystems with (potentially) high site-specific phytodiversity. After solving the problems of high soil-nutrient contents (mainly by soil inversion or deep-sand transfer) and seed limitation (mainly by inoculation with plant material from target communities) extensive sheep-grazing systems were established to enforce disturbance and seed-transfer processes (epi-, endozoochory). Broad-scale studies have shown that restorative grazing leads to a significant reduction of clonal graminoids (dominant particularly on abandoned agricultural fields). Fine-scale studies elucidated the role of soil disturbance and sheep endozoochory. In a common-garden experiment mainly individuals of ruderal graminoids could be detected in sheep faeces, but in the field (Koelerion glaucae pioneer stands) only habitat-specialists established on faeces material of the same source. Soil disturbance enhanced the density and diversity of seed-borne plant individuals compared with intact bryophyte layers. Our results suggest that by means of mechanical/manual restoration techniques and extensive grazing a network of high-phytodiversity sandy sites can be established within a matrix of high-intensity agriculture.
Forests never forget! Is current biodiversity of ancient European forests a legacy of past human land use?

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Abstract: In western Europe, all forests have been virtually cleared and reforested in the past. Once abandoned, human settlements are expected to return to their initial state before disturbance, and forest should recover. But this assumption is highly controversial since after-affects of past land use have been shown to control forest vegetation during several centuries or even millennia. We may even wonder whether part of the current ecological heterogeneity of ancient forests might not be a legacy of past human land use. In this contribution, I present a series of data indicating that former human settlement sites (from the Roman and Medieval times) support not only soil properties and plant communities but also seed banks that still differ from the surrounding forest vegetation despite a same ecological history since abandonment. Archaeological sites are often characterized by a number of eutrophic and/or calcicolous species and, sometimes, by cryptogenic species. Conversely, ancient forest species are usually lacking, due to habitat quality or dispersal limitations. Such plant communities may represent biodiversity spots in species-poor forests, especially when the soils are nutrient-poor. They may also serve as ecological indicators during archaeological field surveys.
Multiscale effects of successive land-use conversion on the vegetation of a marginal European landscape

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Abstract: Over the last six decades, European landscapes have undergone either agricultural intensification or marginalisation. In the latter case, arable land was successively replaced by grassland systems or abandonment. We studied the impacts of land-use conversion from arable land to grassland on species patterns at the patch and landscape scale in the Lahn-Dill-Highlands (Germany). 207 grassland stands (mean patch size: 0.3 ha) were selected in a stratification process based on site data and habitat age. Species composition was sampled for each patch. We applied ordination techniques to quantify the relative importance of site conditions and habitat age on species richness and species composition at the patch scale. A GIS-based spatially explicit model was used to estimate vegetation effects at the landscape scale considering spatial extents ranging between 20 ha and 200 km². At the patch scale, vegetation is clearly differentiated in relation to stand age. At the landscape scale, patterns of differently aged grasslands enhance species richness and vegetation diversity, with decreasing effects for increasing spatial extents.
The influence of landscape structure on the field margin vegetation of Estonian agricultural landscapes

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Abstract: Field margins are considered to be important contributors for the maintenance of biodiversity in agricultural landscapes. We studied the vegetation composition of fields and field margins of six Estonian agricultural landscapes that differed in regard to land use intensity and small-scale landscape structure (ditches, roads and tree or bush layer). We found that species being most abundant in the field margins were the same species that were also frequent in rotational grasslands and crop-fields. Road verges were characterised mainly by annuals and other disturbance-tolerant species. The vegetation of ditch banks consisted of species typical of semi-natural grasslands. Tree-lines and hedgerows or forest edges were characterised by generalist species. The landscape features of close neighbourhood around field margins should be treated as independent environmental factors and the effect of surrounding landscape structure on the vegetation composition of field boundaries should be seen as factorial complex. We suggest that while assessing the influence of land-use intensity and landscape structure on plant diversity, species should be distinguished on the basis of their different tolerance to agricultural disturbance. The species in agricultural landscapes could be classified into two wide emergent groups – agro-tolerant species and nature-value species (i.e. nature conservation demanding species).
Genetic diversity of a common plant species is affected by landscape fragmentation and spatial population characteristics

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Abstract: Anthropogenic fragmentation processes lead to a massive reduction in the area of semi-natural habitats. Fragmented habitat systems within the agricultural landscape provide a valuable arena for the study of the mechanisms that determine species diversity and genetic diversity in natural populations. Avoidance of the unsuitable matrix and altered dispersal distances between native habitat fragments may lead to increased isolation, thus to reduced genetic diversity.

We investigate the extent to which gene diversity within and genetic differentiation between populations of the common herb Geum urbanum L. can be explained by properties of the populations itself and by the present landscape structure.

Our study area comprised three study sites, representing agricultural landscapes with a network of woody sites as potential habitats for G. urbanum. To investigate the response of G. urbanum to landscape fragmentation the genetic population structure was assessed by means of microsatellites. Linear mixed-effects models were used to test for the influences of landscape structure parameters and spatial population characteristics on genetic diversity within and among populations. Genetic structure was affected by habitat diversity, density and isolation of woody habitats, percentage area of travelling networks, average patch size of surrounding habitats and by the number of Geum population patches.
Abstract: Although loss and fragmentation of habitats, as well as increasing intensity of agricultural land use, are generally considered to be important negative drivers of biodiversity, there is scarce quantitative information about their relative roles in biodiversity decline for agricultural landscapes. It has been suggested that corridors between habitat patches such as field margins may compensate both for the fragmentation and for the loss of habitats.

In the frame of project GREENVEINS, we studied the effects of habitat availability, agricultural land-use intensity and landscape configuration on the functional composition and diversity of vegetation in agricultural landscapes. Plant functional groups were examined in 25 agricultural landscapes across seven European countries.

As our results revealed, the availability of natural and semi-natural habitats was the main driver of abundance and species richness within functional groups, while habitat configuration was of minor importance.

We conclude that habitat availability is the main driver of plant species richness in European agricultural landscapes and that the existence of linear elements, either connecting natural and semi-natural patches or supporting alternative habitats, does not compensate the loss of habitats and, hence, the loss of plant diversity.
The effect of shrub cutting and grazing on shrub growth and herbaceous plant communities in the Negev desert of Israel

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Abstract: The interaction between woody and herbaceous vegetation can be positive or negative depending on ecosystem productivity or level of abiotic stress. The aim of the study was to determine the effect of shrub cutting and grazing on shrub growth, and on the interaction between shrubs, soil crust and herbaceous plant richness in the Negev desert, Israel. The experimental treatments were shrub cutting and grazing, in five randomized blocks and factorial design. In addition to measuring the dimensions of all the focal shrubs, we sampled herbaceous plants in 20 pairs of 20 x 20cm quadrats in the shrub understorey and a nearby crust patch. The results of the study showed shrub patches had higher number of species than crust patches at the treatment scale. However, at the sample scale, differences in rainfall amount shifted the effects of shrubs on species richness relative to crust from negative in 2004 to positive in 2005. Compared to uncut shrubs, cut shrubs exhibited more vigorous growth and increased more in branch density because of differences in primary productivity and release of apical dominance. The result of this study may be useful in the application of shrub cutting and grazing for the management of desertified shrublands.
Variation in plant species richness in and adjacent to 64 ponds in SE Norwegian agricultural landscapes

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Abstract: In cultivated landscapes small patches of remnant vegetation, e.g. small water bodies, are highly important for the total biodiversity because they represent the only hospitable habitat for many species. Conjunctures and technological progress highly affect agricultural landscapes via effects on landscape use and management, and since World War II loss of farm ponds has been reported from different parts of the world.

All vascular plants, classified by life and growth form into groups of hydrophytes and helophytes, and terrestrial species of pond margins, were inventoried in 64 Norwegian agricultural landscape ponds and adjacent margins. The study sites varied considerably with respect to species richness.

Species richness in each plant group was modelled separately by generalised linear models, using 56 recorded explanatory variables as predictors. Pond area, water depth and water chemical variables were important predictors of hydrophyte and helophyte species richness. Pond margin area and geographical variables were significant predictors of richness of terrestrial species of pond margins. The weak explanatory power of the selected variables indicates importance of apparent randomness in this ecosystem, and that the ponds and their adjacent margins represent islands in the agricultural landscape that accumulate species more or less individually.
Effect of land use on water quality and aquatic plants of irrigation ponds in western Japan

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Abstract: Rice fields are irrigated throughout the season. Numerous irrigation ponds were constructed in the Seto Inland Sea district of western Japan. As a case study of irrigation ponds, we studied water quality and aquatic plants of ponds in two areas (Higashi-Hiroshima and Hojo) in the Inland Sea district. In Higashi-Hiroshima, cultivated lands are mostly occupied by rice fields, and irrigation ponds are mostly surrounded by rice fields and forests. Pond flora contain diverse floating-leaved, submerged and free-floating species. Many species are restricted to nutrient-poor ponds. In Hojo, the landscape is characterized by citrus orchards distributed widely on hillside slopes. Many ponds have watersheds partly or completely occupied by orchards. Ponds located in agriculturally intensive watersheds had extremely eutrophic water. Submerged and free-floating taxa dominated the aquatic flora. Many of them are known as rice field weeds. Species-rich flora were restricted to the ponds of lower nutrient levels located in forested watersheds. Traditional pond maintenance and management have been effective for diverse flora conservation. Recent rural and agricultural changes have caused negative effects on the pond environment and pond life, not only in our study areas, but also in many other areas in Japan.
Plants as drivers for floristic changes in meadows under different degree of abandonment

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Abstract: When Middle European meadows are abandoned local climate favours succession to forests accompanied by significant loss of biodiversity. We tested meadows of different nutritional status for floristic changes during different degrees of abandonment. Starting from 1999 we sampled relevées at the traditional scale of 25 m² near Vienna. Besides 2 subplots with regular annual cut we measured on every plot one subplot cut only every second year and one subplot, cut only in 1999 but not since that.

The average rates of compositional change on plots from nutrient poor meadows turned out to be significantly lower than in meadows well supplied with nutrients. Although the year to year variation in species abundance on regularly cut subplots was considerably high, we found serious trends in species abundance dynamics. On subplots cut every second year the abundances shifted selectively but the total number of species lowered only to a small amount. Subplots totally abandoned since 2000 showed dramatic changes in species composition and species losses of more than 50 % on average. Highest diversity loss rates were correlated to heavy increase of coverage by Purple Moorgrass (Molinia caerulea). Second important driver for species loss was Wood Small-reed (Calamagrostis epigejos).
Session 18: Agricultural land use changes

GIS and remote sensing based modelling of productivity in semi desert, mountain steppe and alpine ecosystems in Western Mongolia

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Abstract: Mongolia is a country of nomadic livestock husbandry. Since the transformation in 1991 towards a market economy and democracy, livestock husbandry has expanded following a 38% increase in the number of domestic animals. Increasing proportions of the country are now characterised by overstocking and overgrazing. Thus, precise knowledge about the productivity and carrying capacity of the Mongolian ecosystems is important to preserve their biodiversity and to establish a sustainable land use.

Currently we develop a spatially explicit model based on own field investigations, literature review and existing climate and elevation models. The dynamic input is provided by operationally retrieved and analyzed remote sensing data based on the MODIS and LANDSAT sensors (NDVI, precipitation). As the Normalised Difference Vegetation Index (NDVI) has a very strong correlation with above-ground net primary productivity it is used as a driver for plant growth.

Results will regard the resource use efficiency of the herders under different climate and socio-economic scenarios. In future the model is intended to serve as a basis for a decision support system for sustainable land use and regional planning in Western Mongolia.
Survival or demise? — The influence of volcanic eruption and fire on New Zealand vegetation from pollen evidence

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Abstract: Infrequent, intense volcanic disturbance and fires are important factors in New Zealand forests, yet little is known about the damage and vegetation survival after such disturbances. A sediment core from Tiniroto in Gisborne, New Zealand, which was subject to three volcanic eruptions and wild fires over 5000 years, provides an opportunity to examine the key factors correlated with revegetation pattern following the disturbances, by means of fine resolution pollen analyses and multivariate analysis.

The degree of vegetation damage is related to the occurrence of fire rather than deposition of tephra. No major vegetation change was found around the Whakatane (4830±20 yr BP) and Waimihia (3280±20 yr BP) eruption episodes. However, there is a slight increase of shrub and fern components with the occurrence of charcoal particles in these two periods. Despite bearing nearly the same thickness of tephra with Waimihia, the Taupo eruption (1850±10 yr BP) exerts a more substantial impact on vegetation, but even then there was no major damage to the forest and the destruction is mainly restricted to the shrubs and fernland. The prominent taxa after the eruption are either fire prone or reliant on disturbances for regeneration. Another substantial vegetation perturbation marked by charcoal at c. 2300 yr BP, shows a high frequency of fern allies, and is indicative of a semi-open vegetation state. This vegetation structure might also contribute partly to the relative intense vegetation damage from Taupo episode.

The vegetation pattern differs following individual disturbance, suggesting that a site does not undergo the same vegetation sequence following all disturbances. Instead, the pre-disturbance forest structure and changing disturbance regimes over time play a major role in determining the range and severity of disturbance impacts.
Randomness in plant communities: a new approach to its measurement using spatial autocorrelation

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Abstract: Randomness, chance, uncertainty and disorderliness are all terms used to describe the unpredictable component in ecological communities. It is often talked about, increasingly so recently with neutral models, but never measured. We set out to measure the degree to which chance contributes to structure of plant communities. A graph of the dissimilarity between two patches of vegetation versus their distance apart was constructed. The Y intercept of the fitted line (the nugget point) is an estimate of the amount of variation in species composition when all environmental difference and dispersal limitation are excluded. Thus the nugget can be used as an estimate measure of inherent randomness of the vegetation composition. 16 sites around the South Island, New Zealand, of varying vegetation types and environments were sampled. No trends or correlations were found between the amount of randomness and the community type, or species richness of the quadrat. However, the amount of randomness was positively correlated with the community species richness and did seem to be higher in sites that were subject to more frequent or more recent disturbance.
Mechanisms of competitive ability in *Eucalyptus* seedlings across a rainfall gradient

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Abstract: Competitive ability is defined by how plants acquire and allocate limiting resources in the presence of competing vegetation. We tested for how the mechanisms of competitive ability change across broad environmental gradients. We grew seedlings of *Eucalyptus* species in three experimental sites in South Australia. Experimental sites had large differences in annual rainfall. Seedlings were transplanted randomly into plots in a full factorial experiment with neighbour removal and resource addition treatments at each experimental site. At the completion of the experiment, we measured target plant biomass, and functional and physiological traits controlling plant growth and allocation (specific leaf area, leaf weight ratio, total leaf area, net assimilation rate, leaf nitrogen content, and water use efficiency). Competition intensity (the reduction in target plant growth due to competing vegetation) was nearly constant across experimental sites. However, the physiological mechanisms underlying competitive ability were significantly different in each of the three sites. The ability to compete against neighbouring vegetation is a complex trait in plants, and strategies of growth and allocation generating competitive success are variable across environments.
Session 20: Population ecology

Sclerophyllous response to complex environments in the heterophyllous species Acacia implexa (Benth.)

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Abstract: Sclerophyll refers to thick and tough leaves and can be summarised as a relative increase in leaf mass per area (LMA, g/cm²). Sclerophyll communities are generally associated with a low resource environment where the replacement of lost photosynthetic tissue is relatively expensive. Previous studies of sclerophyll have largely focused across populations, species or communities and found that low nutrients and/or water availability increased the prevalence of sclerophyll. Here we tested for plastic responses in leaf form across nutrient, light and water treatments within a population of the heterophyllous species Acacia implexa (Benth.). A. implexa displays three “leaf” types: a true leaf with low LMA, a modified petiole/rachis (a phyllode) with high LMA, and a leaf/phyllode transitional form. An ANCOVA analysis, with biomass as the covariate, found that when all leaves were considered LMA increased in high nutrient and high light environment with no covariate effect. Across true leaves results were as expected. However when transitional and phyllodes were considered there was an unexpected trend of sclerophyll. Here we suggest that the strongest predictors of sclerophyll within a population tend to be light and developmental stage.
**Mycorrhiza and facilitation**

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**Abstract:** Symbiosis with mycorrhizal fungi is very common among vascular plants and mycorrhizal association between plant and fungus is usually beneficial for both sides. Fungus receives carbon from the plant and plants receive mineral nutrients and water from the fungus. The extent of mycorrhizal infection varies widely within and between plant individuals, species, and ecosystems, and in different conditions the symbiosis may shift either towards mutualism or parasitism. Due to their variable effect on host plant species and their patchy distribution in the environment, mycorrhizal fungi influence plant coexistence, succession and invasions.

In the present paper, the possible role of mycorrhizal symbiosis in plant-plant interactions is considered. In particular, we shall focus on facilitative interactions and AM symbiosis. Although the experimental evidence is still limited, we conclude that AM may contribute plant species diversity and composition in natural communities by promoting the interspecific facilitation between juvenile and adult plants. Also, acting together with a current host plant, mycorrhiza stabilize and/or modify the soil environment, influence the other biotic interactions (i.e. pollination, herbivory) and therefore make a habitat more suitable for potential host plants in the future.
Which factors shape seed rain in a mediterranean environment?

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Abstract: Seed rain creates the template under which subsequent filtering forces will shape community spatial pattern. However, information concerning seed rain at community scale is relatively scarce for semiarid environments. Moreover, in these where seeds may last in the soil for several years such effect is modulated by the remnant of previous seed rain.

We have followed seed rain for 18 months in a spatially-explicit replicated design in gypsum communities in Central Spain. We evaluate the effect of seasonality, microhabitat characteristics and spatial pattern in seed rain composition and density. We compare seed rain with seed bank seasonal changes at community scale.

Timing of seed rain occurred in spring simultaneous with seed production and in early autumn linked to the first rains. This suggests a major role for secondary dispersal in these communities. Seed rain composition was very similar to seed bank at sampling plot scale.
Ecological status and regeneration of some medicinally important and threatened plants in Alagar Hills, Tamilnadu, India

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Abstract: Ecology has become a prime science for the survival and betterment of human life. With the increase in population it is now clear that man cannot consider himself alone but must think about a stable relation between his population size and the carrying capacity of the regional ecosystems. Human needs and opportunistic greediness have resulted in the depletion of biotic wealth and large areas of species rich forests are being cleared to make way for agriculture. Several medicinally important plant species of the Alagar hills, part of western ghats are highly threatened due to loss of natural habitat and due to over exploitation. Recovery of natural populations is an important approach in the conservation of threatened species; assessment of ecological amplitude being its first step. A floristic survey was conducted in the selected area with the objective of assessing the ecological amplitude and the regeneration status of threatened medicinal plants. Thirty belt transects (100 x 5 m) were laid in different areas of the forest to study the vegetation pattern. The study concentrated on the medicinal plants, especially trees, since they differ, in their response to the disturbance compared to shrubs or herbs. In a total of fifteen species of medicinally important but threatened plants recorded, *Gracinia gummigutta* and *Artocarpus hirsuta* showed a wider ecological amplitude. Most of the threatened medicinal plants showed decrease in abundance. In plants like *Myristica malabarica* and *Madhuca nerifolia*, there was less regeneration compared to the density of the plants, and are at double risk of habitat loss and regeneration loss.
Abstract. The loss of habitat of naturally fragmented species may result in isolated metapopulations: small groups of populations that are still connected by gene flow but have become isolated from other metapopulations. Genetic isolation may result in genetic differentiation between metapopulations and lowered genetic diversity within the metapopulation. Gene input from outside the metapopulation can hence be expected to enhance cross compatibility and seed viability. This was tested with a pollination experiment in three isolated metapopulations of the endangered plant species *Parnassia palustris*. Outside-metapopulation crosses lead to a significantly higher seed set than within-metapopulation crosses, and this effect was more pronounced in small populations. This means pollen from outside the metapopulation was more compatible than pollen from within the metapopulation, due to a lowered genetic diversity within the metapopulation. The seed set of naturally pollinated flowers was at least equal to that of hand-pollinated flowers, which can be explained by a compensation effect of pollen quantity and donor diversity for pollen quality. The loss of genetic diversity at the level of the metapopulation is most likely not only affecting loci related to cross compatibility, so that reconnection of metapopulations by stepping stones may prevent further genetic erosion.
Effects of clonal growth on genotypic diversity and fruiting success - results from a meta-analysis and a case study on *Maianthemum bifolium*

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Abstract. Clonal reproduction in plants is as old as the first land plant species. The potential advantages of clonal growth include facilitation of resource uptake in heterogeneous environments, persistence under suboptimal environmental conditions and increased attraction of pollinators by increased floral display size. In self-incompatible species, however, clonality may also reduce mate availability because of a shortage in compatible pollen. Random drift and intraspecific competition may then reduce genotypic diversity, further decreasing mate availability and sexual reproduction. Here, we combined AFLP markers, a pollination experiment and an analysis of the fruiting success to find evidence for the described process of genotypic impoverishment. Our study species was the strongly clonal forest perennial *Maianthemum bifolium* (Liliaceae) which shows very low rates of sexual recruitment in our study area in the northern part of Belgium. Additionally, we compared the obtained results on the genotypic diversities within the studied populations with the average weighted genotypic diversities retrieved from a meta-analysis that was conducted on more than 75 studies reporting on the genotypic diversities (G/N, D and E) in clonal plant species.
The Pampas grass (*Cortaderia selloana*), an invasive plant in northern Spain

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Abstract: A summary of the survey programme concerning the Pampas grass (*Cortaderia selloana*) performed by the research group in invasive plants for the Cantabrian area is presented in this work. Data about its origin and present distribution in the world are given, completed with its present and potential distribution in the Iberian Peninsula according to the climatic available data after having estimated the bioclimatic envelope for this species. Some comments about its morphology and reproductive biology are also made. The ecological requirements of the Pampas grass are studied and we have concluded that it has a typical ruderal strategy colonizing disturbed areas where soil has been turned over. After being established, it competes successfully with the local flora and it is almost impossible to eliminate; this brings many problems for the local flora managers. Finally, some management strategies against the ever growing populations of this plant used in some areas of this territory are evaluated and commented.
The leaf size / number trade-off in trees

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Abstract: Why are there so many different sizes of leaves? A large body of past research has explored this question, but a relatively simple interpretation has been largely overlooked: smaller leaves are found on species that make more of them. We tested this hypothesis using a new measurement approach for a sample of 24 common deciduous angiosperm tree species that usually co-occur in the same habitats within the Eastern Deciduous Forest region of Canada. Ninety percent ($r^2=0.90$) of the variation in mean individual leaf mass across species, spanning two orders of magnitude, could be accounted for by proportional trade-off variation in mean ‘leafing intensity’ – i.e., number of leaves produced per unit volume of annual shoots that bear these leaves. Based on this negative isometric relationship, we propose the ‘leafing intensity premium’ hypothesis, where much of the between-species variation in individual leaf mass may have nothing at all to do with any direct adaptation associated with leaf size; – i.e., selection may instead favour high leafing intensity – which corresponds with high ‘budding intensity’ – and so relatively small individual leaf mass results simply as a trade-off. This accounts, we suggest, for why most woody angiosperms – even some of the largest/tallest ones – have relatively small leaves.
On the importance of species size in patterns of assembly and diversity in vegetation

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Abstract: Plant species size distributions are strongly right-skewed at spatial scales ranging from the local community to regional floras, and at virtually every position along broad habitat gradients of both disturbance and substrate fertility. This striking pattern of contemporary vegetation can be accounted for by several evolutionary hypotheses, all of which predict that the plant life history strategies most frequently and most strongly favoured by natural selection involve a relatively small body size, even in habitat types where the intensity and importance of competition is considered most severe. This represents a fundamental disconnect with a large body of traditional theory on competitive ability in plants, and has profound implications for understanding mechanisms of species assembly and coexistence within vegetation. These implications will be explored using recent data from a variety of studies ranging from large scale field surveys, to applications of null models for interpreting resident species composition of local neighbourhoods within natural vegetation, to estimates of plant fitness in controlled competition experiments.
The interaction of soil fertility, disturbance and propagule pools in regulating plant diversity: a synthesis of sowing experiments from North American grasslands

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Abstract: Although soil fertility and disturbance define key niche dimensions for plant species coexistence, it is increasingly apparent that constraints imposed by regional species pools and dispersal limitations can constrain the composition and diversity of plant communities under some circumstances. As a result, a robust understanding of plant community diversity requires knowledge of how locally-resolved species interactions across gradients of soil fertility, habitat productivity and disturbance may be mediated by species' availability to regulate coexistence. This understanding is of particular relevance in agricultural landscapes such as those found in the tallgrass prairie regions of the USA where historic species pools have been greatly diminished by habitat destruction, fragmentation and widespread extirpations of native prairie species. We have implemented sowing experiments in the states of Kansas, Michigan and Minnesota (USA) to investigate the importance of dispersal limitations and propagule pools in constraining local-scale grassland diversity and community assembly under a variety of field conditions. The goal of this presentation is to summarize the findings of these experiments and seek general principles regarding how local and regional forces vary in their contribution to the regulation of plant diversity across gradients of resource availability, productivity, disturbance and successional stage.
Contrasting plant diversity relationships in tropical and temperate regions: the role of evolutionary history

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Abstract: The relationships between habitat parameters and diversity have continuously been in the focus of vegetation science. For example, the unimodal productivity-diversity relationship has been often observed. The decrease in diversity at high productivity has usually been attributed to competitive exclusion. Alternatively, the relatively small species pool size for high productivity conditions may account for this pattern. Small species pool sizes for highly productive habitats have been deemed to be characteristic of the temperate regions, where productive habitats for speciation and species migration have historically been scarce. In contrast, productive habitats in the tropics have been relatively common during evolutionary history. We hypothesize that evolutionary history contributes to the observed productivity-diversity relationship of plants, and that the productivity-diversity relationship differs between temperate and tropical regions. We investigated the productivity-diversity relationship patterns from 163 case studies throughout the world. Latitude described approximately 80% of the variation in the shape of the relationships. The unimodal relationship was found to dominate in the temperate zone, whereas the positive relationship was significantly more common in the tropics. Consequently, the shape of the diversity relationships may differ between temperate and tropical regions due to different evolutionary history of the local species pools.
What is the potential role of dispersal limitation in generating general patterns of plant diversity?

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Abstract: Seed introduction experiments have shown that diversity of plant communities is often dispersal limited. Variation in diversity with habitat productivity has long been a central ecological topic. Plant diversity is mostly highest at intermediate productivity, exhibiting the unimodal relationship. This relationship has been explained by both evolutionary and ecological processes, but the potential role of dispersal limitation has not been considered. We used European flora data to show that dispersal limitation may contribute to the unimodal productivity-diversity relationship. We calculated average relative dispersal probabilities for species assemblages occurring preferentially in different habitat productivity levels. At low productivity levels, species without dispersal syndromes predominate, but at high productivity levels, species with a low number of seeds are common. The total relative dispersal probability, combining both the dispersal probabilities attributable to the number of seeds and to the presence of dispersal syndrome, had a unimodal relationship with habitat productivity. Thus, the unimodal productivity-diversity relationship may arise due to the minimal dispersal limitation of local richness in conditions of moderately low productivity. In conditions where species pool size and biotic interactions do not vary along productivity gradients, the variation in dispersal probabilities with productivity alone can produce unimodal relationships between diversity and productivity.
Abstract: Research on drivers of plant taxonomic diversity have typically focused on only one of two spatial scales, either global patterns, or local patterns. Studies at the global level have tended to be primarily predictive, examining correlations between environmental variables and taxonomic richness. Studies at local scales have tended to included more mechanistic experiments. Much less frequently, studies have tried to link these scales. My goal here is to build on previous work to propose a more general and more quantitative model linking global drivers of plant biodiversity to patterns of local plant species richness. The model attempts to predict local plant species richness from temperature, precipitation, soil fertility, soil pH. Unlike a previous similar attempt, the model attempts to predict actual numbers of species, relying on landmark studies at global spatial scales. Further, it uses a more general mathematical framework, providing greater flexibility in our attempts to capture dynamics between the local assemblage and the regional species pool.
Relationship between productivity, small scale and large scale species richness in herbaceous vegetation

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Abstract: The two parameters of linear species-area curves (SAC), intercept and slope, were related to productivity in order to examine how productivity affects plant species richness at different spatial scales. We used two data sets, the first including 48 plots (each nested from 0.004 to 256 m²) in 12 experimental sites on ploughed, formerly cultivated fields in the Siena region, Italy, the second including 40 nested (0.001 to 1000 m²) plots in hay meadows in the Bremen region, Germany.

The relationship between species richness and productivity (measured as dry standing biomass) was not consistent across the regions and plot sizes studied. The slopes z of the SAC were negatively related to biomass in both data sets, while the intercept c increased with productivity in the Siena data set and was unrelated to biomass in the Bremen data set. The relationship between c and z was negative in the Siena data set and positive in the Bremen data set. Literature data confirmed that there are no clear patterns in the inter-correlations between productivity, small scale and large scale species richness. The results imply that the species-pool hypothesis may not apply to plot sizes as dealt with in this study.
Changes in small-scale species richness and evenness in a fine-scaled grazing gradient: the dynamic equilibrium hypothesis revisited.

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Abstract: Mediterranean pastures are well known for their high diversity, which is heavily influenced by grazing. However, experimental designs that use a fine-grained grazing gradient in a single plot have been difficult to obtain until the arise of GIS techniques. The movements of two sheep flocks were monitored at their grazing grounds (25 ha each) during two years and a digital grazing pressure model was built in order to check for the effects of grazing on plant richness and evenness. Other factors such as topographic variables and ploughing were also considered. The plant community was sampled three consecutive years at both sites, each sampling consisting of 100 randomly located 20 x 20 cm squares. Diversity is shown to depend quadratically (hump-shaped function) on grazing pressure, but at low productivity (dry) sites this relationship turns to be negative linear. Evenness is negatively related to grazing, but those effects can be easily hidden by ploughing. Our results are discussed in the context of the dynamic equilibrium hypothesis.
Long-term dynamics of species-rich meadows and species coexistence

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Abstract: The role of seedling establishment and vegetative multiplication was assessed in meadows with >60 species of vascular plant species per m² (Czech Republic, C Europe). Effects of seasonality and disturbance on the dynamics of the meadows were evaluated over a period of 9 years. Using these data, a cellular automaton model has been developed, and predictions of the development were made over another 5 year period. A comparison of the model outcome with field data showed that dynamics of most plant populations was very stochastic. However, numerous constrains could be identified, making species composition of local assemblages and behaviour of individual plants partly predictable. Based on these constraints, assembly rules were formulated for the community. The unpredictable disturbances caused by ants occasionally building their nests in the meadow and accumulating storage in the soil may partly disrupt the system by shifting the competitive balance between abundant subordinate plants of small stature and a few species of grasses, previously effectively suppressed by mowing, promoting growth of the grasses. The field data suggest that the system has a low resilience and restoration of previous undisturbed stage may take decades. Implications for conservation of the studied meadows will be discussed.
Patterns and importance of clonal plants across biomes in China

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Abstract: Clonal plants occur almost in every plant community, but very few studies have related their roles in local communities to those in biomes. We obtained 1380 relevés and the corresponding climatic data to examine the importance and patterns of clonal plants in most biomes of China and their relationships to environmental conditions. Multiple regression analyses show that clonal plants were more frequent than non-clonal plants in drier, colder and less productive biomes. Shannon’s diversity index (SDI) was negatively correlated with the importance value (IV) of clonal plants in most studied biomes. With increasing IV of all clonal plants or guerilla-type clonal plants only, SDI decreased in the biomes with high species richness, whereas it increased in those with low species richness. However, SDI was not correlated with IV of the phalanx-type clonal plants. Also, phalanx plants occur frequently in the initial period of secondary succession, while guerilla plants occur in the mid and late stages. These findings suggest that clonal plants have the stronger adaptation ability to environmental pressures than non-clonal ones, and clonal growth may facilitate the establishment of plant communities in these disturbed habitats.
Shifts in plant diversity across contrasting long-term soil chronosequences

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Abstract: During succession vegetation development occurs, but in the long-term absence of catastrophic disturbance a decline (retrogressive) phase follows in which both nutrient availability and tree biomass declines. We measured plant diversity across six long-term soil chronosequences that each included retrogressive stages in Australia, New Zealand, Alaska, Hawaii and Sweden. Tree species richness (rarefraction-adjusted) often peaked when tree basal area (a surrogate of tree biomass) peaked, and declined during retrogression, in contrast to theories predicting positive or unimodal responses of diversity to biomass or soil fertility. The Shannon-Weiner diversity index sometimes showed the same pattern, but in two sequences was least when tree basal area was maximal, due to domination of total basal area by a single species. In contrast, total vascular plant species richness often increased during retrogression. The decline in tree diversity during retrogression was often associated with reduced relative amounts of total phosphorus. These results show that forests with high tree diversity and biomass do not persist indefinitely in the long term absence of catastrophic disturbance, and that there is some consistency of patterns across the boreal, temperate and subtropical zones.
Coexistence of plant functional types: A model study for immigration and observed local plant diversity

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Abstract: Whether coexistence between plant species is driven by local or regional processes is one of the most commonly asked questions in community ecology. To answer this question, we have tested the influence of immigration on local diversity using a spatially explicit, individual and rule based model. The model is based on published and unpublished data on the population dynamics of 156 woody species collected in the Eneabba Sandplains (West Australia) over 18 years. In the model the species are represented by 38 plant functional types according to their trait category combinations. The trait categories define individual responses during the simulation of the important life history processes in annual time steps. For immigration experiments we considered different rates for yearly seed immigration, correlated with seed mass and with coexistence ability. Without immigration only few of the Plant Functional Types can coexist in the model. With increasing immigration rates the number of coexisting PFTs increase up to realistic values. As expected, simulated communities are more diverse when seed immigration is higher. However, the PFT distribution observed in the field cannot be completely explained by (even extreme) immigration rates. Additionally, other coexistence mechanisms have to be considered.
**Richness in terricolous lichen vegetation: species pools, habitat factors and heterogeneity**

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**Abstract:** Lichen richness and species pools on different scales, habitat factors and habitat heterogeneity were correlated (scatter plots, Spearman’s rank) for a data set of 693 plots (0.25, 1 m$^2$) in terricolous lichen vegetation from NW Germany, N Denmark (temperate zone), Finland (boreal), SE Greenland (arctic) and Austria (subalpine, alpine) in 56 phytosociologically different microcommunities.

While the regional terricolous lichen pools hardly differ in size, the minimum, mean and maximum lichen richness strongly increase to Arctic and Alps. With 28% of the species occurring over the whole range of studied zones, the terricolous lichen pools are also surprisingly similar (Sörensen), much more than saxicolous and, less surprising, corticolous. For most countries the phytosociological community lichen pools are positively correlated with lichen richness.

Only weak correlations and no hump-shaped relationships could be observed for habitat factors and lichen richness probably because too many gradients are included here. Disturbance factors are usually positively, and those expressing stability negatively, correlated with richness.

Lichen richness clearly correlates with habitat heterogeneity, either directly as gap number or, expressed floristically, as number of phytosociological units of which characteristic species occur in one plot and as richness of Barkman’s growth forms, growth form being an important functional trait for lichens.
Abstract: Traditional competition theory predicts that plant size is the most important trait that governs success under competition in vegetation. Yet, even in communities where competition is considered to be most severe (undisturbed, highly fertile habitats), species size distributions are strongly right-skewed. If size is the most important determinant of fitness under competition, how can so many small species persist and leave descendants in these highly competitive environments? Using multi-species mixtures and monocultures in a controlled competition experiment, we tested the hypothesis that species traits related to survival and reproduction are at least as important as size-related traits for predicting variation in fitness between species under competition. Traits (predictor variables) recorded included survival rate and mean size under competition; in addition, seed size, germination time, early growth rate, size threshold for seed production, fecundity allocation, and adult plant size were recorded for plants growing in isolation. The results have important implications for understanding mechanisms of species coexistence and for the interpretation of hierarchical versus intransitive competition in natural vegetation.
Unique patterns of ecological diversity in relict-refugial habitats of the Balkan Peninsula (SE Europa)

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Abstract: On this territory, due to its specific and very dynamic geological past, have been formed numerous canyons which are mainly built of carboniferous rocks. Some of these canyons in Bosnia and Herzegovina are over 1,700m deep (Neretva river canyon). During glaciation process, which was very protrude in the area over the last Ice Age, many plants have found shelter within these canyons - refugiums flora and vegetation that originate from the far Tertiary.

On this kinds of habitats have been recognized special forms of vegetation diversity. Dominant ecological factors here are very shallow forms of soil, extreme temperature, air humidity and insolation intensity. There has been detected that aspect of terrain doesn't exercise any impact on to diversity determination. It has been determine special ecoclimate which has led to the formation of stenoendemic rock crevices communities of the class Asplenietea trichomanis, and scree vegetation from class Thlaspietea rotundifolii. There has been determined law of declining floristic and vegetation richness from SW to SE, and from Adriatic Sea to inland. Special phenomenon in the process of diversity creation represent polidominant wood communities. Besides, at present day these kinds of habitats encompass the largest centres of unique diversity, among which are some species with global value.
Abstract: In 1964 the American ecologist Pierre Dansereau, having visited New Zealand, published a list of six 'problems'. I review the state of NZ vegetation science by discussing these problems 43 years on. The problems were:

1. “Climatic change is still progressing”. Dansereau implied that the present vegetation is out of phase with the current climate.

2. “Continuity of vegetation defies classification”. This seems no longer a problem to most modern vegetation scientists. Dansereau commented on the lack of faithful species, but are there ever faithful species?

3. “Lack of intolerant trees foreshortens succession”. Dansereau claimed that New Zealand possessed very few subclimax tree species, but recent work has elucidated the roles of species in succession.

4. “Discrepancies of form and function are every frequent”. This addressed the divaricate shrubs and juvenile/adult heteroblasty. Since 1964 there have been many suggestions for how such morphology might be adaptive. Too many. We are now stuck in adaptationism.

5. “Incidence of hybridization is extremely high”. This is true in some families, but untrue overall.

6. “Competing power of exotics is overwhelming”. This has been countered by the chauvinism of some New Zealand ecologists. We need to consider carefully what exotic invasion means.
What would a kiwi know about the future of vegetation science?

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Abstract: Vegetation science changed in many important ways over the last few decades. First, the amount of information available about plants and plant communities has increased dramatically. Second, technological advances (such as the internet, e-mail, and database tools) have made it easy to collaborate with people overseas, and to collate and analyze large amounts of data. Third, people have become much more aware of global environmental issues, especially climate change. Policy makers are looking to scientists for information – but plant ecologists still don’t have a good understanding of the rates at which plants can migrate, the rate at which species can adapt to changing environmental conditions, or even the ways that critical traits like plant height and leaf size vary over present-day climatic gradients.

I think that one of the most promising areas for progress in vegetation science lies in understanding global-scale patterns in plant communities and the environmental factors that shape these patterns. We can make substantial progress in this area by synthesizing information we already have.

Of course, I'm just a kiwi (a naive flightless bird that stumbles around the forest floor in the dark). I'll ask about your ideas for the future of vegetation science in question time.
Session 25: New Zealand and new ideas - overview

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Tree seedling establishment under pine-oak forest in traditional agricultural landscapes in Japan

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Abstract: Japanese red pine (Pinus densiflora) and konara oak (Quercus serrata) forests are two main components of traditional agricultural landscapes in Japan. In recent years, vegetation management activities in these forests have ceased with the decrease in the utilization of wood as fuel; moreover, the dominant species in these forests have changed. Usually, pine forests are replaced with deciduous or evergreen broadleaf forests in a successional sere. However, when tree seedlings fail to establish, nonforested vegetation such as bamboo thickets or scrubs are formed. In this study we examine tree seedling establishment after understorey management activities in pine-oak forests had ceased. In 2005, we surveyed tree seedlings and several environments in experimental forests where understorey mowing activities had ceased. Konara oak seedlings were found to be the most widespread (188 individuals, 54.7%) and were considered to be the main species. From logistic regression, we found that the factors affecting seedling establishment were the distance from adult oaks, dwarf bamboo (Pleioblastus chino) coverage, and pine basal area within 5 m buffers. Dwarf bamboo is considered to be a key species for vegetation successions in traditional agricultural landscapes in Japan.
Using between-patches boundaries parameters for conservation status assessment on coastal dune ecosystems

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Abstract: Coastal dune systems in natural conditions are characterized by a strong sea-inland zonation. In such types of landscape, sustainability is greatly influenced by the specific contiguity between natural patches (habitats).

In the present work we propose to use an adjacency matrix for landscape analysis and conservation status assessment on coastal dune ecosystems.

A land cover map (scale 1:5 000) of the Molise coast (central Italy) was used with the CORINE legend expanded to a fourth level of detail for natural and semi-natural areas. Three 1 km x 350 m windows with different disturbance regimes were analyzed and compared. For each window, number and extension of the edges between each pair of categories mapped were calculated and synthesized in an adjacency matrix.

In the coastal tracts examined, results show a good correlation between adjacency matrix information and the conservation status. In natural conditions a few adjacency types, most of them natural and seminatural, dominate the landscape. Moderately disturbed coastal areas are characterized by a fragmented landscape with a high number of adjacency types. In most disturbed sites, a few adjacency types, most of them between artificial areas, dominate the territory.

Since it is based on a standard land cover classification, the proposed method could represent a good tool in planning issues regarding coastal dune areas of most European countries.
Local and regional distribution of native and alien plant species on coastal dunes in Central Italy

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Abstract: Mediterranean coastal dunes are affected by high levels of human disturbance, particularly in recent years. This study examined the current distribution of the native and alien species growing on coastal dunes in central Italy at regional and local scales. At the regional scale, a floristic sampling was carried out following the European Cartographic Project protocol while at the local scale a stratified random design using the CORINE land cover as strata was followed. Major trends in plant distribution in coastal dunes were identified through Principal Coordinates Analysis (PCoA) considering alien origin, invasive status and growth form. At the regional scale major results showed a high floristic diversity with consistent numbers of non-native species and clear differences between the Tyrrhenian and the Adriatic coast. There was also a negative relationship between the total number of alien species and the species richness of the plot, probably related to disturbance. At the local scale alien composition varied according to community types. America represents the continent which provides the highest number of alien species. Most alien species were casuals while the number of invasive aliens was relatively much lower. Finally, the success of invasive aliens appeared to be related to both annual or perennial evergreen strategies.
Parameterization of major regional environmental gradients

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Abstract: Aggregation of 56 regional climatic, topographical, hydrological, geological and orographic variables was performed on grids of different spatial resolutions from 1 km to 10 km spanning all of Norway’s mainland. Principal component analyses (PCA) were performed on 6 matrices of different spatial resolution and of different sample square (grid cell) numbers. All six principal component analyses revealed four consistent gradients. The ordinations exposed (with decreasing importance) a regional winter temperature-dependent orography and humidity gradient, a mainly regional north-south and elevation-dependent summer temperature gradient, a regional north-south and east-west solar radiation gradient, and a topographic gradient associated with terrain relief and more finely scaled variation. The two first gradients mainly reproduced the most important and recognised regional (but mapped manual) variation for plant distribution in Norway. The third and fourth gradients also contained variation that is known to be important for biota in Norway. The benefit of parameterization of regional environmental variation in gradients over manually drawn maps of distinct zones is the much larger possibility for hypothesis testing, for performing predictive modelling of species and nature types (natural areas), for creating field designs for monitoring, for comparative studies, and for representativity and rareness analyses.
Models of diversity of beech forest vegetation on the vertical and horizontal profile of the Dinaric Alps (W Balkan, SE Europe)

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Abstract: As part of the broadleaved vegetation of the Balkan Peninsula, beech forests form a large belt on the Dinaric Mountains’ profiles, often bringing very specific phytogeographical attributes.

Orography, geological foundation, types of soils and hydrothermical patterns play a determining role in the spacing model and floristical composition of beech communities.

Stretching from the Adriatic Sea to the mountaintops (2,387 m), the thermophilic beech forest belt, including endemic communities, appears above 900 a.m on carbonate and A-C type of soil. On the same profile, beech forests appear again just above 1800 a.m., forming a subalpine endemic community.

On the continental (northern) side, stretching from Pannonia, beech forests appear on slight slopes and very deep soils, on altitudes of barely 150 m. After discontinuation by Querco-Carpinetum, different beech communities form the belt between 600 and 1600 a.m., climbing up to the end of forest vegetation. The specific vegetation of canyons is partly built by polydominant beech forests on carbonate, which can include more than 30 tree species in floristic composition.

The paper comprises the syntaxonomy model on the association level for each vegetation belt, as well as species with specific role in structure and stability of communities.
Impact of the invader *Helianthus tuberous* on vegetation along a low mountain river

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Abstract: In general, the impact of exotic plant species on natural vegetation in Europe is assumed to be low. However, there are some competitive exotic species that have dramatically increased during the last decades. We studied the impact of the competitive clonal *Helianthus tuberous*, introduced from North-America, on the natural vegetation along the low mountain Lahn river (Central Germany) ranging from the mountainous to the planar altitudinal step. Our hypotheses are: (1) The diversity of natural vegetation and the abundance of native species decrease with increasing *H. tuberous*. (2) The abundance of *H. tuberous* increases along the course of the Lahn river because environmental conditions become more favourable in lower altitudes and because the resistance of the natural vegetation against invasive species might decrease along the river. The vegetation was compared between plots with and without *H. tuberous* at 21 sites. The diversity and abundance of native species was higher in plots without *H. tuberous* but there was no relationship between the diversity or the abundance of native species and the abundance of *H. tuberous*. In both, plots with and without *H. tuberous*, diversity and abundance of native species decreased along the river whereas the number of invasive species was not influenced. Furthermore, along the course of the river evenness decreased only in plots with *H. tuberous* indicating an increasing negative influence of *H. tuberous* on the abundance of native species.
Land degradation in the Eastern Pamir (Tajikistan): The Teresken Syndrome

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Abstract: The famous high Pamir Mountains in Tajikistan are threatened by desertification, especially the arid eastern plateau regions. The Pamir is the water storing mountain by glaciers and snow (feeding the Amudarja/Oxus-springs and tributaries) has a high importance for the whole water balance of the Aral Sea basin and thus the 6 Central Asian states. The high mountain flora of the Pamir mainly consists of dwarf shrubs (hemicryptophytes), geophytes and cryptophytes, with very few annuals. Teresken (Ceratoides papposa), the dominant dwarf shrub plant species, is severely used as fodder and for firewood, but is on the other side the basis for wildlife under those harsh conditions. This strong, almost tragic dependance on one plant species is called the Teresken Syndrome. The dilemma is: teresken is used as grazing ground and fodder for sheep, goats, yaks etc., is also the most important basis for wildlife grazing (Marco Polo sheep), but is also the most important energy source (fuel) for the people, for heating and cooking. A whole bunch of development programmes is needed to cut this “Gordian knot”, in order to restore parts of natural vegetation, to protect the rich biodiversity and wildlife, to minimize soil loss and erosion – and thus help the people.
A morphological comparison of leaf heteroblasty between New Caledonia and New Zealand

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Abstract: Leaf heteroblasty, or pronounced changes in leaf morphology during plant development, is a conspicuous phenomenon on many isolated islands. However, morphological comparisons have not been made between islands, and the processes responsible for island heteroblasty are poorly understood. We investigated differences in leaf morphology of heteroblastic trees and shrubs in New Caledonia and New Zealand. Heteroblastic leaves were collected in field searches in several comparable habitat types in both countries. Leaf area, lobing, and degree of circularity were measured on juvenile and adult leaves from 31 species belonging to 19 plant families. Multivariate analysis of variance was then used to compare ontogenetic changes in leaf morphology between countries. Results showed that juvenile leaves were smaller and more lobed than adult leaves. Life history stage did not interact with country, indicating that morphological shifts between juvenile and adult leaves did not differ between New Caledonia and New Zealand. We conclude that island heteroblasty is similar in both locales, despite their strongly different climates, and the phenomenon likely results from some aspect of their shared geological history.
Implications of plant size distributions for reproductive output within natural populations

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Abstract: Where does most of the reproduction come from within plant populations? Traditional life history theory predicts major fitness advantages for large plant size, both in terms of competitive ability and lifetime fecundity. Yet, most plants within a population are relatively small. Their importance in terms of contributing to fitness and affecting the future size and composition of the population should depend on whether or not they are able to reach reproductive maturity and produce offspring. Surprisingly few studies have actually documented plant size distributions within natural populations, especially studies that have distinguished reproductive from non-reproductive plants. We examined this question by analyzing size distribution data for 20 herbaceous species growing in natural habitats: 10 annuals, 4 biennials and 6 perennials. A minimum of 200 flowering plants of each species were harvested from a randomly positioned plot (usually 1x1m) within the region of highest density within the population. The total above ground dry weight biomass was recorded for all individuals including for any non-reproductive plants that were also present within the plot.
Vegetation classification of the Taiwan beech forest

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Abstract: **Fagus hayatae** Palib. ex Hayata is endemic to Taiwan. Although more widespread during the Pleistocene, this species is now only limited to a few isolated fragments on ridgetops (1,340-2,125 m a.s.l.) in northern Taiwan. The structure and species composition of the beech forests were studied on five isolated mountains. The beech usually forms pure stands on ridgetops and is mingled with broad-leaved forest at lower slopes and warm-temperate montane coniferous forest at the upper elevation limit. Comparison of TWINSPAN groupings with the CCA ordination showed a definitive separation of communities along geographic and elevation gradients. The forest structure was characterized by a moderate density with an average basal area of 51.26 m²/ha. The beech contributed more than 68.3% of the total basal area. However, forest understorey species varied considerably in their distribution and abundance among sites. There was a marked difference in size-class distribution among sites. However, the size structures of the populations indicated that a much more drastic or wide-scale disturbance may be needed for the recruitment of the beech forests.
Biodiversity and urban ecology: a tale of 20 cities

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Abstract: Restoration and reconstruction of urban ecosystems is seen as an increasingly important strategy to maintain and protect biodiversity. What is the potential of cities to contribute to biodiversity goals? We assessed the degree of indigenous cover and land environment profiles of New Zealand’s 20 largest cities using Landcover 2 and LNZ. We compared city characteristics using an urban core and buffer zones 5, 10 and 20 km from this core.

New Zealand cities are highly variable in both landform profile and level of biodiversity resource. Although the urban cores are dominated by one or two major land environments at Level 1 of LNZ, many acutely threatened environments are represented within the urban and periurban zone. However, most New Zealand cities currently have less than 2% of indigenous cover within the urban core. Indigenous cover increases with distance from the urban core, with four main patterns apparent. If cities are to reach 10% indigenous cover, protection of indigenous cover in the periurban zone is essential. Strong relationships between urban and regional authorities will support retention of species that move between urban and periurban environments. Nonetheless, ecosystem reconstruction as well as restoration is required. Cities have enormous potential to contribute to indigenous biodiversity, but current restoration and reconstruction goals fall well short of what is required.
Is zoochorous seed dispersal linked to high food value in grassland species?

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Abstract: Large herbivores are potential seed dispersers both endo- and epizoochorously. We test the hypothesis that plant species with highly nutritive foliage are preferentially adapted for dispersal by their larger herbivores (“foliage-is-the-fruit hypothesis”, Janzen 1984). We use a data set of nearly 800 European grassland plant species and their nutritive value (Klapp et al. 1953, from the database BIOLFLOR), and their long distance dispersal capacity by epi- and endozoochory, anemochory, hydrochory and ornithochory (from the LEDA traitbase). To control for possible confounding effects of phylogeny we used a cross-species, as well as a phylogenetically controlled, approach.

In the cross-species analysis, mean nutritive value increased in both species with high potential for endozoochorous dispersal and, less pronounced, with epizoochorous dispersal. In contrast, species with high anemchorous or ornithochorous dispersal potential mean nutritive values were reduced. Potential for hydrochory did not affect nutritive values. In the analysis of phylogenetically independent contrasts only the increased nutritive value of species with endozoochorous dispersal remained significant. Thus the “foliage-is-the-fruit hypothesis”, which was originally formulated for endozoochorous seed dispersal only, may apply to a broader syndrome of both epi- and endozoochorous seed dispersal of palatable grassland species.
Understorey vegetation of a subtropical rain forest in Nanjeshan Reserve, Southernmost Taiwan

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Abstract: Understorey vegetation in a subtropical rainforest in southernmost Taiwan was examined relative to topographic aspect and micro-environmental conditions to explore spatial patterns of species richness and community composition. All understorey plants in seven 5 x 300 m² transects within the Nanjenshan Forest Dynamics Plot were identified and the coverage of each species was recorded. A total of 94 herbaceous species, belonging to 44 families and 83 genera, were recorded, and these contributed half of the plant species richness in the plot. According to TWINSPAN analysis, the 420 quadrat samples could be divided into two main groups associated with topographic position. Group I were dominated by monocots, Carex cruciate and Alpinia oblongifolia, and were mainly found on the ridges and windward slopes, while Group II was dominated by ferns, Diplazium donianum and Pleocnemia rufinervisis, and was distributed along creeks and on the leeward slopes. Separate analyses of the canopy, subcanopy and seedling species showed a discernable distributional relationship to the herbaceous layer, indicating similar resource requirements. Canonical correspondence analysis indicated that aspect and altitude were the major determinants of vegetation variation. However, the investigation on the possible role of gap openings revealed that gap creation appeared to influence small-scale species diversity in the understorey.
Effect of mass flowering on *Fargesia qinlingensis* regeneration and chemical constituent allocation

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**Abstract:** Several bamboos are characterized by long flowering cycles with monocarpic reproduction. The long inter-mast period has prevented documentation of stand change, and a thorough understanding of natural regeneration and chemical allocation among bamboo modules. We examined a mass flowering event of bamboo *Fargesia qinlingensis* in the Qinling Mountains, China, over a four-year period. The numbers of seeds in soil seed bank and on culms were much less than the number of florets, suggesting that a large portion of seeds had been removed or eaten. Seedlings performed better in flowering sites than in un-flowered patches in terms of their height, leaf number per seedling, and average leaf length. Seedling mortality rate was greater in un-flowered patches than in flowering sites. Different performance of seedlings probably resulted from the resource change caused by death of culms, which may support the intraspecific competition hypothesis for semelparity. Crude protein and extract ether in branches and leaves were less in flowering culms than in un-flowered culms, showing evidence that allocation of energy toward growth is sacrificed for allocation toward flowering and fruiting, albeit differences were not large. This is reflected in the phenomena that new shoots regenerated only in un-flowered patches.
Should botanists sample bryophytes? A case study from a small mire, Silica Rapids walkway, Tongariro National Park, New Zealand

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Abstract: An example of an Empodisma/Gleichenia perched bog was surveyed on the north-west slopes of Mt Ruapehu, North Island, New Zealand. The mire overlies a tephra, presumably from the 177AD Taupo eruption, which impeded local drainage resulting in the formation of blanket bog over the sloping surface. The trophic status of the mire appears mesotrophic with a pH range of 5.0-6.5, despite the domination of the central mire by Empodisma minus and Gleichenia dicarpa.

A comparison was made between the analyses of the mire vegetation, within and without bryophytes. The communities described and underlying ecological gradients were nearly identical, suggesting bryophytes play only a small role in structuring the vegetation communities, their distribution reflecting their reliance on vascular plants to ameliorate environmental conditions and provide habitat. The inclusion of locally rare bryophyte species may not provide additional information to that supplied by the vascular species in this vegetation type, and appeared non-essential in community descriptions of this system.
Distribution and habitat characteristics of herbaceous plant communities in the gorge of Iriomote Island, southern Japan

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Abstract: There are well protected subtropical plant communities in Iriomote Island, in the Ryukyu Islands, southern Japan. We started to research the controlling factors which determine the distribution of unique herbaceous rheophyte communities in the island in 2004. We recognized three associations; Lindsaeo japonici-Salvietum pygmaeae, Pilo-Arundetum formosae and Agrostemmo-Begonietum formosanae, which are distributed close to the riverside of the gorge. The Lindsaeo japonici-Salvietum pygmaeae is confined to the beds of swift-running rivers and is distributed there up to flood-level; it is considered as one of the true rheophyte plant communities. Pilo-Arundetum formosae was observed around the reach of regularly occurring flash floods. These two associations have many rheophyte plants such as Crysinus yakushimensis, Shenomeris gracilis, Bolbitis appendiculata, Polysotichum yaeyamaense, Viola tashirio and Ophiorrhiza japonica f. tashiroi. Almost all of these species are consided as endemic species of the Ryukyu Islands. The habitat of Agrostemmo-Begonietum formosanae is different from the other two associations and stands are situated on rocky slopes beyond the reach of flash floods.

The influence of small dams for water intake on the rheophyte communities was not so serious because they are constructed at the vicinity of the lower bound of the distribution range of Lindsaeo japonici-Salvietum pygmaeae.
Applying GIS technique to spatial planning and evaluation of vegetation inventory plots

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Abstract: The National Vegetation Diversity Inventory and Mapping Project has been carried out in Taiwan from 2003. The Taiwan Vegetation Information System was set up concurrently. It integrated the past and current vegetation inventory data. There are more than 10,000 plots in the data now. The purpose of this study is to evaluate the representability of present plot data in order to have the more efficient future inventory. The information from the Third Forest Resources and Land Use Inventory of Taiwan ended in 1995 was used as the population for natural vegetation distribution. The qualitative factors based on Climatic Zones and Geographic Climatic Regions and the quantitative factors based on the environmental gradients (elevation, whole light sky, aspect, and warmth index) were used to evaluate the representability of plots. By overlaying process in GIS, the distributions of plots on the evaluation factors were retrieved and tested by test statistics of goodness of fit. The results indicated that the plots were over-sampled in the high altitude areas and under-sampled in low altitude areas. At the same time, some specific areas were very insufficiently sampled. It means the future investigations should concentrate on the areas where sampling is insufficient.
A comparison of ecological and habitat differences between alien *Ligustrum lucidum* Ait. and native *Ligustrum japonicum* Thunb. in Japan

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**Abstract:** Range expansion of the alien evergreen species *Ligustrum lucidum* Ait. is noticed nowadays in Japanese urban areas (Yoshinaga 2001, Hashimoto 2003). Ecological differences between *L. lucidum* and the native species *Ligustrum japonicum* Thunb., and differences in their habitat conditions were compared. *L. japonicum* and *L. lucidum* are both evergreen understorey species, but *L. lucidum* can sometimes grow to 10 m in height. *L. japonicum* is native to essentially all Japanese areas of evergreen broad-leaved forest and secondary deciduous forest. The following conclusions can be made: 1) *L. lucidum* produces many small fruits and many birds eat and spread them; *L. lucidum* has superior seed-dispersal ability. 2) *L. lucidum* can germinate in the shade, but most seedlings are not shade-tolerant. 3) The habitats of the two species differ, but both species sometimes occur together. Neither species competes in shady places. Species characteristics differ. In particular, *L. lucidum* occurs in places with bright sunlight and decreases in darker places. *L. japonicum* occurs in stable forest. Since forests in Japanese urban areas are becoming more and more fragmented, however, the habitat and populations of *L. lucidum* increase.
Analysis of plant traits in coastal dune vegetation zonation (Lazio region, central Italy)

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Abstract: The coastal environment is subject to considerable stress, which strongly affects vegetation. In this work we compared strategies of several species of the major dune plant communities, by analyzing morphological and functional traits. We randomly sampled the coastal vegetation in Lazio region to define the plant communities. Plots sampled in the field were analysed through multivariate techniques. In order to investigate the major strategies developed by dunal species, the most common species were selected and characters judged most indicative of plant adaptations were measured for the whole plants, leaves or seeds. Statistical testing allowed us to reveal differences among community functional groups for different morphological and functional traits. By analysing the floristic data we identified 5 vegetation groups which match the major plant communities of the dune system. By analyzing plant traits through species ordination we were able to identify three major groups: A) species that utilize resources rapidly; B) species that store resources; C) species that invest in aerial phytomass. Moreover the analysis of the single characters highlighted clear differences between the communities of the foredune and those of the inland slope in the traits of plant height, life form and leaf phenology.
A quantitative tool for defining rarity

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Abstract: The condition of rarity may be a precursor to loss of biodiversity, yet rarity per se does not necessarily imply extinction risk. Taxa can be rare in different ways and vulnerable to different threats. Rabinowitz (1981) provided a framework to categorize rarity using abundance, habitat restriction, and range; however, neither the categories nor the placement of species within them has been determined empirically for a regional set of organisms. To better understand the mechanisms causing rarity (as well as invasion) we need a quantitative method to define species distributions and detect changes in pattern through space and time. I used a multivariate ordination analysis for vascular plant species of the southeastern United States to determine how species sort according to local abundance, habitat preference, and range area. Species clearly do sort along axes of abundance, range, and habitat preference, and the axes are orthogonal in ordination space, indicating little redundancy of information. However, species sort continuously and are not defined by a specific number of categories. Explicit recognition of the continuous nature of the forms of rarity will provide a more realistic starting point from which to examine the mechanisms causing rarity.
Higher plasticity of form and function for invasive species? A test on grasses

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Abstract: We tested the hypothesis that invasive species exceed their non-invasive relatives in the capacity for physiological and associated morphological/anatomical adjustments to short-term changes in the environment. Grasses from semiarid temperate grasslands were grown under variable moderate light intensity, and plant traits were compared with those in the plants’ original habitat. For C4 grasses, invasives displayed greater changes in leaf morphology (area, thickness, specific leaf area) and anatomy (tissue proportions) than non-invasive species. Leaf intervein distance was invariant for C4 grasses, but for invasives leaf morphology was not less responsive than for C3 grasses of high colonization potential, as expected based on stronger functional constraints on C4 leaf structure. For a subset of C4 grasses we tested stomatal sensitivity to abrupt change in irradiance. Invasive species displayed faster and greater response in stomatal conductance than their non-invasive relatives in high-to-low light transition, which may be adaptive in improvement of water use efficiency under variable irradiance. In low-to-high light switch, invasives were not superior indicating efficient light use is of less importance among grasses. Our results suggest greater plasticity of leaf traits for invasive than for non-invasive grasses, that may contribute to their successful expansion in habitats with contrasting light climate.
Diversity patterns of high mountain ecosystems in Dinaric Alps (W Balkans, SE Europe)

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Abstract: Diversity forms within the high Dinaric province of the West Balkans were investigated.

Populations on the peaks of high mountains (over 2000 a. m) are separated, so evolution processes resulted in specific forms and a high level of floristic and vegetation richness.

Vegetation within the Caricetea curvulae class on siliceous rocks is characterized by a high degree of floristical diversity (600 plant species and more than 100 communities), as well as within the Elyno – Seslerietea class on carbonate in the alpine belt (550 species; 80 communities).

Floristic richness increases going from vegetation on shallow and humid soils to more developed wetland soils where communities of Scheuzherio - Caricetea fuscae class are present. These communities, as well as those of the Montio – Cardaminetea class, are floristically poor (30-50 species).

In high mountain areas wind has a crucial determining impact on biodiversity patterns. Habitats more exposed to wind influence are inhabited with communities of very low floristic diversity, but rich in endemic taxa. High mountain vegetation shows no significant difference in diversity patterns going from the Adriatic Sea toward the continent, which indicates very low impact of typical local climate on high altitudes. The impact of periodic glaciation is very strong on the mentioned habitats, which could be predicted after determination of glacial relicts, especially in Salicetea herbaceae communities.
Vegetation composition and structure of lowland tropical rainforests of southern Taiwan and Orchid Island

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Abstract: The lowland rainforests of southern Taiwan are situated at the northern edge of the tropical zone, and are currently highly threatened. The forests are subjected to frequent typhoons and strong northeastern monsoons. Existing vegetation datasets of 1,250 quadrats (each 10 x 10 m) from four permanent plots in southernmost Taiwan and one on Orchid Island (76 km off Taiwan's southeast coast) were analyzed. The study forests contained 273 species of trees and shrubs (79,145 individuals with a dbh ≥ 1 cm) with a basal area of 43.27 m²/ha. The initial TWINSPAN division separated the Orchid Island samples from all Taiwan samples, and this was attributed to the existence of a greater proportion of southern Malesian floristic elements in the Orchid Island forests. Further subdivisions of the dataset into five forest types were closely related to elevation, aspect and exposure. Species composition, structure and abundance patterns varied markedly among the forest types. Examination of tree distribution in the more exposed forests showed that most species were specialists for either windward or leeward habitat, and some were generalists with wide habitat preference. However, spatially heterogeneous environmental conditions, such as tree-fall gaps and micro-relief could also lead to patchy distributions in the sheltered valley forests.
Differential effects of cattle and sheep on the spatial structure of pastures dominated by *Poa bulbosa*

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Abstract: The balance between annuals and perennials in Mediterranean pastures is determined by the higher competitive proficiency of the latter and the level of disturbance borne by the community. The type or size of disturbance also affects community dynamics, and herbivores are a major disturbing force here. Land-use changes in the last years have incremented the presence of cattle at the expense of smaller animals such as sheep and goat, a phenomenon that causes differently scaled changes in the vegetation. *Poa bulbosa* is a late colonizer of the pastures of Central Spain and is one of the few perennials present in those communities, where it forms turfs that displace the surrounding annuals and therefore reduces diversity. The differences in spatial structure in cattle- and sheep-grazed pastures were examined by registering presence/absence in 2.5 X 2.5 cm squares of a 1 m² grid and by calculating Moran's I autocorrelation coefficient for every sample. Sheep-grazed pastures show a more fragmented structure, which agrees with the smaller perturbations caused by them compared to cattle. However, as an equal level of cover can be caused by different levels of grazing pressure by both animals, consequences for diversity can be highly scale-dependent.
Arbuscular mycorrhizal fungi and microbial population analysis of natural east Texas habitat types

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Abstract: Ecological classification of natural east Texas habitat types is based primarily upon their vegetation, topographic position, soil texture, hydrology, fire frequency, and plant nutrient availability. This classification scheme does not take into account such important components of terrestrial ecosystems as AMF (arbuscular mycorrhizal fungi) and soil bacteria. Almost all natural terrestrial plant communities contain AMF, which form symbioses with 80% of all plant species. From this perspective it is advantageous to study AMF microbial diversity across different natural east Texas habitat types. For achieving this main purpose three wide-spread east Texas plant species were chosen: Toxicodendron radicans/pubescens, Callicarpa americana and Chasmanthium sessiliflorum. Samples from each of these plants were checked for AMF presence.

Amplified 18S rDNA genes of AMF and 16S rDNA genes of soil bacteria were target of DGGE (denaturing gradient gel electrophoresis) to observe differences between AMF and soil bacterial communities across the range of natural east Texas habitat types.

Describing AMF and microbial diversity across different habitat types using molecular techniques provides a new and additional powerful tool for ecological classification of east Texas natural habitat types.
Predicting changes in suitable habitats for beech (Fagus crenata Blume) forests under climate warming in Shirakami Mountains World Natural Heritage Area, northern Japan

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Abstract: Suitable habitats for beech (Fagus crenata Blume) forests in the year 2100 were predicted in Shirakami Mountains World Natural Heritage Area, northern Japan, using a classification tree model and two climate change scenarios (RCM20 and CCSR/NIES). According to the predictive distribution model ENVI (Matsui et al., 2004), developed with four climatic and five land variables, major controlling factors for the forest distributions were warmth index (WI) and winter precipitation (PRW). Since PRW shows little changes under the two climate change scenarios, WI is the major factor controlling the forest distributions in the future. The suitable habitats for the forests (probability $\geq 0.5$) in 2100 were predicted to shrink from the current 95.4 % to 0.6 % (RCM20) or 0 % (CCSR/NIES). Elevation equivalent to the warmth index (WI) of 85.3, that is the lower range limit for F. crenata dominant forests, currently exist at 43 m a.s.l.; however, this will shift upwards in 2100 at 588 m (RCM20) or 909 m (CCSR/NIES). Temperature increase in the lower range limit of the forests would cause F. crenata tree death and density reduction, and cause the growth of other deciduous, broad-leaved trees such as Quercus crispula and Q. serrata.
Mechanical characteristic features of summer green broad-leaved trees at region of heavy snows in Japan

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Abstract: Middle and northern parts of Japan have heavy snows in winter. The depth of snow comes up to 5-10m in some areas. It is expected that trees have strategies to live and survive against the heavy snows.

Vegetation surveys were conducted at a heavy snow area in Gunma prefecture, middle of Japan. The vegetation types Hamamelido-Fagetum crenatae occurred on gentle slope, Nanoquercetum appeared on steep slopes, and Ilici-Thujetum standishii occurred on rocky ridges. The former two communities consisted of broad-leaved trees like Fagus crenata and Quercus crispla var. horikawae, the latter dominated by the needle-leaved trees Thuja standisii and Pinus parviflora.

To examine physical properties of tree trunk and branches, trees were cut and brought in for mechanical tests. The species used were Fagus crenata, Quercus crispula, Q. crispula var. horikawae, Viburnum furcatum, Prunus grayana, Clethra barbinervis and Acer japonicum.

Fracture strength, specific gravity and percentage of water content in branches showed constant values independently of any parts in a tree. Tree species indicated higher mechanical properties than shrub and smaller species in height. It was suggested that trees occurring at heavy snow area obtain the stronger properties of the organisms against snow to avoid failure of the trunk and branches by the weight.
The function of *Reynoutria japonica* Houtt (Polygonaceae) in enhancing subsequent change in succession on avalanche disturbed area in Mt. Fuji, central Japan

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**Abstract:** We studied growth conditions of *Reynoutria japonica* Houtt (Polygonaceae) and environmental factors to clarify the functions of the plants for vegetation recovery in two disturbed sites, A and B. The former is in a seral stage with scattered trees disturbed by a past avalanche which occurred several decades ago, and the latter is the latest disturbed area. The seedlings of *R. japonica* were more likely to establish on the ground surface with large sized gravel and rocks accumulated by avalanche disturbance. The plant seeds can be captured efficiently in many spaces created by gravel and rocks. The ground surface of the site B was covered by relatively large gravel and rocks, whereas that of the site A was covered by gravel with fine sand. Large patches of *R. japonica* observed mainly in the site B function to enhance invasion of pioneer tree species into the patches. In the site A, however, large patches of *R. japonica* could not be found. As a result, we concluded that the decline of the *R. japonica* population is one of the reasons that the vegetation recovery did not advance to a closed forest in the study site A.
Plants growing on unusual substrates: the edaphism. Notes from the antipodes (Iberian Peninsula)

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Abstract: The relationship of a relict and endemic flora with rocks like the serpentines or the gypsum has been a primary driver of numerous scientific investigations. The serpentines have probably been the most investigated unusual substrate. However, the term serpentinophily seems to be forbidden to designate this phenomenon, confronted to the broadly used concept of gypsophily. In both cases we are speaking of the phenomenon of edaphism or a group of edaphic factors that explain the existence of special floras on unusual soils. Nevertheless, these factors are not unanimously accepted by ecologists, so that they usually face up the denominated “physical hypothesis” and the “chemical” one. The Iberian Peninsula is an ideal place to reexamine this topic. In our communication we want to add dolomites and limestones to the discussion. Although, from our point of view, it is the combination of both factors which can explain the "serpentinophily", the "gypsophily" and the "dolomitophily" (and therefore, also the serpentinophytes, gypsophytes and dolomitophytes' existence) it is evident that the relationship of Ca/Mg should be pondered. In our investigation we have almost compared 100 limestones, dolomites, serpentines and gypsum soils and we have concluded that, next to other nutritional factors, calcium and magnesium are the keys of these edaphisms.

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Vegetation and structure of the Tottori Sand Dunes, the typical Japanese coastal dunes

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Abstract: The Tottori Sand Dunes are the largest coastal sand hills in Japan. The dunes stretch for 16 kilometers along the coast and are 2 kilometers wide. The highest dune near the ocean is about 50 meters high. The area is humid and annual precipitation is over 2000 mm. The dunes were regarded as a nuisance for local people for centuries. They have tried to plant pine trees to stabilize dunes as much as possible. After WWII, the area of aeolian dynamic dunes has strongly decreased. Now an area of only 180 hectares is remaining as native sand dunes. But the dunes are still valuable representatives of the typical coastal dunes in Japan and we investigate the structure of coastal plant community. We measured distribution of the plant community using a GPS receiver and studied species composition and abundance of the community in the dunes. We made a detailed vegetation map and analyzed community structure by GIS software. Based on the vegetation survey, native plants occupy a wide area in the center of the dunes, while alien weeds communities surround them. The distribution pattern of plant communities is different between coastal and inland areas.
Effects of forest-floor avalanche disturbance on the structure and dynamics of a subalpine forest near the forest limit on Mt. Fuji

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Abstract: In subalpine forests near the forest limit on Mt. Fuji, a volcanic high mountain in central Japan, slush avalanches occasionally destroy forest-floor vegetation through an influx of volcanic gravel from bare upper sites. The vegetation structure of *Larix kaempferi*–*Abies veitchii* forests near and distant from avalanche paths was investigated to determine the effects of forest-floor disturbance on successional processes. In the forest near an avalanche path, which showed evidence of forest-floor disturbance, the *L. kaempferi* population had a discontinuous age structure with three age groups, indicating that *L. kaempferi* seedlings established under the *L. kaempferi* canopy after disturbance of the forest floor. *Abies veitchii* immigrated at least about 50 years after regeneration of *L. kaempferi* in this forest.
Modeling the distributions of nine evergreen tree species in western Japan using a Phytosociological Relevé Database (PRDB)

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Abstract: Relationships between evergreen tree species’ distribution and climate in western Japan, were quantified based on the Phytosociological Relevé Database ("PRDB"), which contains 11,070 species composition (i.e., relevé) data. Classification tree models were adopted for the model development. Three different predictive distribution models were constructed for each of the nine species: (1) the individual models (SP-model), (2) occurrence in the top layer (B1-model) and (3) the dominance in the top layer (DO-model). Four climate variables: warmth index (WI), temperature of the coldest month (TMC), summer precipitation (PRS) and winter precipitation (PRW), were used as predictor variables. The resulting classification tree models showed that the distribution of the nine species were all accurate (ca. 80% classification accuracy). Among the four predictors, WI and/or TMC were indicated as major determinants for the macro-scale distributions, followed by PRS and PRW. The relationships between the species and climate variables showed a clear patterns for the SP-models and B1-models, while less clear for the DO-models. This suggests that other variables such as landform or species interaction be important for the evergreen species to dominate the canopy.
Tall and mat-forming herbs do not deserve conservation priority in the agricultural landscape

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Abstract: Can tall herbs or mat-forming herbs be threatened? We believe in general not. An area of 100 km² in SE-Norway was thoroughly surveyed in 1958-61 and 2000-04. Among the 850 vascular plants species ever found in this limestone, agro-forestry area many showed significant increase or decrease in frequency. Large changes in land-uses during the last 40 years have changed the vegetation mosaic, and many swamp forest and semi-natural grassland species in particular have suffered. Several other minor changes of land use either led to increase or decrease of species groups. But, independent of the effects of distribution and land-use, the functional traits of root-system and ramet length were important for survival and spread. Tall herbs succeeded, particularly if they were rhizomatous. Herbs with other life-forms could certainly also be successful or invasive but not with as high predictability. Our results indicate that tall and mat-forming herbs almost never deserve conservation attention, but contrary often awareness against invasiveness.
Impact of the native Sika deer (*Cervus nippon*) on the forest floor vegetation: the natural experiment

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Abstract: Overabundance of deer is becoming a serious problem in ecosystems in temperate and boreal regions worldwide. In Japan, the native Sika deer (*Cervus nippon*) population has drastically increased in last few decades. We assessed the impact of high-density populations of Sika deer on plant species composition in the Okutama region, the northwest part of the Tokyo metropolis. We selected two sites which have different deer browsing history; the site which has had a high-density deer population since the 1990s ('core' site), and the other site, where the deer became locally extinct in the 1940s, and expanded from the ‘core’ site after the 1990s ('edge' site). We assessed the change of plant species composition by monitoring plots which were surveyed in 1979-1985. A second survey was conducted in 1999-2006. The vegetation data for 36 plots was collected in each site.

In the ‘core’ site, 32.6% of total species present at the first survey have disappeared, and 9.0% have newly colonized on the second survey. In the ‘edge’ site, 15.2% have disappeared and 9.6% have newly colonized. Compositional change was significant in the ‘core’ site, both in the Jaccard’s dissimilarity index between first and second surveys and the moved distance in ordination space (DCA and NMDS).
Species distribution models applied to the ecology and conservation of endangered plants (SE Iberian Peninsula)

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Abstract: Species distribution models provide useful tools for conservation biologists. These models, based on habitat suitability, may be relevant for the ecology and preservation of targeted species.

The Mediterranean arid ecosystems of SE Iberian Peninsula (SW Europe) show high biodiversity and high rates of endemism. Landscapes and vegetation evolved hand-in-hand with traditional pastoral and agricultural practices, but those habitats are seriously threatened by current land-use changes (greenhouses and urbanization).

Our work is focused on evaluating this situation and proposes strategies aimed to conserve three endangered plant species (“focal species”) characteristic of such habitats (Linaria nigricans, Linaria benitoi and Astragalus edulis). The first step to reach the objective is to generate distribution models for such species.

Starting from GPS presence records and a high-resolution environmental database, we applied distribution models using presence-only based algorithms. Resulting models are masked, evaluated and selected to obtain the best ones using the ROC (AUC) approach. The distribution surfaces are useful to: estimate population sizes, calculate potential distribution areas, locate areas subject to different threat degrees, and propose areas to be treated as “conservation reserves”.

We conclude that high-resolution presence-only based distribution models provide a reliable method to apply to conservation of endangered plants.
Modeling forest bird distribution in Hawai`i

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Abstract: Predictive models of bird distribution were developed with GIS by integrating bird counts with habitat data derived from remote sensing. Landsat imagery was used to map vegetation composition and structure as measures of habitat. Results are presented for a Hawaiian honeycreeper, the ʻiʻiwi (*Vestiaria coccinea*), from the Kaʻu forest on the Island of Hawaiʻi. We applied a hierarchical Bayesian approach to handle problems associated with “levels” of effects (e.g., irregular survey coverage among years). These models used a conditional autoregressive method that incorporated the geographical proximity of observations to account for autocorrelation among bird counts and habitat. Estimates of densities were generated for all 1-hectare cells within the 47,408-hectare Kaʻu study area and totaled to estimate population size. Density surface maps based on models that incorporate habitat characteristics, spatial dependence, and nuisance effects more accurately depict bird distribution than simple interpolation of survey data alone. Such modeling products will assist in guiding future census and management efforts.
Comparative study on the hyperhalophilous vegetation microgeoseries in Andalusia (S. Spain)

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Abstract: Halophilous plant communities constitute a very special and interesting vegetation type both from a floristic and phytocoenotic point of view, with an outstanding amount of endemic and rare plant species and formations. This work has been carried out in order to point out the interest of this vegetation in southern Spain, where scarce comparative studies have been made. Three halophilous vegetation microgeoseries taking place in Andalusia have been identified, characterized and compared: the meso-Mediterranean semi-arid Guadician-Bastetan microgeoseries (Baetic phytogeographic province, Guadician-Bacensean sector) represented only in a small continental area of Granada political province (Eastern Andalusia); the thermo-Mediterranean Murcian-Almeriensian microgeoseries (Murcian-Almeriensian province, Almeriensean sector) developing in coastal territories of Almería (Eastern Andalusia), as well as the thermo-Mediterranean Mediterranean-Iberian-Atlantic microgeoseries (Gaditan-Onubo-Algarvian province, Gaditan-Onubensean and Algarvian sectors) located in coastal areas of Huelva, Cádiz and, to a lesser extent, Sevilla (Western Andalusia). As a result of our field research, nearly 50 different plant communities have been identified. We provide their dynamic position in the vegetation microgeoseries, and we show their distribution area in Andalusia. Finally, a comparative study on these three microgeoseries is made in two ways: by using floristic and phytocoenotic composition.
Edaphohygrophilous vegetation in southern Iberian Peninsula: Comparative and analytic study on Andalusian riparian forests (SE Spain)

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Abstract: Riparian forests along the Andalusian rivers (SE Spain) are represented by two phytosociological classes: Nerio-Tamaricetea (generally comprising shrublands developed in dry, semi-arid and/or halophytic areas, mainly with a Mediterranean, Saharo-Arabian and Iranian-Turanian distribution) and Salici-Populetea (woodlands and shrublands with an Euro-Siberian optimum, but extending to Mediterranean rivers with a permanent flow). An approach to the study of both vegetation types in Andalusia has been carried out. As a result of this, we show data on their distribution and phytocoenotic composition in southern Spain. These data have later been analyzed and contrasted by using multivariant analysis techniques, more precisely: Multi-Response Permutation Procedures (MRPP) (Zimmerman et al. 1985), Indicator Species Analysis (ISA) (Dufrene and Legendre, 1997) and Detrended Correspondence Analysis (DCA) (Hill and Gauch, 1980). A total amount of more than 340 phytosociological relevés have been used in the present study, allowing us to identify 3 phytosociological orders and 9 alliances within both vegetation classes. The use of statistical techniques has helped us to test whether these syntaxonomic units have statistical significance. Likewise we have been able to recognize which plant species are the most faithful to the considered groups and to determine the best interrelated syntaxonomical units.
Plant indicator values of a high-phytodiversity country (Italy) and their evidence, exemplified for model areas with climatic gradients in the southern inner Alps

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Abstract: We tested the new Ellenberg-Pignatti indicator values in Festucetalia valesiaceae communities of three valley regions. In these landscape types gradients of all value types exist: light (L), temperature (T), moisture (F/M), nitrogen (N), continentality (C) and soil reaction (R).

In a spatial approach we compared DCA results with indicator value results and with climatic data. We found comprehensible results in all cases.

In a temporal approach we compared relevés from two time windows: 1930-50 (Braun-Blanquet) and 1990-95 (Schwabe and Kratochwil). Mostly we found in these communities, which are said to have high “stability”, no significant changes on average for any of the indicator values. In the case of N- and R-values there was a trend of increase (partly significant).

In general the new database has shown the “robustness” of the Ellenberg indicator value model for the new database including extended L-values in comparison with Central Europe, and established its usefulness for a synthetic approach. In our systems L-, T-, F/M- and C-gradients can be characterised well by means of indicator values and are an excellent tool for explaining DCA results. Caution is necessary especially when correlations of different factors are intermingled in temporal approaches.
Ambrosia artemisiifolia L., a species that changes the structure of ecosystems

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Abstract: It is very hard to find any species in Europe's flora as invasive as Ambrosia artemisiifolia L. Continuous investigations which are conducted in Bosnia and Herzegovina (SE Europe) reveal that this species is spreading very fast and occupies different habitats. Only 50 years have passed from the time when a small population was observed for the first time in Bosnia and Herzegovina, near the Sava river in the North. Today this plant has spread 500 km to the South, to the Adriatic Sea. Populations of this species invaded more than 80 % of ecological niches within a year or two.

In the territory of Bosnia and Herzegovina this species is most frequent in arable land communities, Stellarietea mediae, and very often covers 80 – 100 % of the area. Next in frequency are populations from Populetalia albae and Bidentetea communities, and also communities of Chenopodietea, Artemisietea and Agropyretea classes. Lately this species is recorded in meadow communities, Agropyro – Rumicion and Arrenatherion elatioris, on nitrificated land, and also in Inuletea viscosae communities near sea shores. As well as causing serious allergy problems, this very resistant and highly adaptable species completely changes structure of existing communities and complete ecosystems.
Changes along an altitudinal vegetation gradient in Southern Norway during 70 years

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Abstract: North boreal forests cover a large proportion of the Norwegian land surface. The predicted anthropogenic climate changes are supposed to influence these areas. In our study area, situated near Lillehammer in Central Southern Norway, a detailed mapping of vegetation was carried out in 1932-1936, and climatic parameters were recorded from the 1930’s to 1968. We repeat these investigations to identify vegetation changes and their relation to climatic factors. In the 1930’s in a 14 km² area 346 plots of 100m² were marked in a regular grid, representing a height interval from 750 to 1150 m a.s.l. The vascular plant flora was surveyed in each plot. Hitherto 100 of these plots have been reanalyzed. The total number of vascular plant species observed in this subset was 208 in the 1930’s and 201 in 2005-2006. The mean number of species recorded per plot was 37.3 in the 1930’s, compared to 35.7 in 2005. However, the species turnover was rather high (19% on average), reflecting changes in main ecological factors. Preliminary analyses based on Ellenberg’s indicator values reveal that temperature and light are the main causes for changes in species composition. The climatic effects on vegetation will be analysed and presented in more detail.
Some morphological traits of Quercus serrata subsp. mongolicoides leaves and species composition of its coppice woods in Northern Kanto, Japan

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Abstract: Leaf, acorn, and hull morphology of Quercus serrata subsp. mongolicoides were compared with Q. crispula, and Q. mongolica. The shape and allometry of Q. serrata subsp. mongolicoides leaf were extremely close to Q. mongolica but different from Q. crispula. However, there were some individuals which show intermediate forms between Q. crispula and Q. mongolica. The same tendency was observed in the acorn and hull.

The coppice woods which had Q. serrata subsp. mongolicoides in the canopy were found in the lower part of the Ashio mountainous district in Northern Kanto (150-550m a.s.l.). In this region, secondary coppice woods where Q. serrata and/or Q. serrata subsp. mongolicoides dominant are widely existed. Many woods where Q. serrata subsp. mongolicoides dominant occur on the slope on the west side where a dry and strong monsoon wind hits in winter.

The vegetation of the woods divided into 2 communities, A and B. Community A, separated by the presence of Gynostemma pentaphyllum and Chaenomeles japonica, etc. corresponds to the association Quercetum acutissimo-serratae. Community B, separated by Acer crataegifolium and Dioscorea gracillima, etc. corresponds to the association Castaneo-Quercetum serratae. Most of the woods with Q. serrata subsp. mongolicoides belong to Castaneo-Quercetum serratae.
Can the occurrence of *Senecio jacobaea* be influenced by management practice?

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**Abstract:** *Senecio jacobaea* L. (Asteraceae), tansy ragwort, is a poisonous weed in grasslands of various countries (e.g. Great Britain, New Zealand, Central European states), and the further spread of the species into farmland must be prevented. To assess the influence of management practice and site conditions on the occurrence of *S. jacobaea*, we conducted a survey in the northern and central part of Switzerland. Botanical assessments were carried out on grassland plots containing *S. jacobaea* and on neighbouring plots without *S. jacobaea*. For these plots, we analysed the soil nutrients and the details of management practice such as type and intensity of management and fertiliser application. The most important factors influencing the occurrence of *S. jacobaea* were related to management: there was a considerably high risk for the occurrence of the species on parcels with low nitrogen fertilisation, continuous-extensive grazing (set stocking), and a high openness of the sward. *S. jacobaea* was not present in meadows cut more than twice per year. We conclude that a long-term control of *S. jacobaea* can best be achieved by avoiding sward damage and by preventing the species’ seed formation in the pasture and local vicinity.
Geological foundation as a dominant factor in creation of ecological diversity – A case study from Bosnia and Herzegovina (SE Europa)

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Abstract: Although covering a small territory, the species and vegetation diversity of the Dinaric Alps (W. Balkans) have come to their full expression in relation to a geological foundation. Successive geological periods have formed different types of bedrocks on this 52 000 km² area. Among these the most important from an ecological point of view are the serpentine-peridotite igneous rocks which occur in the form of islands inserted into the limestone based area. The impact of this foundation on the vegetation cover is so strong that on this kind of substratum occurs exclusive serpentinophytes which are considered to be Tertiary relicts (alliances Polygonion albanicae and Potentillion visianii). In the zone of limestone, in a similar way to the old igneous rocks, occur also several separated dolomite areas, which represent nowadays refugium of Tertiary flora and vegetation. These are habitats of exclusive dolomitophyte rock communities from the alliance Peucedanion neumayeri. Due to its unique and specific forms of diversity, entire vegetation cover on these types of bedrock is included into the province of relict black pine woods, as a part of Eurosiberean-boreoamerican region, where the climax vegetation is wood with relict Illyrian black pine Pinion austriacae.
Why do some Japanese mountains lack subalpine coniferous forests?

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Abstract: Coniferous trees, such as *Abies mariesii*, are usually distributed in the Japanese subalpine zone, while they are not observed on some mountains in northeast Japan. Instead, bamboo grassland and deciduous shrubbery dominate in those areas. Distribution patterns of the coniferous forests vary among different mountain landscapes called the Pseudo-alpine zone. There have been no conclusive reasons why *A. mariesii* forests occur in the Pseudo-alpine zone, although there are some references to discuss such reasons.

In this presentation, *A. mariesii* forests in the Pseudo-alpine zone, where formation of coniferous forests zone is not apparent, have been investigated to clarify the reason why such vegetation forms in the area.

Our study showed that *A. mariesii* forests were preferentially in conditions with gentle or leeward slopes. Soil depth under the *A. mariesii* forests was conspicuously thin in comparison with that under other plant communities. *A. mariesii* regeneration was suppressed by the bamboo grass, which wraps up forest floor and surface soil in the melting snow season. Furthermore, there was no great difference in the distribution pattern of *A. mariesii* forests in the Pseudo-alpine zone between now and approximately 5000 years ago, which analysis was based on the results of neighbouring pollen analyses and our findings.
Vegetation dynamics of Scotch Broom in its native range

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Abstract: Scotch Broom (Cytisus scoparius (L.) Link) is an invasive species to New Zealand and other temperate and Mediterranean climates.

In its native central European range, the thermophilous species was originally rare in the primeval forests of pre-agricultural times, and restricted to rocky slopes and other xerothermic sites. It then benefited from the large-scale agri-silvi-cultural transformations of historic times, and became a common species of degraded sites in clearings, coppices, pastures, and fallows of traditional cultural landscapes.

With the advent of modern agriculture, most of these poor sites were either improved for agriculture or abandoned and reforested, both processes leading to a continuing decline of the species.

In many regions, broom now mainly occurs on old fields abandoned shortly after WW II. The thickets are accompanied by different types of grass-dominated vegetation. Various optional successional stages following the broom stages may be observed. As the leguminous shrub is capable of improving soil chemical properties by means of nitrogen-fixation and deep-reaching roots, it may actively alter the successional pathways of its sites: a comparison of open and dense thickets revealed significantly higher proportions of nitrophytes in dense broom stands. Mineral-nitrogen, magnesia and calcium contents were elevated in the soil solution of dense thickets.
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