BOOK OF ABSTRACTS

IUFRO 2012
Biodiversity in Forest Ecosystems and Landscapes

2ND INTERNATIONAL CONFERENCE ON

Biodiversity in Forest Ecosystems & Landscapes

University College Cork | August 28th - 31st 2012 | www.ucc.ie/en/iufro2012

IUFRO

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

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Coláiste na hOllscoile Corcaigh, Éire
University College Cork, Ireland

SECOND INTERNATIONAL CONFERENCE ON BIODIVERSITY IN FOREST ECOSYSTEMS AND LANDSCAPES

UNIVERSITY COLLEGE CORK, IRELAND, 27-31 AUGUST 2012

CONFERENCE COMMITTEE

Scientific Committee

John O'Halloran (chair), Anne Oxbrough, Sandra Irwin, Tom Kelly, Alex Mosseler, Keith Kirby, Tor-Bjorn Larsson, Eckerhard Brockerhoff, Herve Jactel, Ravinder Kohli, Vinod B. Mathur, Michael English, Mick Keane and Eugene Hendrick.

Local Organising Committee

Anneli Englund, Anne Oxbrough, Sandra Irwin, John O'Halloran, Tom Kelly, Lauren Fuller, Mark Wilson, Conor Graham and Ruth Carden.

The organisers would like to thank all the people who helped us to organise the conference

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WELCOME FROM THE CONFERENCE CHAIR

Welcome to University College Cork, the first university campus in the world to receive the Green Flag Award, and welcome to the Second International Conference on Biodiversity in Forest Ecosystems and Landscapes. The first in this series took place in August 2008 in Kamloops, Canada. At that time the meeting was a great success and was attended by more than 120 participants representing 21 countries from a diverse array of forest-related fields from researchers, to consultants, NGOs and governmental agencies.

Maintaining biodiversity is a key goal of global forest policy, which aims to promote forest ecosystem health and resilience in the face of increasing deforestation, habitat fragmentation and climate change. Sustainable forest management practices promote biodiversity, and research to underpin policies and practice is a priority. Forests provide key services from fuel and timber, recreational uses and carbon sequestration, and it is vital that the impacts of increasing pressures are examined. This conference will address these issues by bringing together stakeholders from across the globe, providing a forum for knowledge exchange. We have organised a full schedule including three keynote speakers and nine separate symposia on a range of topics relating to forest biodiversity.

This event would, of course, not be possible without the support of our sponsors, and the voluntary effort of many people. I would like to thank our local organising committee for their hard work this year. Heartfelt thanks are also due to the speakers, poster presenters and symposium organisers for the quality of the scientific programme.

I thank everyone for their support and express my hope that you will enjoy this conference, meeting peers, discussing research and having a great time in Cork, rated by Lonely Planet as one of the 10 best cities to visit in the world.

Have a pleasant stay in Cork.

John O'Halloran
Conference Chair
j.ohalloran@ucc.ie

WELCOME FROM THE COORDINATOR OF IUFRO DIVISION 8

Dear Delegate,

On behalf of IUFRO, I would like to welcome delegates from many countries to this forest biodiversity conference in Ireland organized by our colleagues from Cork and other places.

Already four years have gone since the first conference on biodiversity in forest ecosystems and landscapes was successfully hosted and co-organised by our excellent colleagues from Thompson Rivers University in Kamloops (British Columbia, Canada). It was a very inspirational time and location where we already made vague plans to meet again four years later somewhere in Ireland ....thanks to some key people's involvement, and support from University College Cork in association with Irish Department of Agriculture, Food and the Marine, our early dreams have become reality, and here we meet again, sharing results, views and novel ideas with new people!

Certainly, in the meantime, forest biodiversity related issues have continued to be prominent all around the globe on political agendas and are now among the 6 special emphasis areas of the IUFRO strategy. This special emphasis is in line with major international processes and cutting-edge science in terms of its view of the relationships between forest biodiversity, ecosystem services and people. This conference is a great opportunity for interactions between many IUFRO units, in particular from Division 7 "Forest Health" and Division 8 "Forest Environment", dealing with forest biodiversity and landscape-level strategies for biodiversity conservation. It is also an opportunity to advance ideas and propositions in the frame of the newly established IUFRO task force on Biodiversity & Ecosystem Services[1].

Wishing you a very fruitful conference in Cork!

Jean-Michel Carnus
IUFRO – Coordinator Division 8
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[1] www.iufro.org/science/task-forces/biodiversity-ecosystem-services

KEYNOTE TALKS

IRELAND DOES HAVE FORESTS!!! THE IMPORTANCE OF HIGHLY MANAGED FOREST FRAGMENTS IN AGRICULTURAL LANDSCAPES

John O'Halloran, School of Biological Earth and Environmental sciences, University College Cork, Ireland

Abstract: Ireland has an unusual forest landscape, characterised by small plantations embedded in a matrix of un-forested land that is largely dominated by agriculture. As recently as 6000 years ago, native pine (*Pinus sylvestris*), oak (*Quercus* sp.), elm (*Ulmus glabra*) and alder (*Alnus glutinosa*) forests covered much of the Irish landscape. However, extensive deforestation by man coupled with a change to a cooler, wetter climate, led to a decline in forest cover to around 1% by the 1900s. Today, forest cover has again increased to 10% of land area, primarily through plantation establishment on previously un-forested lands, with native woodlands constituting only around 1%. This decrease in Ireland's forest cover and subsequent extensive afforestation, almost exclusively with non-native tree species during the twentieth century, has undoubtedly been associated with some loss of native forest biodiversity.

This paper reviews the outputs of two major studies of biodiversity in Irish forest: BIOFOREST and FORESTBIO project. These projects made significant progress in providing fundamental data on the biodiversity of Irish plantations and native forests. Surveys of ground vegetation, epiphyte, invertebrate (ground- and canopy-dwelling spiders and beetles, and lepidoptera) and bird diversity were carried out at throughout Ireland. Biodiversity surveys were conducted using standardised sampling methods. A canopy fogging technique was used for an in-depth study of canopy invertebrate biology. A detailed survey of deadwood in native woodlands and plantation forests was also conducted at a sub-set of forest sites. An investigation of the potential of terrestrial laser scanning for use in the measurement of structural proxies for biodiversity in forests was also undertaken. A detailed study of the importance of planation forests for the Hen Harrier, a species of conservation concern, was also undertaken.

Key results from these studies will be presented and considered in the context of their implications for forest policy and practice. A range of recommendations for forest management has been produced based on the findings of these studies. This research will improve understanding of the factors influencing biodiversity in forests and help the forestry sector to develop sound strategies for SFM, and achieve its objectives of protecting forest biodiversity while continuing to produce wood biomass of adequate quality and in sufficient quantity in Ireland.

Biography: John was recently appointed as chair of Zoology in UCC, is the joint leader of the Centre of Excellence in Ornithology at University College Cork which is now recognized internationally, and was responsible for developing the Centre of Excellence in Ecotoxicology at the Environmental Research Institute, UCC, where he is joint strategic research coordinator. The main focus of John's research is forest ecology and ecotoxicology. In his research projects the questions addressed range from ecosystem processes and biodiversity assessment, though to individual species studies, organ, organelle and genetic impacts. He is dedicated to transferring research from the field, lab and bench to class and industry. John leads a research group comprised of 4 Post-doctoral Researchers, 8 PhDs and several MScs. John is Vice President of the British Trust for Ornithology and recently completed a 6 year term as executive Editor of the international journal Bird Study, during which time he increased its ranking significantly and was awarded a prize for journal design and publishing.

FOREST PLANT SPECIES DIVERSITY: FROM A DARK PAST TO AN UNCERTAIN FUTURE

Martin Hermy, Department of Earth & Environmental Sciences, Catholic University of Leuven, Belgium

Abstract: The last century has shown vast changes in land use, forests were deforested and in other places reforestation and afforestation were and are common features. A review is given of the consequences of former (agricultural) land use on the plant species diversity and composition in deciduous forests. Most work has been done in NW Europe and NE America, using old maps and other sources as a means to identify ancient and recent forest; it usually relates to effects of former land use during the last 2 centuries. Recently work reports effects of Gallo-Roman land use on the current species composition, both in the vegetation and seed banks. A considerable proportion of forest plant species is confined to ancient forests, i.e. forests continuously existing since a certain threshold date (e.g. 18th century). These plant species have a low colonization capacity in common due to dispersal or recruitment limitation; yet a lot remains to be explained. Evidence suggests dispersal limitation as the predominant, initial factor complex. Indeed, many ancient forest species have short-distance dispersal and often do not have persistent seed banks. Yet, some evidence is found that if they successfully migrate into recent forest, their fitness may be high. In view of the ongoing climate change, it is clear that many forest plant species will not be able to extent their range sufficiently fast (in a spontaneous way). The necessary northward shift will be severely hampered by the often extreme habitat fragmentation which occurred over the last centuries. Assisted migration might be the way to overcome these problems. But extinction debts, although difficult to assess, are plausible and environmental pressures will undoubtedly fasten their pay-off, as recent evidence suggests. So it all indicates that we relatively know little about the past, but that the future is uncertain for these plants.

Biography: Martin Hermy, Ph.D. in botany, full professor at the Catholic University of Leuven (K.U.Leuven), faculty of Bio-science engineering, Department of Earth and Environmental Science and Head of Division 'Forest, Nature and Landscape Research', also guest professor at the University of Ghent.Martin's teaching includes courses such as Ecology, Nature conservation and management, Green management, Ecological data processing and Applied flora knowledge. He has published more 200 peer reviewed papers and also edited or co-authored 7 books (written in Dutch) on topics such nature management (1989, 2th ed 2004), historical ecology of forests (1993), small landscape elements (1997), urban green management (2005) and forest communities (2009). He has been an associated editor for Applied Vegetation Science since 2005. Martin has a longstanding interest in ancient forests and in the impacts of former land use on the floristic composition and diversity of forests. Along the same line, he has investigated the impact of fragmentation on the plant species diversity in deciduous forests (with some work on heath lands, grasslands), the colonization capacity of (ancient) forest plant species and the changes in the flora over long periods both on the forest and plot level. In addition to his interest in forests, he has recently started working on green roofs and the use of perennial plant species in urban green. The bewildering variety of plant species in the temperate zone is at the heart of his research interests.

BIODIVERSITY CONSERVATION IN A SUSTAINABLE FOREST MANAGEMENT FRAMEWORK: SPECULATION, SCIENCE AND EXPERIMENTS

John Spence, Dept. of Renewable Resources, University of Alberta, Canada

Abstract: Over the past three decades humans have begun to perceive that forests were more than collections of trees potentially useful as a stock for various wood products and habitats for species valued as collectable food items or associated with recreational opportunities. Nowadays forests are increasingly valued as natural capital that provides hugely significant ecosystem services that we humans rely on. In sum, these services are likely more important to human welfare than the products and traditional economic benefits that forests have provided. We believe that biodiversity is somehow connected to provision of those services, or at the very least, a good indicator of the 'health' of the forest ecosystems that provides them. Although related, these concerns are not the same as concerns about threatened and endangered species. Sound science suggests that concerns about biodiversity in the context of ecosystem health can be effectively managed through new approaches that have introduced terms like 'sustainable forest management' and 'ecosystem-based management' in to the forestry lexicon. Development of such approaches has been initiated mainly through induction and speculation. Although such activities have long been the basis for 'progress' in managing forest ecosystems, science requires more. New ideas must be rigorously tested, preferably through experiments conducted at scales relevant to the scale of anthropogenic perturbation, and that are compatible with scales of natural disturbance because these processes have generated and maintain the ecosystem characteristics that we value. A pressing question is how to proceed with both the science and effective implementation of the knowledge gained. The EMEND ('Ecosystem-based Management Emulating Natural Disturbance') experiment, located in NW Alberta, Canada, is one of several large scale experiments being conducted around the world to provide an ongoing scientific foundation for a new approach to forest management. Such experiments attempt to integrate many aspects of forest pattern and process, include studies of a wide array of taxa and are necessarily launched a prosecuted with a long-term perspective. Several 'para-scientific' elements are necessary to foster effective policy uptake and implementation. These include: an adaptive management framework, development of useful conservation 'tools' such as ecological surrogates, innovative efforts in outreach and extension and willingness to stay the course through the ups and downs of fad and fascination. The result will be a fundamental change in the culture of forest management that brings it into line with our newfound concept of forests as being more than collections of trees.

Biography: John received his BSc (1970) in biology at Washington and Jefferson College, his MSc (1974) in Zoology at the University of Vermont, his PhD (1979) in Zoology at the University of British Columbia. He has been in an academic position at the University of Alberta in Edmonton, Canada since receiving his PhD and served as Chair of the University's Department of Renewable Resources 2001-11. He was a visiting professor at the University of Bern, University of Oxford, Michigan State University and Sun Yatsen University & a visiting scientist with both the United States and Canadian Forest Services. Research in Spence's laboratory has pursued both basic and applied questions in entomology, forestry and aquatic ecology, with biodiversity and insect conservation as main themes. Since 1996, he's been actively involved in broad-based research on sustainable forest management, mainly through co-leadership of the EMEND (Ecosystem Management Emulating Natural Disturbance) project in NW Alberta. His work has been recognized: the Gold Medal in of the Entomological Society of Canada, Scientific Achievement Awards from the Canadian Institute of Forestry and IUFRO, an Alberta Emerald Award, an Alberta Science and Technology Prize, election to the Finnish Academy of Arts and Sciences and the Mexican Academy of Forestry. He has published >150 scientific papers and guided c. 50 graduate students through the course.

OVERVIEW OF THE PROGRAMME

	27/08/2012 Monday	28/08/2012 Tuesday	29/08/2012 Wednesday	30/08/2012 Thursday	31/08/2012 Friday	01/09/2012 Saturday
08.00						
		Registration				
09.00		Keynote 1	Keynote 2		Keynote 3	
10.00		Symposium 1	Symposium 4		Symposium 8	
11.00		Tea/Coffee	Tea/Coffee		Tea/Coffee	
12.00		Symposium 2	Symposium 5		Symposium 8 cont'd	Optional Post Conference Excursion
13.00		Lunch	Lunch	Mid Conference Excursion	Lunch	
14.00		Symposium 2 cont'd	Symposium 6		Open Session C	
15.00		Tea/Coffee	Tea/Coffee		Tea/Coffee	
		Symp. 3	Open Sess. B		Symposium 9	
16.00		Open Session A	Symposium 7			
17.00		Poster Session	IUFRO Task Force Meeting		Wrap up	
18.00	Conference Opening & Registration					
19.00			Conference Dinner			
20.00						

CONFERENCE PROGRAMME

MONDAY, 27th AUGUST 2012

18:30 – 20:00	**Conference Opening & Registration** Western Gateway Building, UCC	

TUESDAY, 28th AUGUST 2012

08:30 – 09:00	**Registration** Western Gateway Building, UCC	
09:00 – 09.45	**Keynote Address 1** **John O'Halloran**	Ireland does have forests!!! The importance of highly managed forest fragments in agricultural landscapes

Symposium 1: Aquatic biodiversity and forests

Conveners: Deanna H. Olson & Mel Warren

Forest-dependent biodiversity includes stream- and wetland-dwelling species that are highly associated with and adapted to forested ecosystems and their attributes wherever forests occur in the world. This biota can be affected, often adversely, not only by forest management practices but also by factors such as invasion of non-native species, or in the future, climate change. For example, timber harvest, invasive species, or climate change (e.g., extended drought) may alter aquatic habitat conditions such as water temperature, water quantity, substrate composition, or down wood availability which singly or in concert can cascade across multiple organizational levels of aquatic organisms. This symposium will explore a broad context of forest aquatic biodiversity, ranging from descriptions of the diversity of species dependent on particular forest types to quantification and prediction of shifts in biodiversity as a result of contemporary or future factors affecting the world's forests and the waters that drain them. Presenters from around the world will be solicited to give papers on the aquatic biota in forested systems, describing the extent of diversity in forest aquatic systems, documenting linkages to forest attributes in the context of contemporary and future issues affecting forests, and sharing innovative approaches to their conservation.

09:45 – 09:50	Introduction	
09:50 - 10:05	Robin Moore	**T1** Novel partnerships for amphibian conservation
10:05 – 10:20	Deanna H. Olson, Jeffrey Leirness, Patrick Cunningham and Ashley Steel	**T2** Riparian buffers and forest thinning: Effects on headwater vertebrates 10-years post-treatment
10:20 – 10:35	Rebecca Flitcroft and Kelly Burnett	**T3** How important are stream network relationships anyway? The example of juvenile coho salmon on the mid-Oregon coast
10:35 – 10:50	Melvin Warren and Ken Sterling	**T4** Effects of small instream wood on fish diversity, evenness, dominance, and assemblage composition and structure in a sand-bed stream of the Gulf Coastal Plain, USA
10:50 – 11.05	Jenna Piriou	**T5** Wetlands biodiversity and management in forests in western France
11.05 – 11.20	Conor Graham, Tom Drinan, Simon Harrison and John O'Halloran	**T6** Effect of plantation forestry on brown trout communities in Irish peatland lakes

11:20 – 11:40	*Tea Break*	

Symposium 2: Challenges and opportunities for maintaining biodiversity in forested landscapes in the context of climate change and the cumulative effects of anthropogenic and natural disturbances

Conveners: Walt Klenner & Doug Lewis

In this symposium we explore landscape-level approaches to evaluating and managing the effects of current and future stressors on biodiversity in forested ecosystems. Concerns about the ongoing loss of forest habitat to urban development and agriculture, habitat fragmentation, and the conversion of complex old natural forests to early seral managed stands and exotic species plantations are well documented. In a 21st century of expanding human influence on forested ecosystems, coupled with the projected effects of climate change on the distribution of forests, the need for modelling approaches to anticipate change, and mitigation practices to diminish the impact of these stressors on forest biodiversity has never been more urgent. Traditional consumptive uses of forest resources (e.g. timber harvesting) are expanding with increasing interest globally in biofuels and biomaterials. In addition, non-consumptive uses such as wind power installations have the potential to perforate and fragment forests with roads and early seral habitats. In this symposium we explore the tools and modelling approaches that can help predict future conditions, identify the likely impacts these changes will have on forest biodiversity individually or as spatial and temporal cumulative effects, and explore options for future desired conditions and management planning that can help diminish biodiversity loss.

11:40 – 11:45	Introduction	
11:45 – 12:00	Walt Klenner, Russ Walton and Doug Lewis	**T7** Managing landscapes in southeast British Columbia for forest biodiversity in the context of multiple objectives management and climate change
12:00 – 12:15	Bevan Ernst	**T10** Assessing landscape connectivity for forestry management
12:15 – 12:30	Che Elkin, Simon Briner, Robert Huber and Harald Bugmann	**T9** Evaluating the relative impact of adaptive forest management and land use changes on mountain forest biodiversity under climate change
12:30 – 12:45	Deanna H. Olson and Kelly M. Burnett	**T10** Aquatic-terrestrial connectivity designs in forests: Funnels and chains across landscapes
12:45 – 13:00	Deniz Özüt, Uğur Zeydanlı, Ayşe Turak, Mehmet Demirci and Mehmet Demir	**T11** Integration of forest biodiversity conservation into forest management in Turkey
13:00 – 14:00	*Lunch Break*	
14:00 – 14:15	Liz L. Deakin, Gary M. Barker, Louis Schipper, Jason M. Tylianakis and Raphael K. Didham	**T12** Glitches in the matrix: To what extent does increased productivity in agricultural systems lead to ecological impacts in adjacent forest fragments?
14:15 – 14:30	Frank Krumm, Daniel Kraus and Marco Conedera	**T13** Does integration satisfy demands on biodiversity in European forests? An attempt to clarify with a conceptual framework
14:30 – 14:45	Ignacio J. Diaz-Maroto, Pablo Vila-Lameiro and Olga Vizoso-Arribe	**T14** Land-use changes in natural broadleaved forests in the NW Iberian Peninsula: effects of anthropogenic disturbances
14:45 – 15:00	Kevin M. Potter and Barbara S. Crane	**T15** Assessing the risk of climate change and other threats to forest biodiversity across the U.S. Southern Appalachian region
15:00 – 15:25	*Tea Break*	

Symposium 3: The potential impact of Invasive Alien Species (IAS) on forest biodiversity into the future

Convenor: Nick McCarthy

According to the UN and FAO the single biggest to biodiversity is invasive alien species. With the added impacts of climate change, coupled with increasing movement of people, goods and services around the world the threat of IAS to our forests and forest biodiversity is never more poignant. We have seen first-hand the problems that these species can cause if nothing is done (e.g. Grey squirrel, Rhododendron) promptly to control or eradicate the species early. The challenge facing researchers and practitioners alike will be not only to control the IAS already present but to ensure early identification of new threats and take appropriate measures to remove them and thus maintain the integrity of the forests and the biodiversity within. To this aim this symposium will examine the threat posed by IAS to forest biodiversity, revise the lessons from the past successes and mistakes and investigate whether new developments such as biocontrol, early warning systems, citizen science, and DNA barcoding have roles to play in the early identification and subsequent control of Invasive Alien Species in our forests.

15:25 – 15:30	Introduction	
15:30 – 15:45	Nick McCarthy	**T16** Invasive species and the threat to Irish forestry
15:45 – 16:00	Bastian Egeter, Phillip J. Bishop and Bruce C. Robertson	**T17** DNA-based detection of frog predation by introduced mammals in New Zealand forest ecosystems

Open Session A, Chair: Nick McCarthy, Waterford Institute of Technology

16:00 – 16:05	Introduction	
16:05 – 16:20	André Arsenault, Bill Clarke and Rein Van Kesteren	**T18** Distribution of the boreal felt lichen in a ribbed moraine landscape of Eastern Newfoundland
16:20 – 16:35	Robert J. Northrop	**T19** Development and assessment of an integrated set of wildlife habitat relationship models for terrestrial vertebrates
16:35 – 16:50	Miles Newman, Fraser J.G. Mitchell and Daniel L. Kelly	**T20** Exclusion of large herbivores: Long-term monitoring of plant community composition in Irish semi-natural oak woodlands
16:50 – 18:30	Poster Session	

WEDNESDAY, 29th AUGUST 2012

09:00 – 09.45	**Keynote Address 2** **Martin Hermy**	Forest plant species diversity: from a dark past to an uncertain future

Symposium 4: Using long-term data to investigate forest biodiversity

Conveners: Fraser Mitchell & Nadia Barsoum

Forest ecosystems are dynamic but the dominant tree cover can have turn over times from many decades to centuries. This provides a challenge for research into the biodiversity of forest ecosystems which is typically run over relatively short time frames. This symposium will explore the contribution to forest biodiversity research made by long-term monitoring and palaeoecology. This research delivers long-term datasets that can be used to explore successional trends in biodiversity but issues over temporal, spatial and taxonomic resolution still need to be addressed. These datasets also provide an essential means of testing the validity of the chronosequence approach (substituting space for time) which is the most widely used technique in forest succession investigations.

09:45 – 09:50	Introduction	
09:50 – 10:05	Frans Vera	**T21** The forest: A catastrophic shift of the wood-pasture to an alternative stable state on the expense of biodiversity
10:05 – 10:20	Keith J. Kirby	**T22** Vegetation change in Wytham Woods (southern England) in a wider temporal and spatial context
10:20 – 10:35	Caroline Heiri, Harald Bugmann and Peter Brang	**T23** Fifty years of natural dynamics in Swiss forest reserves: stand characteristics and developmental trends
10:35 – 10:50	Karen M. Moore, George F. Smith, Daniel L. Kelly and Fraser J.G. Mitchell	**T24** How to grow a forest: The first 10 years of a long-term native woodland restoration experiment
10:50 – 11:05	Fraser Mitchell	**T25** Taxonomic homogenisation in semi-natural woodland – the long story
11:05 – 11:20	Jenni Roche, Fraser Mitchell and Steve Waldren	**T26** Using palaeoecological techniques to assess biodiversity value and native status: a case study of Scots pine in Ireland
11:20 – 11:40	*Tea Break*	

Symposium 5: Biodiversity research and restoration management of semi-natural woodlands and high conservation value forest in commercial forests

Conveners: Declan Little & John Cross

The concept of restoration management as opposed to strict conservation management is worthy of attention as the former has received considerable focus in many countries during the past decade with respect to semi-natural woodland management, and especially in Ireland. Restoration management differs from merely conserving remnants of existing high nature conservation value forests in that factors such as increasing habitat size, connectivity with similar and other habitat types and mitigating against negative land use impacts are also taken into account. Within commercial forests identification of high conservation value areas and opportunities to enhance biodiversity value are also becoming increasingly important especially with the advent of forest certification initiatives.

11:40 – 11:45	Introduction	
11:45 – 12:00	Carlo Urbinati, Luca Bagnara, Valeria Gallucci, Emidia Santini and Marcello Miozzo	**T27** Forest structure restoration for improving the role of English yew and Silver fir in coppiced woodlands
12:00 – 12:15	Daniel L. Kelly and Anke C. Dietzsch	**T28** Patterns in tree diversity in montane rainforest in Cusuco National Park, Honduras, Central America
12:15 – 12:30	Kevin Collins, Declan Little and John Cross	**T29** Building a strategy for the sustainable management of Ireland's native woodlands
12:30 – 12:45	John L. Devaney, Marcel A.K. Jansen and Pádraig M. Whelan	**T30** Negative neighbourhood effects in yew woodlands
12:45 – 13:00	Sandra Ikauniece, Guntis Brūmelis, Oļģerts Nikodemus, Raimonds Kasparinskis and Juris Zariņš	**T31** Effects of soil, canopy and habitat fragmentation factors on vegetation in *Quercus robur* woods in the boreo-nemoral zone

13:00 – 14:00	*Lunch Break*	

Symposium 6: Forests and bird conservation

Convenors: Mark Wilson & John Calladine

Habitat change is the single biggest threat to bird populations with a vulnerable conservation status. The majority of threatened bird species across the globe are habitat specialists, and of these, more species depend on forests than on any other habitat type. Deforestation, fragmentation and other anthropogenic changes to natural and semi-natural forest habitats threaten many forest specialist birds around the world. At the same time, expansion of forests both through afforestation and through encroachment of scrub and woodland habitats following abandonment of agricultural land, constitute a threat to many specialists of open habitats. However, many areas where forest cover is now increasing have experienced significant deforestation in the past. New forests have the potential to enhance bird diversity in a wide variety of circumstances, though identifying the most effective ways of reconciling commercial and conservation agendas remains a challenge for forest managers. This symposium will explore the opportunities for and threats to bird populations posed by forest-related habitat change, and the complementary roles of native and plantation forests in securing the conservation status of forest birds, and the contribution forest and plantation management can make to the conservation of birds typical of more open habitats.

14:00 – 14:05	Introduction	
14:05 – 14:20	Robert Milne and Lorne Bennett	**T32** Enhanced avian diversity in complex managed forests in multifunctional landscapes, southern Ontario, Canada
14:20 – 14:35	John Calladine	**T33** A comparison of the breeding bird assemblages associated with constant cover forestry and clear-fell rotation management systems in conifer plantations
14:35 – 14:50	Jeffery L. Larkin, Petra B. Wood, Than J. Boves, James Sheehan, David A. Buehler *et al.*	**T34** Cerulean warbler response to forest management: Can forest management produce more breeding birds?
14:50 – 15:05	Luc Barbaro, Eckehard G. Brockerhoff and Inge van Halder	**T35** Edge effects on bird functional diversity and avian insectivory in mosaic forest landscapes: a transcontinental comparison
15:05 – 15:20	Mark W. Wilson, Jason Parker, Giacomo Dell'Omo, Barry O'Mahony, Thomas C. Kelly, Sandra Irwin and John O'Halloran	**T36** Foraging activity of breeding Hen Harriers (*Circus cyaneus*) in forested landscapes revealed by GPS
15:20 – 15:40	*Tea Break*	

Open Session B, Chair: Daniel Kelly, Trinity College Dublin

15:40 – 15:45	Introduction	
15:45 – 16:00	Veronika Fontana, Anna Radtke, Thomas Wilhalm, Erich Tasser, Stefan Zerbe and Ulrike Tappeiner	**T37** Effects of land-use change on plant species composition on traditional agro-forest systems in the Alps
16:00 – 16:15	Richard O'Hanlon and Tom Harrington	**T38** Fungal biodiversity in Irish forests: Non-native species support similar biodiversity but different communities of fungi from native forests

Symposium 7: Conserving native biodiversity in forests managed for bio-energy

Convenors: David Flashpohler & Chris Webster

As the value of forests for providing a feedstock for bioenergy increases, more land will likely be converted to fast growing tree plantations or other intensively managed forest systems to increase short-term production of cellulose. Worldwide, plantation forests account for about 5% of total forest cover, but this percentage is increasing at a rate of about 2-3 million ha yr^{-1}, particularly in some developing countries where much of the planet's biodiversity resides. In general, plantations and other intensively managed forests support fewer plant and animal species than native forests because they are simplified in terms of tree and other plant species richness and in terms of many structural and process related forest functions. However, native biodiversity can be retained in some bioenergy forests by using careful management in all stages of establishment, tending and harvest. Key considerations for conservation biodiversity as plantation forests grow as a proportion of total world forest cover include choice of plantation tree species, harvest frequency, rotation age, and care and management of biological legacies and forest understory plant and wildlife communities. We provide background and guidance that can be used to guide future bioenergy forest management in a new era of using forests to capture and store carbon and to generate bioenergy.

16:15 – 16:20	Introduction	
16:20 – 16:35	Eckehard Brockerhoff and Stephen Pawson	**T39** Risks and opportunities for biodiversity conservation in forests managed for bioenergy production
16:35 – 16:50	Chris Webster, David Flaspohler and Amber Roth	**T40** Legacy tree retention balances commodity and conservation objectives in intensively-managed North American aspen forests
16:50 – 17:05	Robert Froese, Linda Nagel and Michael Premer	**T41** Long term effects of whole-tree harvesting on productivity, soils and plant community dynamics in managed quaking aspen stands in the US Upper Midwest

17:05 – 18:00

IUFRO task force on biodiversity and ecosystem services

The meeting will discuss the development of this new IUFRO task force which was set up in 2011. Anybody interested is welcome. Contact: IUFRO division 7 & 8 coordinators Eckehard Brockerhoff (Eckehard.Brockerhoff@scionresearch.com) and Jean-Michel Carnus (jean-michel.carnus@pierroton.inra.fr).

19:00 – Late

Conference Dinner followed by a Ceilí with the Owenabue Valley Traditional Group

Vertigo, County Hall, Carrigrohane Road, Cork

THURSDAY, 30th AUGUST 2012

08:30 – 18:30 **Mid Conference Tour**

Killarney National Park

FRIDAY, 31th AUGUST 2012

08:45 – 09.30	**Keynote Address 3** **John Spence**	Biodiversity conservation in a sustainable forest management framework: speculation, science and experiments

Symposium 8: Biodiversity indicators in forest ecosystems

Convenors: Anna Barbati and Frédéric Gosselin

Biodiversity indicators are crucial for forest resource monitoring and management. They can either account for the fate of different kinds "forest species" (e.g. indicators based on bird censuses) or the state of conservation of forest habitats, or to monitor trends in the biodiversity component as related to the sustainable management of forests (e.g. the indicators used by the Montreal and MCPFE-Forest Europe regional processes on sustainable forest management). Inside these last processes, biodiversity indicators are probably those on which consensus is the weakest – both scientifically and politically. This is why the symposium aims at discussing issues on biodiversity indicators in forest ecosystems, especially – but not exclusively – addressing the following three points: (1) "testing" of forest biodiversity indicators or sets of indicators: magnitude of the relationship between the indicator and components of biodiversity (structural, compositional and functional); (2) sampling schemes and operational protocols and their implications for estimating biodiversity indicators and (3) "usefulness" of indicators, especially as related to decision making (political or else) and the perception of biodiversity indicators.

09:30 – 09:35	Introduction	
09:35 – 09:50	Péter Ódor, András Bidló, Ildikó Király, Gergely Kutszegi, Ferenc Lakatos, Zsuzsa Mag, Sára Márialigeti, Juri Nascimbene, Ferenc Samu, Irén Siller and Flóra Tinya	**T42** Stand structure as indicator of forest biodiversity in temperate mixed forest: a multi-taxon approach
09:50 – 10:05	Frédéric Gosselin and Christophe Zilliox	**T43** Tree species diversity, composition and abundance as indicators of understory vegetation diversity in French mountain forests: variations of the relationship in geographical and ecological space
10:05 – 10:20	Nicolas Debaive, Nicolas Drapier, Loïc Duchamp, Yoan Paillet, Frédéric Gosselin, Max Bruciamacchie and Olivier Gilg	**T44** First large-scale assessment of the amount of CWD in French forest reserves
10:20 – 10:35	Piermaria Corona, Lorenzo Fattorini, Sara Franceschi Walter Mattioli and Caterina Pisani	**T45** The ordering of trees communities by using diversity profiles
10:35 – 10:50	Nadia Barsoum	**T46** Applying a range of forest biodiversity indicators to investigate the influence of mixed tree species stands compared with single tree species stands across spatial scales
10:50 – 11:05	Laurent Larrieu, Pierre Gonin and Marc Deconchat	**T47** Preliminary results of implementation at wide scale of a taxonomic biodiversity indicator: the Potential biodiversity index (PBI)
11:05 – 11:20	Kevin M. Potter and Christopher W. Woodall	**T48** Incorporating evolutionary relationships into regional assessments of plot-level forest biodiversity

11:20 – 11:40	*Tea Break*	
11:40 – 11:55	Ryan P. Powers, Nicholas C. Coops, Jessica L. Morgan, Michael A. Wulder, Trisalyn A. Nelson, Charles R. Drever and Steven G. Cumming	**T49** A regionalization and biodiversity assessment of the Canadian boreal forest using remote sensing
11:55 – 12:10	Stephen Pawson, Michael Ulyshen, Thomas Adams, Thomas Paul, Chris Ecroyd, Jessica Kerr and David Henley	**T50** Remotely sensing biodiversity in plantation forests
12:10 – 12:25	Anna Barbati, Marco Marchetti and Piermaria Corona	**T51** European Forest Types and Forest Europe SFM indicators: a snapshot approach for monitoring forest biodiversity at European level
12:25 – 12:40	George F. Smith, Amanda Browne, Aileen O'Sullivan, Pat Neville and Richard Nairn	**T52** Criteria and indicators for high conservation value forest: adapting forest stewardship council principles for practical forest management
12:40 – 12:55	Anne Holma	**T53** Biodiversity indicators for forest industry
12:55 – 14:00	*Lunch Break*	

Open Session C. Chair: Tom Kelly, University College Cork

14:00-14:05	Introduction	
14:05 – 14:20	Anke C. Dietzsch, Linda Coote, Mark W. Wilson, Conor Graham, Lauren Fuller, Tom Gittings *et al.*	**T54** A comparison of the initial responses of plants, invertebrates and birds to the afforestation of grassland habitats
14:20 – 14:35	Gorik Verstraeten, Lander Baeten, Bart Muys and Kris Verheyen	**T55** Compositional shifts in the understorey vegetation after the conversion from mixed deciduous forest to spruce monocultures
14:35 – 14:50	Josephine Haase, Jaboury Ghazoul and Michael Scherer-Lorenzen	**T56** Effects of tree species and functional diversity on the resistance against insect herbivores
14:50 – 15:05	Kimiko Okabe, Satoshi Yamashita, Tsutomu Hattori, Motohiro Hasegawa, Hiroshi Tanaka and Shun'ichi Makino	**T57** Conservation of deadwood could conserve microscopic organisms such as mushroom mites
15:05 – 15:20	Thomas Bolger, Julio Arroyo, Joan Kenny and Kirsty Daly	**T58** The mite (Acarina) fauna of Irish forests - a study of the contribution of forests to the Irish fauna and of the differences associated with tree species and microhabitat

15:20 – 15:40 *Tea Break*

Symposium 9: Conservation management for invertebrates in forest litter and woody debris

Convenor: Anne Oxbrough and John Spence

Invertebrates are a key component of forest biodiversity, with species appealing to many, in their own right, as highly desirable components of the natural world. Furthermore, they fulfil vital roles in ecosystem function, including central functions in decomposition, nutrient cycling and terrestrial food webs. Therefore, understanding the interactions between these organisms and their environment will help elucidate and manage the impact of forestry activities on forest function. The latter is a matter of particular importance, given the expected demand for forest products, ecosystem services and recreational opportunities into the future. Forests are typically managed at stand and landscape levels, however invertebrates are also influenced by factors acting at much smaller scales. Furthermore, there is increasing evidence that at these small scales stands are homogenised to some extent by modern forest practices, likely reducing the ability of managed stands to sustain their characteristic organismal diversity. This symposium will focus on research at scales relevant to the ecological requirements of invertebrates in litter and woody debris and address how their needs can be included in policy for sustainable forest management. This symposium will bring together leading researchers in invertebrate ecology, and litter and deadwood dynamics, from across the globe, representing boreal and temperate forest ecosystems and exhibiting a range of management intensity. Each speaker will make management recommendations to aid the inclusion of invertebrates into forest policy which aims to maintain ecosystem health and biological diversity.

15:40 – 15:45	Introduction	
15:45 – 16:00	David H. Wise	**T59** Spiders, decomposition rates and global climate change
16:00 – 16:15	Jari Niemelä, Johan Kotze, Jarmo Saarikivi, Stephen Venn and Ferenc Vilsics	**T60** Invertebrates in urban forests: diversity, distribution and management recommendations
16:15 – 16:30	Hervé Jactel, Antoine Brin, Thierry Labbé, Céline Meredieu and Stephen Pawson	**T61** Modelling the impact of forest management on deadwood and associated saproxylic beetle diversity
16:30 – 16:45	Kenichi Ozaki, Katsuhiko Sayama and Akira Ueda	**T62** Conserving saproxylic beetles across stand age gradients of plantation forests in a human modified landscape
16:45 – 17:00	Stephen Pawson and Alwin Sky	**T63** Saproxylic diversity and its contribution to wood decomposition processes in an intensely managed forest ecosystem
17:00 – 17:15	Timothy T. Work and Suzanne Brais	**T64** Impact of post-harvest biomass removal on epigaeic invertebrates in jack-pine forests of Western Quebec, Canada

17:15 – 17:45 **Conference Closing and Prize Giving**

John O'Halloran, University College Cork

GENERAL INFORMATION

Conference Venue

The conference will take place at the Western Gateway Building, University College Cork (see map on page 25).

Registration and information desk

The registration and information desk will be located in the main atrium of the Western Gateway Building. We recommend picking up your registration material as soon as you arrive at the venue. Conference registration will be open between 6.30 pm – 8.00 pm on Monday 27th August during the welcome reception and between 8.30am and 6pm daily.

Registration is required for all participants and exhibitors. Registered participants and exhibitors will receive a badge giving them access to the conference venue, which must be worn visibly at all times.

Presentation upload

Presentations can be uploaded in room G09, opposite the registration desk in the main atrium. A member of the conference organising team will be available to facilitate presentation upload throughout the conference. However, it is recommended that talks be uploaded at least a day before the presentation is scheduled, and a minimum of one session prior to the start of the scheduled talk. Upload of talks for the first day of the conference will be given priority at the welcome reception and during the registration period of the following morning. Talks should be saved using Microsoft Powerpoint in Office version 2010 (file extension .pptx) or 2003 (file extension .ppt). Please try to keep the size of your presentations below 10MB. Please save the name of the presentation as follows:
<session number>_<surname>_IUFRO2012 (e.g. 7_WILSON_IUFRO2012).

Posters

Posters should be displayed in the main atrium for the duration of the conference, and attached to the correct numbered poster board (see poster section at the end of this document) using the Velcro attachments provided. Please remove posters by 1pm on Friday.

Student prizes

Student prizes for best presentation and best poster will be selected by a team of judges from the conference organising and scientific committees using the criteria outlined below. Prizes will be awarded during the closing of the conference.

Best Presentation Award

- The scientific excellence, creativity, innovation and the content in addressing a research question.
- The quality of the presentation (*i.e.* clarity, layout and design, *etc.*).
- The presentation itself (*i.e.* how well the speaker was able to deliver a stimulating talk, abidance by allocated time and effectiveness in communicating the concept to the audience, *etc.*).

Best Poster Award

- Creativity, straightforward and balanced, combining science and art.
- The contents where text and figures should be presented in a manner that viewers with little previous knowledge will understand the scientific subject.
- The message of the poster should be readily visible and understandable.
- Effectiveness in communicating the concept during poster session.

Refreshments and Lunch

Coffee and tea will be served during morning and afternoon breaks in the atrium. Lunch will be served during the lunch breaks. These refreshments are included in the conference fee.

Social Events

Welcome Reception

The Welcome Reception will take place in the Atrium of the Western Gateway Building, University College Cork, on Monday from 6.30pm until 8.00pm.

Conference Dinner

The conference dinner will take place on Wednesday 29th August at *Vertigo*, located on the top floor of the County Hall on Carrigrohane Road (see Maps section). This is a ten minute walk from the Western Gateway Building. A drinks reception at 7pm will be followed by dinner at 7.30pm and a traditional Irish band and Ceilí. This is included in the conference fee.

Public Transportation

Train

Iarnród Éireann: www.irishrail.ie Kent Railway Station, Cork city, approximately 2 km from UCC.

Bus

City Bus: Approximate bus fare to University from Railway station is €2. Bus No. 5 (marked Rossa Avenue) get off at College Road. From City centre, Bus No. 8 (marked Bishopstown) get off at Gaol Cross.
Bus Éireann: www.buseireann.ie. Bus Station, Cork city approximately 1.5 km from UCC.
AirCoach: www.aircoach.ie (Dublin airport - Dublin - Cork). Patrick's Quay (behind Metropole Hotel), approximately 1.5 km from UCC.
CityLink: www.citylink.ie (Galway - Cork city/Cork Airport, Limerick-Cork city/Cork Airport). Patrick's Quay (behind Metropole Hotel), approximately 1.5 km from UCC.
Eurolines: operated by Bus Éireann offers a direct bus daily from London to Cork - look for the 'Tralee-London' route.

Parking at UCC

There is limited public parking available on campus (see map on page 26). UCC is well served by public transport.

Cork Airport

Aiport code ORK - this is the only airport in Cork, 8 km from the city centre and is serviced by taxis as well as regular bus service. Information on airlines and routes that fly into Cork can be viewed on the airport website: www.corkairport.com.
Bus Éireann provides a regular Air Coach service to and from Parnell Place Bus Station in the city centre throughout the week. Cost approximately €6 each way (www.buseireann.ie).
Citylink also provides buses departing from Cork Airport every 30 mins, connecting with over 30 city hotels, guest houses and city-centre locations. Cost is approximately €6 each way. (www.citylink.ie).

Taxi

Approximate taxi fare to University from Railway Station: €10.
Approximate taxi fare to University from Airport: €15

ABC Taxis, Pouladuff Road, 021 4961961
Premier Taxis, Douglas Street, 021 4847600
Shandon Taxis, 42 MacCurtain Street, 021 4502255 & 021 4505522

Emergency Numbers

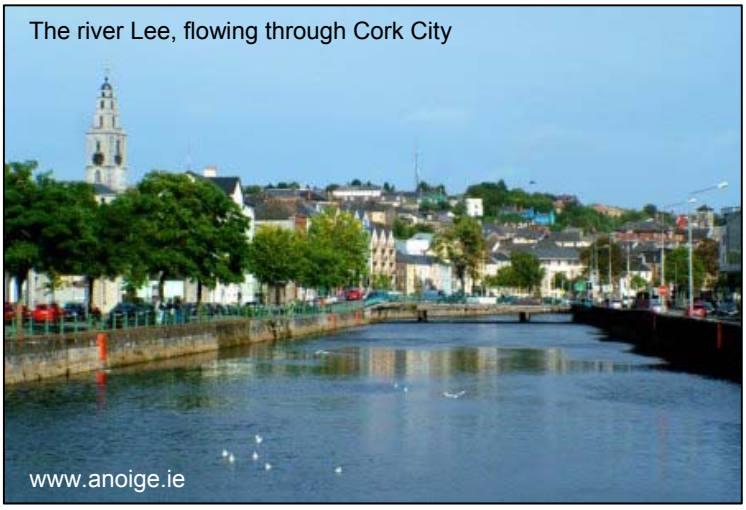
Emergency Police, Fire, Ambulance: 112 or 999
These numbers are free of charge but should only be used in cases of genuine emergency. On answer, state which service you require, wait to be connected to that service, then clearly state the location at which assistance is required.

ATMs and Bank Branches

The nearest ATM and bank branch to the conference venue is the Allied Irish Bank (AIB) which is located across the road from the Western Gateway building at the traffic lights.

WELCOME TO CORK!

Statio Bene Fide Carinis - A safe harbour for ships is the motto on the coat of arms of our friendly and vibrant port city. Cork city, on the banks of the river Lee, boasts the second largest natural harbour in the world by navigational area (with Sydney harbour being the largest), with direct ferry crossings to mainland Europe (Roscoff, France). Cork is Ireland's second largest city with a population of approximately 120,000 and is a university city with a total student population in excess of 35,000. The city has two main third level education institutes - University College Cork and Cork Institute of Technology. In 2005, Cork was nominated the European City of Culture and was named one of the 3 top cities in the world to visit in 2010 by the Lonely Planet tourist guides' "Best in travel 2010".


The river Lee, flowing through Cork City

www.anoige.ie

The name 'Cork' derives from the Irish '*Corcach Mór Mumhan*', which means the 'Great marsh of Munster' and refers to the face that the centre of Cork city is built on islands which are marshy and prone to episodes of flooding. St. Finbarr is the patron saint of Cork. He followed the River Lee from its source in Gougane Barra to Cork and founded a monastery in the 7th Century where St. Finbarre's Cathedral now stands. The first Viking attacks on the monastery occurred during the early 9th Century and these are documented within the historical written records held by other monasteries. By the 12th Century, Cork was a medieval walled city which was divided along a North-South axis by the Main Street, which corresponds to the current North and South Main Streets. The Augustinian Red Abbey which stood outside the city wall is the only surviving building from medieval Cork.

The River Lee is a sandstone river that has its source in the beautiful and mountainous area of Gaugan-barra in West Cork. It travels 90 km, winding its way through the city of Cork and is a prominent feature of the city. The city of Cork is a major Irish seaport with docks and quays scattered along the broad waterway of the Lee on the city's east side. IUFRO visitors will find further information about Cork city and county at www.cometocork.com.


Cork City from the air, looking westwards

www.portofcork.ie

Cork city was named the European Capital City of Culture 2005 and is full of historical attractions, beautiful Georgian architecture and a lively nightlife. Located in the South West corner of Ireland it is the country's second largest city. Like so many areas in the centre of Cork city, both the South Mall and Grand Parade were built over channels of the River Lee in the eighteenth century.

Shopping and Food

Cork city's main shopping areas include shopping on St. Patrick's Street, Princes Street, Oliver Plunkett Street and the North Main Street. The large shopping centres in Cork city include Merchant's Quay Shopping Centre, Paul Street Shopping Centre, French Church Street, North Main Shopping Centre and the English Market. St. Patrick's Street is Cork's main thoroughfare with a huge selection of shops including a great selection of restaurants and pubs. St Patrick's Street is Cork city's longest shopping street and Princes Street and Grand Parade is where you will find access to the English Market (see below).

French Church Street has a number of little shops hidden away, ranging from clothes, shoes, chocolate shops and café's with heated outside seating for some, where there is always a buzz around. The area around Paul Street, Carey's Lane and French Church Street is known as the Huguenot Quarter where you can find a walled Huguenot graveyard, with the Huguenot history being associated with Cork from the 1700s, when they fled to Cork from France and worked in the textile area in the manufacture of linen and silk as well as property development.

Cornmarket Street, also known as Coal Quay, has a history of street trading in Cork from the late 1800s, where many of Cork city citizens purchased their goods. Cornmarket Street was home to St. Peter's Market which opened as a food market in olden times and today it is a lively bar and restaurant. Much of this area has since been developed for apartments and a shopping units. Currently, Saturday morning on Cornmarket Street still proves to be a favourite with street traders in this area. Located off St. Patrick's Street you will find many little side streets and lanes, again with a host of shops and eateries. Cork's Opera Lane is a fine example of a new shopping area blending in with the old historic buildings of Cork such as Crawford Art Gallery and the Queen Anne house at Emmet Place.

Cork's English Market is a delightful covered market area that has been the backbone of Cork's history and one of the oldest markets of its kind, supplying the people of Cork and its visitors since the 1700s. The English Market has a range of wonderful stalls for you to browse such as fresh meat, fish, poultry, fresh fruit and vegetables, many local cheeses, smoked salmon, olives, spices, confectionary and traditional trip and drisheen stall, French soaps, lavender, flowers, wool, wine, champagne and many more delights. Having enjoyed browsing the many stalls in the English Market, why not stop and enjoy a coffee and some people watching in one of the wonderful cafés, coffee docks and enjoy some delectable chocolates at the same time! The English Market can be accessed from either Princes Street or Grand Parade.

Top attractions in Cork city

1. Combine a visit to Cork City Gaol (www.corkcitygaol.com) and Lifetime Lab (www.lifetimelab.ie)
2. Visit the English Market (www.englishmarket.ie) and experience Cork cuisine
3. Indulge in city centre boutique and designer shopping
4. Ring the bells at St. Anne's Shandon Church (www.shandonbells.ie/) and visit the Butter Museum (www.corkbutter.museum)
5. Stroll through the grounds of UCC (www.ucc.ie) and visit the Lewis Glucksman Gallery (www.glucksman.org)
6. Marvel at the St. Fin Barre's Cathedral (www.cathedral.cork.anglican.org)
7. Cork Public Museum and Fitzgerald Park (www.corkcity.ie/services/recreationamenityculture/museum)
8. Marvel at the stars at Blackrock Castle Observatory (www.bco.ie)
9. Take time out at Crawford Art Gallery (www.crawfordartgallery.ie)
10. Kayak into the city or catch a traditional sporting fixture

Places to visit in East Cork

- Blarney Castle - Kiss the Blarney Stone (www.blarneycastle.ie)
- Fota Wildlife Park - Walk with the animals (www.fotawildlife.ie)
- Kinsale - Enjoy the seafood restaurants and the spectacular sights of Charles Fort and the Old Head of Kinsale (www.kinsale.ie)
- Cobh - Explore the Titanic trail (www.visitcobh.com)


Charles Fort, Kinsale

UNIVERSITY COLLEGE CORK

University College Cork (UCC) was established in 1845 as one of three Queen's Colleges (the others were at Galway and Belfast). The site chosen for the college is particularly appropriate given its connection with the patron saint of Cork, St Finbarr. It is believed his monastery and school stood on the bank of the river Lee, which runs through the lower grounds of the university. The University's motto is 'Where Finbarr Taught, let Munster Learn.'

The UCC campus is noted for its mature well-wooded grounds containing several Californian Redwood trees. These form a splendid setting for the Gothic revival-style Main Quadrangle buildings, modelled on a typical Oxford college by the renowned Cork architect of the mid-19th Century - Sir Thomas Deane.

Today the University has a current enrolment of over 12,500 undergraduate students and some 3,600 students at postgraduate level, including over 1,000 PhD candidates. UCC's diverse student body includes over 1,900 students representing 75 nationalities worldwide. The University is a beautiful place and is enhanced by an atmosphere of friendliness and pride that makes UCC not only an enjoyable place to study but also a great place to work. Many people spend their entire adult lives in the University and make lifelong friends during their time here.

UCC has many visitors each year and there are many things to see on campus including the Lewis Glucksman Art Gallery, the Honan Chapel and the newly refurbished Ogham Stones collection, the Crawford Observatory and the Visitors' Centre.

The university is an internationally competitive, research-led University that plays a key role in the development of Ireland's knowledge-based economy. Our research strategy is focused on creating major centres of excellence for world-class research and is closely aligned with key Government policies including the *Strategy for Science Technology and Innovation* (SSTI), *Building Ireland's Smart Economy* and the Report of the Innovation Taskforce. Despite adverse economic conditions, overall research expenditure achieved in 2009/2010 was €83.8 million.

UCC the world's first Green Flag University

University College Cork became the first 3rd level educational institution in the world to be accredited with the prestigious international 'Green Flag' award on February 19th 2010, a direct result of the Green-Campus programme, a student-led initiative undertaken by UCC students and staff over the last three years.

The Green-Campus programme has seen the University save €300,000 in waste management costs, reduce waste to landfill by nearly 400 tonnes and improve recycling from 21% to 60%. Furthermore, UCC has conserved almost enough water this year to fill the equivalent of the Lough of Cork.

Steps taken by the students and staff of UCC towards becoming a green campus include: the establishment of a Green-Campus Committee; enhanced recycling capabilities throughout the campus; students in lecture theatres and laboratories are alerted to turn off lights and electrical equipment; university maintenance vehicles are now running on biodiesel; carpooling has been introduced to facilitate lifts to and from campus; enhanced Park & Ride and bike parking areas are designed to encourage more sustainable travel and each year the Students Union holds a Green Awareness Week on campus, where real actions are supplemented by academic talks on environmental sustainability.

School of Biological, Earth and Environmental Sciences (BEES)

The School of Biological, Earth and Environmental Sciences (BEES) was formed in 2010 through the amalgamation of the former Departments of Geology and Zoology, Ecology and Plant Science and the Environmental Science Programme at UCC. BEES hosts a diverse research community encompassing molecular and organismal aspects of animal and plant sciences, including the forest ecology research group (www.ucc.ie/en/forestecology/). Although the primary facilities are housed within the Distillery Fields campus, BEES has access to several field sites (e.g. Lough Hyne Research Station) and has especially strong research collaborations with the Environmental Research Institute (ERI), where some BEES staff and postgraduate students have research facilities. The movement of the vast majority of BEES staff, students and facilities to the Distillery Fields campus (a short stroll from UCC's main campus) has created a productive and dynamic research community on the banks of Cork's River Lee.

State of the art greenhouse facilities at the School of Biological, Earth and Environmental Sciences Distillery Field campus at UCC.

CONFERENCE TOURS

Mid-Conference Excursion

Thursday 30th August

A one day excursion to Killarney National Park and surrounding areas in Co. Kerry will take place on the third day of the conference (www.killarneynationalpark.ie). In the morning we will visit Derryreag upland conifer plantation on the Cork-Kerry border (see map) where scientists will discuss recent developments in Irish forest biodiversity research for a range of taxonomic groups. Next, we will we will visit Killarney National Park located in the heart of County Kerry and designated as a Biosphere Reserve by UNESCO in 1981. Located to the east of the MacGillycuddys Reeks, the highest mountain range in Ireland, this 10,000 hectare National Park includes the world famous Lakes of Killarney and their surrounding woodlands and mountains. With a mild climate and varied habitats the park is home to an interesting array of plant and animal life and contains many features of importance including native Irish Oak and Yew woodlands and only herd of native Red Deer remaining on the island of Ireland.

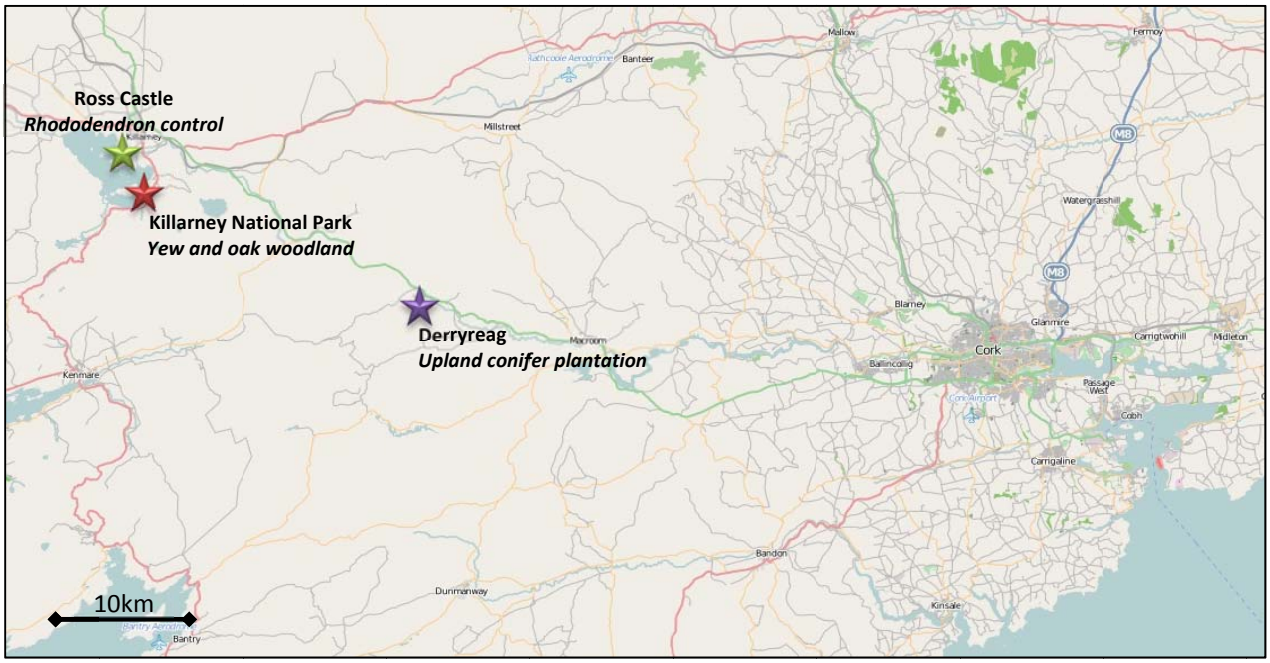
Cost: Included in the registration fee for conference participants along with transport and lunch. The cost is €40 for guests.

Departure point: We will be leaving from the Brookfield Health Sciences Building (BHSB) at 8.30am sharp! The BHSB can be reached via a footbridge over the river Lee from the Western Gateway Building (see map).

What to bring: A water bottle, shoes for hiking, warm clothing, a waterproof jacket and insect repellent. A sun hat and sun screen just in case!

Itinerary:

8.30am	Depart from Brookfield Health Sciences Building, UCC
9.30-11.00am	*Biodiversity in Irish plantation forests, Derryreag*
11.30-12.30	*Rhododendron control, Ross Castle, Killarney National Park*
12.30-1.30pm	Lunch at Muckross House Garden Restaurant, Killarney N.P.
1.30-5.00pm	*Biodiversity in Ireland's native woodlands, Muckross Peninsula, Killarney National Park*
6.30pm	Return to Brookfield Health Sciences Building, UCC



Map of south west Ireland, showing locations of Cork City and the venues for the mid conference excursion.

Post-Conference Tour (optional)

Saturday 1st September

An optional post-conference tour is offered to Gougane Barra National Forest Park and Blarney Castle. This tour will give participants the opportunity to explore the natural and cultural heritage of County Cork.

Cost: €50 per person. This fee includes bus transport, mid-morning and afternoon refreshments, lunch at a venue near Gougane Barra and entrance to Blarney Castle.

Departure point: We will be leaving from the Brookfield Health Sciences Building (BHSB) at 9am. The BHSB can be reached via a footbridge over the river Lee from the Western Gateway Building (see map).

What to bring: Clothing and shoes for hiking in wet weather (hiking boots/shoes, rain jacket, water proof pants, warm clothing). The hike of 1hr-90mins will involve some ascent (a moderate level of fitness is required). An easier walk is also available, if preferred.

Blarney Castle

Blarney Castle is just six miles from Cork city. It was built by one of Ireland's greatest chieftains, Cormac MacCarthy, nearly six hundred years ago. It is home to the famous Blarney Stone at the top of the tower. Legend has it that after kissing the stone, the gift of eloquence is bestowed, and the lucky patron will never be lost for words again (www.blarneycastle.ie). The visit will include a walk round the castle and grounds, and the chance to kiss the stone!

The spectacular Blarney Castle

Gougane Barra Lake & St Finbar's oratory

Gougane Barra

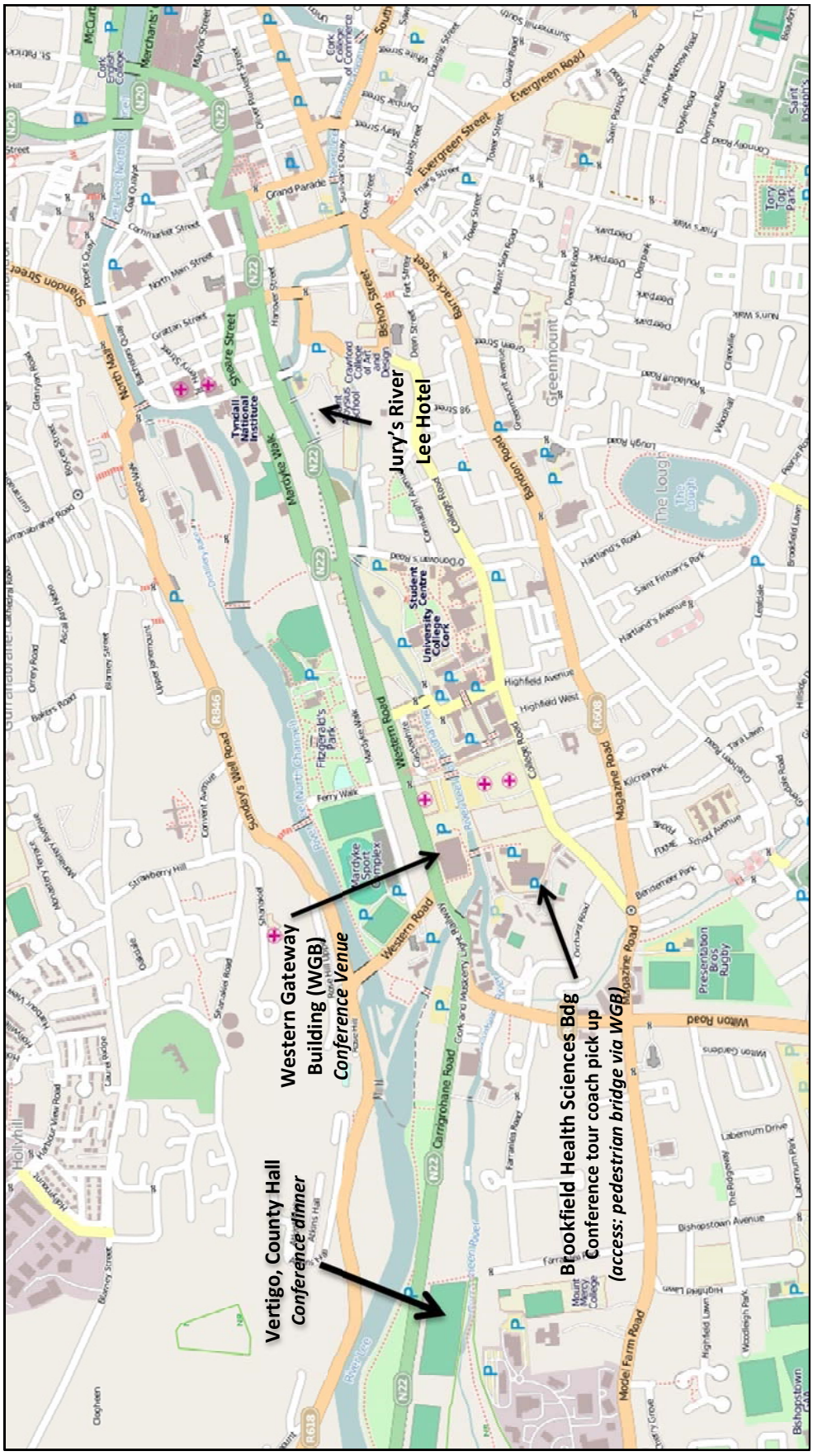
Gougane Barra is situated 44km south west of Cork city. This area of outstanding natural beauty comprises 142 hectares of forest park, Gougane Barra Lake and St Finbar's oratory. The forest park was afforested between 1938 and 1942 with Sitka spruce, Lodgepole pine, Japanese larch and Scots pine. Many of these areas have now been restocked, having reached commercial maturity. However, one of the finest stands of Sitka spruce in Ireland still exists in the valley bottom with trees reaching 38 meters and carrying a volume of up to 3 cubic meters each (www.coillteoutdoors.ie). The Gougane Barra area is composed of old red sandstone and the characteristic layering or bedding of the sedimentary rocks can be clearly seen in the high cliffs around Com Rua at the head of the valley. Gougane Barra Lake lies in a rock basin carved out by the ice but nowhere does it reach depths greater than 12 meters (www.gouganebarra.com).The visit will include a 90 minute walk up through the forest with stunning views of the valley below, a visit to the oratory and lunch at a local venue.

Notes:

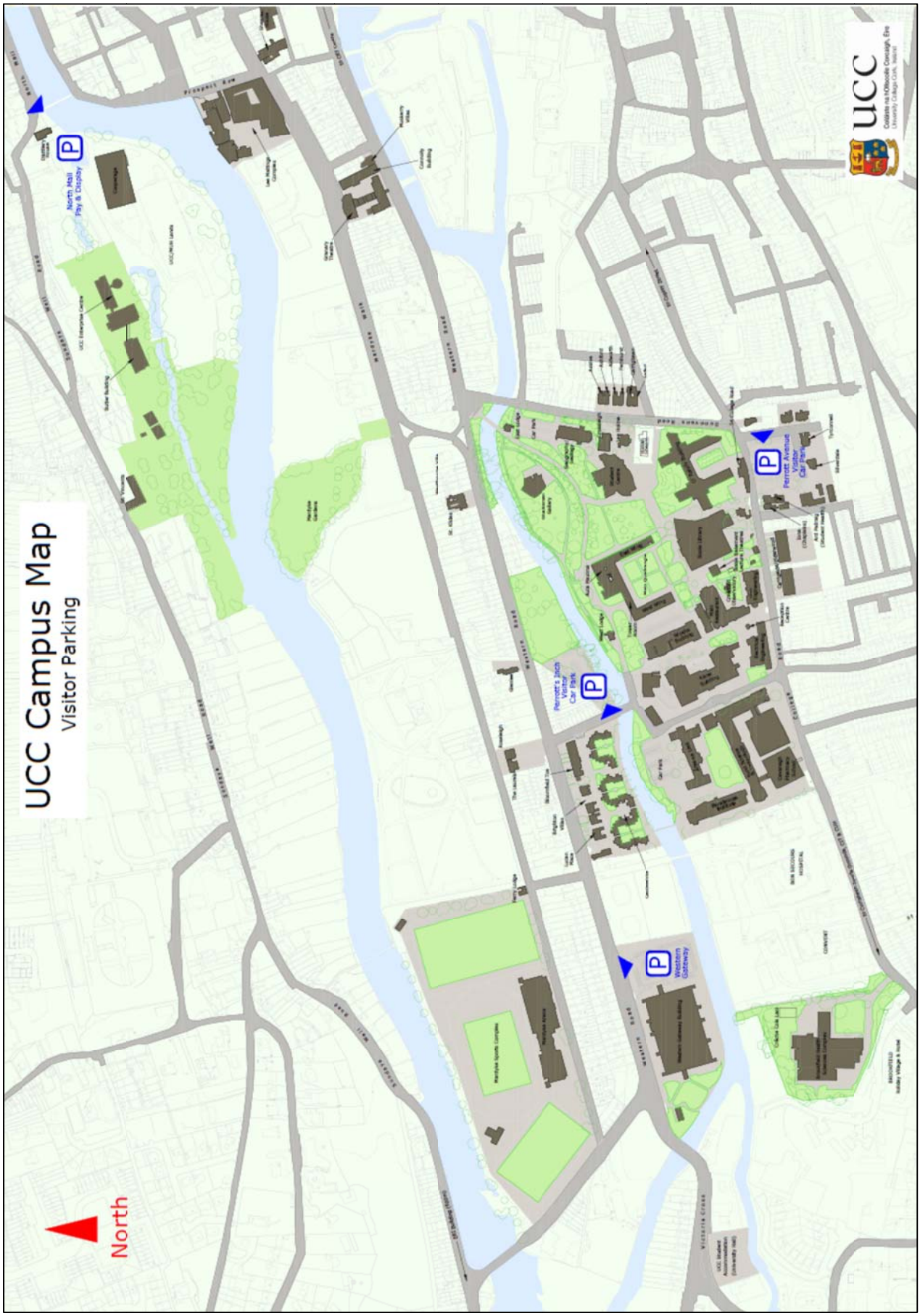
Excursions can be booked at the time of registration. All guides will be in English. Excursions will take place if sufficient numbers attend. Destinations are subject to change with or without notice. Transportation will be by chartered bus.

MAPS

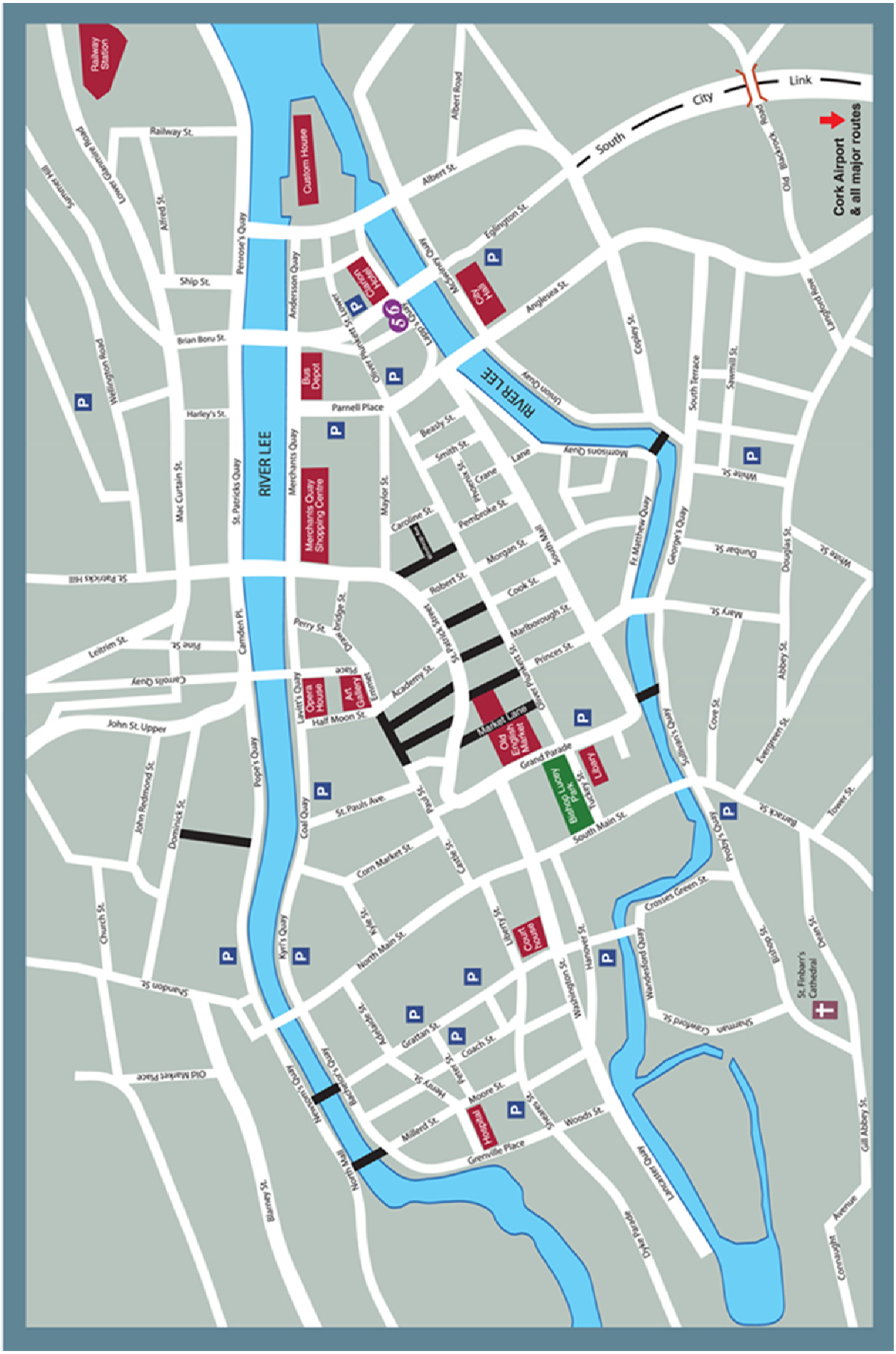
CONFERENCE VENUES



UCC CAMPUS


UCC Campus Map
Visitor Parking
North
UCC
North Mall Pay & Display
Perrott's Glen Visitor Car Park
Perrott Avenue Visitor Car Park
Western Gateway

CORK CITY CENTRE



ABSTRACTS

Oral Presentations

T1 Novel partnerships for amphibian conservation

Robin Moore*
Conservation International, Arlington, VA, USA

Amphibians are at the forefront of the biodiversity extinction crisis, with close to a third of some 7,000 species classified as threatened, more than 900 species falling outside of protected area coverage and over 450 critically endangered or endangered species restricted to just one site. Recognizing the scope of the crisis, over 80 experts came together in 2005 to produce the Amphibian Conservation Action Plan (ACAP), an ambitious blueprint outlining major actions needed to curtail the extinction crisis. Where the ACAP effectively highlighted the scale of the crisis, it fell short on enabling governments and civil society to take action because the priorities outlined are not nationally or regionally specific. The critical next step towards advancing the ACAP is therefore refining its objectives within the context of national and regional strategies and engagement by national resource management agencies and NGOs to implement conservation actions. To date ten workshops have been held to develop national or regional strategies for amphibian conservation planning. These plans have laid the foundation for implementing on-the-ground actions that tackle one of the primary threats to the survival of amphibians: loss of core forest habitat. To date we have partnered in the creation and management of 14 new protected areas in seven countries encompassing 22,000 hectares of forest and containing 55 threatened or endemic species. We are currently implementing a project that integrates adaptive management and long-term monitoring to investigate if amphibians are appropriate indicators of the effectiveness of habitat protection for biodiversity conservation in the face of climate change. I will present case studies that highlight the strength in partnership in achieving in situ amphibian conservation, and a vision for scaling up global amphibian conservation in the coming years.

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T2 Riparian buffers and forest thinning: effects on headwater vertebrates 10-years post-treatment

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The Density Management and Riparian Buffer Study of western Oregon, USA was initiated in 1994 to assess: 1) upland forest density management approaches to accelerate development of late-successional forest characteristics in managed federal forests; and 2) the efficacy of alternative riparian buffer widths along headwater streams, in the context of upland thinning, to retain key aquatic species and habitats. Instream- and streambank-dwelling vertebrates were monitored as part of the riparian component, using a before/after/control methodology. We analyzed animal counts along 45 stream reaches at 8 study sites, distributed from the foothills of Mount Hood to Coos Bay, Oregon from data collected in one year pre-treatment and years 1, 2, 5 and 10 post-treatment. Using linear regression, we sought the simplest model to explain the variability in post-treatment animal abundances at the reach scale, after accounting for pre-treatment counts. Streambank models analyzed all amphibians, all terrestrial-breeding amphibians, *Plethodon dunni* and *P. vehiculum*. Instream models analyzed all vertebrates, all amphibians, stream-breeding amphibians, *Dicamptodon tenebrosus*, and *Rhyacotriton* species. Streambank models included buffer treatment, survey area, stream width, pre-treatment count, and no. days post-treatment. Instream models also included survey method, hand sampling or electrofishing. Along banks, pre-treatment counts alone were adequate to explain variation in amphibian numbers, but there was support for a negative effect of the narrowest buffer for all groups analyzed except *P. vehiculum*. Instream, more complex relationships resulted, with important covariates including pre-treatment counts, stream width, and buffers. Decreasing counts over time in reaches with the narrowest buffer were evident. However, with our moderate thinning regime and in treatments with all buffer widths, species occurrences were retained. A short-term risk to species abundances for long-term habitat restoration benefits is suggested.

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T3 How important are stream network relationships anyway? The example of juvenile coho salmon on the mid-Oregon coast

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For aquatic dependent species, the stream network is the template for connectivity among habitats and individuals. Aquatic ecologists are working to develop theory and techniques for analysis of dynamic stream processes and communities of organisms within the context of the stream network. At different spatial scales, stream network structure informs habitat connectivity for aquatic-obligate species. The movement of aquatic species both upstream and downstream is limited by stream channels and may be modified by the downstream flow of water, nutrients, and physical materials such as wood and substrate. Barriers associated with anthropogenic land uses effect habitat connectivity for aquatic obligate species within the stream network. Analysing streams as networks offers a realistic and holistic perspective for assessing movement and distribution by freshwater aquatic species in response to life-history needs and environmental conditions. Such analysis informs assessments of long-term population resilience. This project was developed to compare the effectiveness of traditional in-stream habitat metrics with metrics that described the spatial location of habitat within the stream network when explaining density of juvenile coho salmon (*Oncorhynchus kisutch*) in seven subbasins of Oregon's mid-coast over a five-year period. Analysis revealed that network variables perform better at explaining juvenile coho salmon density than instream habitat variables. Further, analysis of network distances among seasonal habitats indicates that juvenile coho salmon density may be higher where the distance between critical seasonal habitats is short. This work furthers aquatic conservation, management, and restoration by including analysis of the proximity and connectivity among aquatic freshwater habitats.
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T4 Effects of small instream wood on fish diversity, evenness, dominance, and assemblage composition and structure in a sand-bed stream of the Gulf Coastal Plain, USA

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Use of woody habitats by fishes is well documented for salmonids and to some extent warmwater sportfishes. However, response of fishes to woody habitats in small, sand-bed streams of the upper Gulf Coastal Plain, USA, is poorly known even though wood provides the primary cover in these systems. We examined the effects of small instream wood on fish diversity, community evenness, dominance, and assemblage composition and structure. To do so, we installed woody brush bundles over a 475-m segment of a small stream in northern Mississippi, USA. This sand-bed stream (max. width ~6.0 m) is deeply incised, hydrologically flashy, and has little woody or other cover. We installed bundles in two treatment patterns. To create patchy woody cover in a reach (Patchy treatment, n=2), we installed three clusters of bundles (6 bundles/cluster) at 30-m intervals (60-m treatment reach). To create dense woody cover in a reach (Dense treatment, n=2), we placed similarly spaced clusters and also placed groups of 3-4 bundles across the stream at 5-m intervals between the clusters. As a reference (Non-Woody treatment), we included two reaches lacking woody cover. We sampled fishes and took physical measurements (depth, width) in the treatment reaches in July, November 2009, April, and September 2010. Overall, we captured 2,635 fishes representing 30 species and 9 families. Richness and evenness (PIE) were significantly higher in the Dense (13.6 species, 0.83 PIE) and Patchy (13.8, 0.83) treatments than in the Non-Woody (9, 0.65) treatment. Conversely, dominance was significantly higher in the Non-Woody treatment (0.54) than the other two woody treatments (both 0.31). Abundance was not significantly different among treatments. Assemblage differences among reaches were manifested primarily in shifts in abundance of common species rather than wholesale species addition or replacement. Woody habitat positively affected diversity and evenness and also was associated with assemblage shifts in this small, highly modified stream.
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T5 Wetlands biodiversity and management in forests in western France

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Forests in western France (Brittany and Normandy) are often peppered with small wetlands. These forests have been planted with coniferous trees since the middle of the 19th century. Species used for reforestation were first indigenous, e.g. *Pinus sylvestris*, and subsequently exotic like *Pseudotsuga menziesii*, *Larix kaempferi* and *Picea sitchensis*. Reforestation at this massive scale had harmful consequences on landscapes and wetlands. Wetlands have been planted with *Picea sitchensis*. Current PhD research deals with the questions of reforestation consequences of the forest's biodiversity and the restoration of wetlands. Several sampling schemes are used to evaluate the consequences of reforestation and the relevance of restoration. Samples were taken in each region from three sites; from a “natural” wetland, from a reforested wetland managed by a Parc naturel régional which restore wetlands (ecocentric management) and from a reforested wetland managed by a private owner (economic management). Vegetation was sampled along a transect in each environment to evaluate the loss of biodiversity in an afforested wetland and to see if biodiversity increases when wetlands are restored by taking out trees. A survey was carried with inhabitants, walkers, farmers, local councillors. This survey aimed at highlighting the public's expectations in terms of forest management. The final goal is to produce tools to help environment managers to manage and restore wetlands.
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T6 Effect of plantation forestry on brown trout communities in Irish peatland lakes

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Much of the plantation forestry in Ireland is on peat soils, which are known to pose the greatest risk to receiving waters through increased sedimentation, acidification, heavy metal accumulation and increased loading of plant nutrients and dissolved organic matter. However, moderate phosphorus and nitrogen enrichment can have positive trophic impacts in oligotrophic systems and increased dissolved organic carbon concentrations can also buffer the toxic effect of heavy metals such as aluminium. Here we report results on a study investigating forestry mediated changes to water chemistry impacts on brown trout community structure, growth rate and energetics in peatland lakes in the west of Ireland.
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T7 Managing landscapes in southeast British Columbia for forest biodiversity in the context of multiple objectives management and climate change

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There are global concerns about the loss of forest biodiversity resulting from human induced changes in the extent and condition of forest ecosystems, and climate change represents a serious additional threat. We used landscape-level modelling of a 280,000 ha study area in southern BC to illustrate the challenges that will likely arise from interactions between forest management and climate change. Five climate change scenarios were developed representing combinations of temperature and precipitation change, including one incorporating a trend towards an increasing frequency and severity of extreme events. The effects of these scenarios on forest condition were projected for 90 years, with five mechanisms affecting forest condition: 1. Forest harvesting, 2. The frequency and severity of natural disturbances, 3. Site productivity and tree growth, 4. Tree species composition, and 5. The conversion of forest to grass-shrub ecosystems. The “hotter and drier summer” and “more frequent extreme events” climate change scenarios combined with continued harvesting resulted in a 2X increase in the area affected by natural disturbances, a reduction in standing volume of about 33%, up to 40% of the area converted to grass-shrub ecosystems, reduced growth and timber productivity on greater than 50% of the study area and a similar area with shifts in leading tree species composition. In turn, these changes affect long-term timber supply, the ability to maintain critical old forest habitat for threatened species such as mountain caribou (*Rangifer tarandus caribou*), and water quality and quantity. The cumulative effects of continued land use activities that do not consider climate uncertainty will likely result in unintended consequences to forest biodiversity, and other socio-economic benefits derived from forest resources such as flood mitigation, a sustainable flow of timber, and recreational opportunities. Forest management approaches to diminishing or mitigating some of these effects are discussed.
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T8 Assessing landscape connectivity for forestry management

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The connectivity of habitat in a landscape is widely accepted as factor that contributes to the conservation of biodiversity. Landscape connectivity can be defined as the degree to which the distribution of habitat facilitates or impedes movement among habitat patches. Forest harvesting alters the distribution of mature forest habitat in landscapes. Despite the wide recognition of the importance of managing landscape connectivity, metrics that quantify connectivity are limited in the scale their application and the extrapolation of their results to applied forest management. The relationship between Probability of Connectivity (a graph based connectivity metric) results and the dispersal values used for its calculation are proposed as a method of quantifying connectivity that can demonstrate general patterns of habitat distribution for a range of species over large spatial extents. I used this technique to examine the effects of various forest management impacts on the connectivity of a 110 000 ha landscape subject to different rates of harvest and natural disturbances. The distribution and amount of harvested forest were found to have a significant impact on landscape connectivity compared to scenarios with only natural disturbances. The road network associated with harvesting activities had a greater impact on connectivity than would be expected based solely on the area of forest it displaces.
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T9 Evaluating the relative impact of adaptive forest management and land use changes on mountain forest biodiversity under climate change

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Climate change is predicted to impact mountain forest ecosystems by directly altering the biophysical processes that determine forest dynamics, as well as by altering people's land use decisions. The capacity for adaptive forest management to maintain forest biodiversity, and associated forest ecosystem services, will depend on the relative importance of these direct and indirect impacts, and where on a landscape they are most influential. By coupling a climate sensitive forest landscape model to a socio-economic land use model we projected how climate change may impact forest ecosystems in a central European dry inner-alpine valley under a range of future scenarios. We found that both the direct impacts of climate change on forest ecosystems, and the indirect impacts of land use shifts, depended highly on elevation and landscape position: direct climate change had the biggest impact on forests at low (<1000 m a.s.l.) and intermediate elevations (1000-2000 m), whereas the impacts of land use change were most prominent at low (<1000 m) and high (>2000 m) elevations. While the impact of land use change differed considerably depending on the climate scenario, the direct impacts of climate change on forests were generally much greater than the land use impact. Consequently, developing suitable adaptive management strategies that take into account the spatial and temporal dynamics of forest biodiversity and associated ecosystem services is of paramount importance. However, our results also suggest that the potential for adaptive forest management to mitigate negative climate impacts also depends on landscape position. At lower elevations future increases in drought are projected to be sufficiently severe that the capacity to mitigate changes in forest diversity and structure may be limited. In contrast, at intermediate and higher elevations forest diversity is projected to increase, with the rate and location of change being more sensitive to management actions.
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T10 Aquatic-terrestrial connectivity designs in forests: Funnels and chains across landscapes

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Our managed forest landscape connectivity design targets headwater streams to create a web of connections across the landscape. In managed forests, stream-riparian management zones are used as foraging, breeding, and dispersal habitat by a wide variety of species with both aquatic and terrestrial affiliations. Overland dispersal of organisms between watersheds serves to connect populations of many taxonomic groups among basins across forested landscapes. Small streams and their associated riparian areas are useful points within a landscape for linking basins across ridgelines because such headwaters are frequent and are in relatively close proximity to adjacent drainages. Riparian management designs that serve to "funnel" organisms to headwater areas where "chains" of habitat across ridgelines are provided may aid landscape-scale population connectivity. Landscape management considerations for placement of headwater linkage areas include: 1) targeting connections at landscape nodes where three discrete watersheds ("triads") join; 2) maintaining north-south, east-west, and elevational habitat connectivity in the face of climate change; 3) incorporation of place-based disturbance regimes such as headwater debris-flow-prone areas; 4) targeting connectivity areas to address sensitive species conservation strongholds; and 5) geometric considerations at the forest-stand scale of a single project or proposed timber sale, including managing habitats to connect adjacent forest ownerships, such as to connect corners of checkerboard landscape blocks along diagonals. At finer spatial scales, management approaches for habitat "funnels" along riparian zones and "chains" across ridgelines include retention or restoration of forest structural components and green tree retention. Data from our headwater stream amphibian studies in the U.S. northwest suggest that our 'funnel and chain' linkage area design would address forest fragmentation effects from timber harvesting and benefit multiple species.
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T11 Integration of forest biodiversity conservation into forest management in Turkey

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Forest ecosystems comprise nearly 65% of all terrestrial biodiversity but 90-95% of forests do not have any protection status. Therefore the future of forest biodiversity greatly depends on how “unprotected” forests – the matrix – are managed. One particularly effective way to conserve forest biodiversity in the “managed forests” is through integration of biodiversity conservation into the forest management system. One quarter of the land area of Turkey is within the forest regime and is owned by the state. Management of these almost all of this area is done by General Directorate of Forestry (GDF) through a 20-years cycle of planning and management by regional forestry directorates. GDF adopted a new regulation system in 2004, which recognizes the ecological functions of the forest ecosystems. Accordingly, GDF has been seeking to establish a methodology to determine and manage the forests, where ecological function precedes the economical function. Since 2000, through external funding and collaborations with universities and NGOs, 18 pilot studies were conducted, in which biodiversity conservation was tried to be integrated into the forest management plans. The major challenges throughout this decade-long experience was i) subjective assessments of biodiversity elements to be integrated into management, ii) inclusion of unfeasible amount of biodiversity elements (i.e. species) into integration studies, iii) high cost of inventory studies, iv) transforming the point data into planner-friendly polygon data in a biologically sensible way, v) absence of silvicultural measures/guidelines for biodiversity conservation. This study evaluates these challenges and suggests an integration approach/methodology, which promises to overcome these challenges, developed by GDF and Nature Conservation Centre. Key results of a pilot study are also presented in comparison with the results of earlier pilot studies.
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T12 Glitches in the matrix: to what extent does increased productivity in agricultural systems lead to ecological impacts in adjacent forest fragments?

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One of the key drivers of biodiversity loss is land-use change, which is particularly ubiquitous in New Zealand’s agricultural landscapes. To support the world’s ever-increasing human population, there has been a significant increase in the area devoted to agriculture, which has caused forest habitats to become increasingly fragmented. Habitat loss and fragmentation are identified as major threats to biological diversity, as reduction of habitat size dramatically increases opportunities for species loss and changes in ecosystem functions. Forest fragments with large perimeter/area ratios have higher relative exposure to external influences from the surrounding land-use matrix. It is now recognised that nutrients and other resources added to one system in the agricultural matrix may also move or ‘spill-over’ into adjacent natural systems, consequently altering ecosystem dynamics. Our study aims to test changes in a suite of community and ecosystem-level response variables in forest fragments adjacent to varying intensities of surrounding agricultural practice. In a landscape-scale experiment in the Waikato region of New Zealand, metrics of invertebrate and plant communities (biomass, richness, community composition) and ecosystem function (decomposition and herbivory) have been measured across 24 paired pasture and forest sites. Here we present results pertaining to what extent ecological impact in forest fragments scales with surrounding agricultural land-use intensity. Quantifying relationships between elevated agricultural productivity and their impacts across juxtaposed forest habitats is fundamental for the conservation management of these threatened areas. Moreover, determining the relationship between land-use intensification and biodiversity loss is essential for the development of sustainable agriculture in the future.
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T13 Does integration satisfy demands on biodiversity in European forests? An attempt to clarify with a conceptual framework

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One of the recent approaches to maintain forest biodiversity is the concept of multi-functional forests, where several ecosystem services can be obtained from the same area. Although more than 70 % of European forests are primarily managed for timber production, the remaining part is assigned to other forest functions such as protection against natural hazards or as habitat for rare species. Increasing importance of ecological values and other forest functions than timber production have promoted the multi-functionality approach in different parts of the world. However, multi-functionality in forests has its limitations since it turns out to be easily watered down particularly on a larger scale and therefore often creates conflicts. Forest managers and nature conservationists often promote segregative approaches because they argue that the provision of multiple goods on the one hand and the maintenance and enhancement of species richness on the other hand, on the same area is not possible. However, both positions seem finally not viable in European forests where the demand for different forest functions has to be satisfied on a relatively small scale. Consequently, it becomes clear that an overall integrative concept, with segregative as well as integrative components is a crucial instrument for maintaining forest biodiversity. Within the project: “The integration of biodiversity conservation into forest management”, we collect case studies and different approaches in European forests, how to implement the maintenance or enhancement of biodiversity on a smaller scale. We develop and present a conceptual framework that incorporates these processes contributing to biodiversity and other demands on forest ecosystems, and the context within which they must interact. This framework helps to order and clarify biodiversity issues and provides an improved understanding for further analysis with respect to the different demands on European forests.
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T14 Land-use changes in natural broadleaved forests in the NW Iberian Peninsula: effects of anthropogenic disturbances

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The forest landscape in the Iberian Peninsula, in general, is the result of thousands of years of human intervention. In particular, the historical evolution and land-use changes in NW Iberian Peninsula were also the result of intensive use of land and its natural resources by men. The aim of this work is to describe the evolution and historical background of the forests to establish measures for their conservation and recovery. The main focus was on natural broadleaved forests, which have been intensively exploited ever since Roman times. These forests have been converted to agricultural land, felled for the naval, metallurgical and railway industries, sold along with Church lands, suffered forest fires, and been substituted by fast growing species, as pines and eucalyptus. All of these activities have led to a reduction in the forest area occupied for these ecosystems. Today, broadleaved forests cover small and generally rugged areas, and remain where the terrain often prevents other types of land use. Remains of these forests can be found in flat areas close to villages, but the understorey vegetation and regeneration is limited owing to human activity. Therefore, their present situation raises the problem of their silvicultural and economic transformation. On a positive note, the area covered by these forests has increased recently owing to better awareness about their conservation and to the recognition as habitat of interest by the European Union, as part of the Nature 2000 Network.
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T15 Assessing the risk of climate change and other threats to forest biodiversity across the U.S. Southern Appalachian region

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Changing climate conditions and pest and pathogen infestations will increase the risk that forest trees could experience population-level extirpation or species-level extinction during the next century. Negative impacts on the biodiversity and ecological functionality of forests could result. The conservation and management of forest biodiversity in this context is complicated by the facts that (1) the ecological importance of individual forest tree species depends on their evolutionary distinctiveness in relation to co-occurring species and that (2) forest tree species differ in their physiological tolerances, life-history strategies, and population dynamics, which could drive dissimilarities in their potential responses to threats. Addressing these facts will be particularly challenging in species-rich regions such as the Southern Appalachian mountains of the southeastern United States. We assessed the relative risk of extirpation for 130 forest tree species native to the region, based on ecological and life-history traits (including population structure, rarity, regeneration capacity, dispersal ability, habitat affinities, and genetic variation); species-specific projections of climate change pressure; and predictions of pest and pathogen susceptibility. We used canonical discriminant analysis to cluster species into groups based on three discriminating factors: rarity, genetic variation and pest and pathogen risk. These groups may require different management and conservation strategies. For each of 6,200 permanent forest inventory plots across the region, we multiplied each species' plot-level importance value (on a scale of 0-100) by its relative risk rating (scale of 0-1) and by its evolutionary distinctiveness compared to other species in the region (scale of 0 -1). When summed across all species on a plot, the result was a plot-level measure of relative risk posed to the biodiversity present on the plot. This work should be valuable for scientists and managers attempting to determine which species and forested areas to target for monitoring efforts and for conservation and management activities.

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T16 Invasive species and the threat to Irish forestry

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Invasive Alien Species (IAS) pose one of the most significant but least addressed international threats to biodiversity within natural ecosystems and agricultural settings. According to the Secretariat of the Convention on Biological Diversity since the 17th century, invasive alien species have contributed to nearly 40% of all animal extinctions for which the cause is known. In fact one recent study estimates that 40 percent of all insect damage to crops in the US is attributable to non-indigenous species. While only a small percentage of organisms transported to new environments become invasive, their negative impacts on food security, plant, animal and human health and economic development can be substantial. Most nations already struggle with complex and costly invasive species problems. This paper presents a snapshot of the Invasive alien species that are already in our forests and also the potential threats to Irish forest biodiversity from new IAS arriving on our island in the future. In addition it highlights some simple guidelines that we as citizens can follow to try and prevent the entry and invasion by some of these species onto our Island. Publicising and addressing the problem of invasive alien species is urgent because the threat is growing daily, and the economic and environmental impacts are severe.

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T17 DNA-based detection of frog predation by introduced mammals in New Zealand forest ecosystems

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Amphibians are declining worldwide and introduced predators are generally accepted as major agents of this decline. Wildlife management decisions regarding the control of introduced predators to protect endangered species are often based on data derived from predator diet studies. In order to estimate the impact of introduced mammals on New Zealand's endemic forest-dwelling frogs (*Leiopelma* spp.) an analysis of predator diet was undertaken. However, visually identifying frog remains in stomach contents of small mammals was found to be unreliable. We aimed to develop a technique that would reliably detect anuran remains in small mammal stomach contents. Species-specific genetic primers were developed for three frog species. Feeding trials were conducted whereby hedgehogs (*Erinaceus europaeus*) and Norway rats (*Rattus norvegicus*) were presented frogs (*Litoria raniformis*) as food items and subsequently euthanized at predetermined time intervals. Kill-trapping for wild mammals in frog habitat was undertaken. Stomach contents from all predators were subjected to both visual and PCR analysis. Identification of prey remains was substantially more successful using the DNA-based technique. The half-lives of prey DNA detection in hedgehogs (5.8 h) and rats (5.72 h) suggest that prey DNA is amplifiable for the vast majority of the gastric emptying period. In the wild, hedgehogs were identified as predators of *L. raniformis*, pigs (*Sus scrofa*) as predators of *Litoria aurea* and ship rats (*Rattus rattus*) as predators of the critically endangered Archey's frog (*Leiopelma archeyi*). This approach considerably increases the power of prey detection in small mammal diet studies, leading to a greater understanding of the impact that introduced fauna may be having on native species.
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T18 Distribution of the boreal felt lichen in a ribbed moraine landscape of Eastern Newfoundland

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The boreal felt lichen (*Erioderma pedicellatum*) is considered endangered in Canada and critically endangered by the International Union for Conservation of Nature. The species has suffered a major reduction in its range over the last century including its extirpation from New Brunswick Canada, Sweden, and Norway and loss of known local populations in other areas. The healthiest and most abundant populations occur on the Island of Newfoundland. Interestingly, while some Newfoundland populations may have disappeared and some seem to be undergoing significant reductions in the number of thalli, conversely recent observations in other areas have discovered new populations and new thalli establishment. Our study has two major objectives: 1. Describe the preference of the boreal felt lichen for specific ecosystems using the forest ecosystem classification of Canada including a detailed terrestrial ecosystem map produced by air photo interpretation and field-work in a ribbed moraine landscape of the Avalon Peninsula. 2. Assess the dynamics of the habitats preferred by the boreal felt lichen using forest structure, disturbance, and tree-ring analysis. Preliminary results using the distribution of over 1000 thalli of *Erioderma* suggest that the species exerts a clear preference for certain forest ecosystem types as well as certain specific microhabitat characteristics associated with the host trees. We will discuss further the dynamics of the preferred ecosystems and microhabitats we have uncovered and the management implications for an endangered species in a managed landscape in the context of past, present and likely future disturbances such as climate change.
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T19 Development and assessment of an integrated set of wildlife habitat relationship models for terrestrial vertebrates

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The continuing loss of forest and forest fragmentation within the state of Maryland has raised considerable concern over the loss of biodiversity and its impact on basic ecosystem functions that support ecological services needed by society for sustainability. To address the need for a systematic approach to explore the potential responses of common amphibians, reptiles, birds, and mammals to habitat alterations and loss, a habitat assessment tool was developed that uses an integrated series of databases that link geographic distribution, forest type, seral stage, vegetative and non-vegetative structure, and non-forest habitat for 236 terrestrial vertebrate species commonly found in Maryland. The tool was tested using presence/absence data for 29 commonly occurring herpetofauna collected over a two year period on seven forest sites (10-95 aces) within the Piedmont Plateau physiographic province. Forest compostion and structural data for these sites was collected using standard USDA Forest Service methodology. A goodness of fit test was conducted using the chi-square statistic. Significant goodness of fit was found between the observed and predicted herpetofauna at all 7 sites (χ20.05, 6df = 0.9, P>.975). The chi – square statistic indicates that the model is working well for reptiles (X2 0.05, 6df = 0.18, P>.975) and amphibians (X2 0.05, 6df = 0.98, P>.95). Significant goodness of fit based on predicted observed values to the 95% prediction level (X2 0.05, 6df = 8.7, P>0.05) was observed. Low rates of omission errors (3%) suggest that the model is achieving improvements in accuracy over earlier wildlife habitat relationship models, a possible outcome of its narrow geographic focus and its focus on the use of local and regional habitat descriptions when available. The habitat models and evaluation procedures are now being incorporated into the USDA Forest Service decision support system for integrated forest ecosystem management.
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T20 Exclusion of large herbivores: long-term monitoring of plant community composition in Irish semi-natural oak woodlands

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Irish native woodlands are threatened by lack of tree regeneration and loss in diversity of native species. Large herbivores can impact greatly on sapling survival and species with woodland affinity, both by their presence and absence. Although wild large herbivores, such as deer, are now considered to be overabundant in many regions, woodland managers have struggled to find the ideal solution as herbivore-vegetation interactions are not fully understood. Woodland ecosystem dynamics are long-term processes, which may be studied either empirically at short-term (within a decade) or historically at long-term (within centuries and millennia) time scales. With landuse changes proceeding faster than woodland succession, it is vital that the processes occurring in our woodlands are monitored. This study aims to investigate the changes occurring through time, with the exclusion of large herbivores, using empirical long-term vegetation data collected over ~40 years. A set of deer exclosures, ranging in size from 260-5560 m2, were established between 1969-74 in oak woods within two National Parks in Ireland. Baseline surveys were carried out, with subsequent data being collected at irregular intervals up to 2011. Vascular plant abundance and frequency were recorded using restricted random sampling within 1 m2 plots, with bryophytes being recorded to varying degrees. Results indicate that both species diversity and composition change with time. The influence of herbivore removal was observed at both the vascular plant and bryophyte level. Taxa such as *Rubus fruticosus agg*. (bramble) respond positively to grazing removal by increasing its frequency over time. Analyses indicate that long-term removal of herbivores can alter community composition.
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T21 The forest: a catastrophic shift to an alternative stable state of the wood-pasture at the expense of biodiversity

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Europe in its pristine state would have been covered by high forest. Park-like wood-pastures grazed by cattle (*Bos taurus*) and horses (*Equus ferus caballus*) have traditionally been characterized as degraded forests, because these animals prevent regeneration of the trees. Such grazers have been regarded as alien species in European forest habitats, which must be removed from forests in order to restore natural conditions. Where indigenous ungulates like Red Deer (*Cervus elaphus*), European Bison (*Bison bonasus*) or Roe Deer (*Capreolus capreolus*) are present, forest conservation programmes typically call for these to be culled to levels that do not prevent tree regeneration. As a consequence, many wood-pastures have changed into high forests, resulting in a severe loss of biodiversity. Among the species that have been lost are specialists of mosaic landscapes, as well as light demanding tree species such as Pedunculate oak (*Quercus robur*) and Sessile oak (*Q. petraea*). In high forest, such species are outcompeted by shade tolerant species like beech (*Fagus sylvatica*), Hornbeam (*Carpinus betulus*), Lime (*Tilia spp*.) and Elm (*Ulmus spp*.). However, cattle and horse are indigenous species, and can be in terms of the effect of their grazing on the vegetation, as they are the domesticated descendants of native European species (Aurochs and Tarpan). In wood-pastures all tree species regenerate in grazed open grassland, protected by spiny *Prunus spinosa* and *Crataegus monogyna*, called nurse species. Solitary trees come up and groves are formed. Within the groves, regeneration of trees is prevented by the large herbivores, causing these groves to revert to grassland. This results in a non-linear, cyclical succession in which light demanding and shade tolerant tree species thrive together, a situation which is supported by long term palaeoecological data. Wood-pastures are therefore the closest modern analogues of the natural vegetation. The functional removal of indigenous large ungulates from many wood-pasture habitats has resulted in a catastrophic shift from dynamic wood-pastures to high forest as an alternative stable state, with less biodiversity.

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T22 Vegetation change in Wytham Woods (southern England) in a wider temporal and spatial context

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To prepare for the future we must understand the past, particularly where forest biodiversity is concerned. Long-term monitoring plots recorded in 2010/11 are used here to look at current vegetation patterns in Wytham Woods, but then to relate them to changes over time and across the region within which the Woods sit. The 164 10x10 m plots used are set out in a systematic grid across the 340 ha of Wytham Woods. The current patterns of species distribution and abundance can be related to changing conditions in the Woods over the last (nearly) 40 years through comparisons with previous records from these plots (1974, 1991, 1999). Variations in canopy cover and the impact of high levels of herbivory by deer appear to have been the main factors driving vegetation change over this period. Over longer time periods land-use patterns, the difference between ancient and recent woodland within the site, have also influenced the distribution of individual species. To assess the significance of the Woods for conservation also requires us to make wider landscape comparisons, to show how they fit into the distribution pattern for ancient woodland across the neighbouring counties and what proportion of the woodland flora for these counties (based on county floras) has been recorded from the Woods. The results illustrate the importance of both taking account of both temporal and spatial variation when assessing the results from any given survey.

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T23 Fifty years of natural dynamics in Swiss forest reserves: stand characteristics and developmental trends

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Understanding natural forest dynamics is important for achieving an economically and ecologically sustainable forest management but also for biodiversity and nature conservation. However, little is known about the natural long-term development of forests in Western Europe; most of these forests were influenced strongly by management for many centuries. Therefore, studies on unmanaged Western European forests are few, and are often based on single case studies with sometimes peculiar forest succession and management history. This makes it difficult to gain a general understanding of natural forest dynamics. For our study, we used a unique data set covering up to 50 years of repeated forest inventories from 25 forest reserves distributed throughout Switzerland to i) investigate structural differences between these unmanaged reserves and managed Swiss forests, and to ii) explore the natural dynamics – especially of beech (*Fagus sylvatica*) forest associations – 50 to 100 years after management has ceased. We found that forest reserves differ from managed forests through higher densities of giant trees, higher stem numbers and basal areas, and thus, a higher growing stock. In contrast, snag densities differ little (yet) – with the exception of reserves having generally higher densities of small diameter snags. The temporal development of tree species abundances shows for lowland beech forests an overall trend towards increased beech dominance, while several light-demanding tree species vanish. Contrastingly, in mountain Norway spruce (*Picea abies*) – silver fir (*Abies alba*) forests tree species abundances fluctuate according to the developmental phase of the stand, but no species goes extinct. Long-term forest inventories are a valuable means to gain a better understanding of the temporal trends of natural forest dynamics, and they allow not only the comparison of static stand structural features, but the assessment of direction and speed of change.
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T24 How to grow a forest: the first 10 years of a long-term native woodland restoration experiment

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Biodiversity enhancement is a core component of Sustainable Forest Management (SFM). With growing recognition of forest degradation and increasing implementation of SFM, woodland restoration is being prioritised. Ireland's forest cover is just under 11% and is one of the lowest in Europe. Only about 1% of land cover is semi-natural native woodland, with most of the remaining forest area composed of non-native conifers. Replacing conifer plantations with native woodlands, especially in areas of conservation interest, is an increasing component of SFM in Ireland. While there is some guidance on the establishment of native woodlands on clearfelled conifer stands, there is a lack of empirical data. We report on the beginning of a long-term native woodland restoration experiment by describing vegetation diversity and composition 10 years after baseline surveys in conifer clearfell. In 1999, nineteen pairs of 400 m^2 permanent plots were established in conifer clearfell with one plot of each pair fenced to exclude large herbivores. Vegetation was surveyed in 1999, 2001 and 2009. Generally, succession was to heather dominated vegetation in all plots. Vegetation community development was strongly influenced by grazing pressure, previous crop species, soil type, soil pH, brash cover and time since felling. Fencing had a significant positive influence on typical woodland species diversity and vegetation composition over time. Unless grazing pressure is reduced in unfenced areas, woodlands are unlikely to develop. We recommend that intensive management, such as planting, should be delayed for more than 10 years so that vegetation and tree regeneration potential can be assessed. Grazing management and control of invasive species will be necessary to promote succession towards native woodland in certain areas. Woodland restoration is likely to be most successful within 250m of existing woodland. Allowing succession to proceed to heathland may be more feasible than woodland restoration in some sites.
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T25 Taxonomic homogenisation in semi-natural woodland – the long story

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Long term monitoring data that cover several decades indicate that there has been taxonomic homogenisation in woodlands in southern England due to the development of denser canopies and eutrophication. Small hollow pollen analysis provides data on the spatial scale of a stand of trees that covers temporal scales of thousands of years and thus provides the possibility of exploring the trend in woodland species change over very long time periods. The taxonomic resolution of pollen data is inferior to vegetation quadrats but it is still possible to explore trends over time. Small hollow pollen data from seven semi-natural oak woodlands in central and western Ireland that each cover the last 3,000 years have been analysed to explore the temporal trends in taxonomic change. These analyses reveal that Irish woods have also undergone taxonomic homogenisation over recent decades. Over longer time periods the diversity of each wood has been dynamic and appears to be related to opening of the canopy in response to human intervention.
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T26 Using palaeoecological techniques to assess biodiversity value and native status: a case study of Scots pine in Ireland

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Pinus sylvestris colonised Ireland relatively early in the postglacial, becoming an important component of certain habitats, then declining dramatically. It is widely believed to have been extirpated during the early medieval period. *P. sylvestris* had been reintroduced by the eighteenth century and is currently widespread and naturalising in semi-natural habitats. The species' native status in Ireland is unresolved and the relevant conservation and forest management strategies are disjointed. Clarification on the native status and biodiversity value of *P. sylvestris* in Ireland is urgently required. This study examined the vegetation history of Rockforest, an apparently naturalised pinewood in the Burren, a karstic landscape in western Ireland. Pollen and macrofossil data from Rockforest Lough covering the last 2000 years are presented. Much like the present, the dominant vegetation type was an open, species-rich pinewood with abundant *Corylus*. Consistent with a diverse habitat mosaic, 68 terrestrial taxa were recorded. The vegetation history was relatively stable, with continuous woodland cover and, remarkably, no *Pinus* decline. *Pinus* pollen is represented continuously throughout at values consistently exceeding 38% of total terrestrial pollen. Macrofossils demonstrate the local presence of *Pinus* at c. AD 840. This suggests that a relict population of *P. sylvestris* has persisted at Rockforest. The genetic diversity of this apparently unique population should be investigated. *P. sylvestris* should be considered native to Ireland. Palaeoecological reconstructions provide a context for assessing the naturalness of modern habitats. This and other studies have described open, species-rich pinewoods with *Corylus* in the Burren from the early Holocene. While it is acknowledged that woodlands throughout western Europe have been anthropogenically modified, the floristic and structural similarities between the modern Rockforest pinewood and fossil assemblages suggest that its vegetation is relatively natural. Rockforest pinewood is of high biodiversity value due to its species-richness, habitat diversity, continuity, uniqueness and relative naturalness.
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T27 Forest structure restoration for improving the role of English yew and Silver fir in coppiced woodlands

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Abies alba and *Taxus baccata* have decreased over time in many European forests and especially in the Mediterranean region, due to human activity and climate change. In the last decades both species have been a common target of several conservation actions (e.g. LIFE projects). In central Italy these species are found in semi-natural coppice beech woodlands, intensively managed for centuries, but abandoned or in conversion to high forests today. Our research aimed to assess their forest structure and dynamics, the effects of previous or current management on the functional role of the two target species and to propose appropriate guidelines of sustainable forest management. In three study sites of central Italy we established intensive sampling plots where more than 1500 trees with dbh ≥ 3 cm where identified, labelled, and mapped and dbh, total height, crown size and other variables recorded. Horizontal and vertical structural diversity was assessed using distance-dependent and independent methods. Age structure, tree-ring growth and climate sensitivity of both species were determined with dendroecological analysis. With 3D forest modelling we could simulate the effects of sylvicultural treatments aimed to favour the growth and recruitment of the two target species. Results revealed that the presence of healthy adult trees does not guarantee natural regeneration of these species. Excessive canopy cover, interspecific competition and ungulate browsing appear to be important limiting factors to young individuals. Compared to current conditions, previous coppice management has not limited and probably has favoured their regeneration processes. Natural evolution is not the appropriate action in these woodlands nor are the traditional methods of coppice conversion to high forests. Ad hoc treatments, such as group or individual selective thinning and girdling on neighbour trees could be applied to enhance growing and reproductive performance of target species, but also to increase forest structure and biodiversity.
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T28 Patterns in tree diversity in montane rainforest in Cusuco National Park, Honduras, Central America

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Central America is a melting-pot where two floristic kingdoms meet, the Laurasian (N. Hemisphere) and the Gondwana (S. Hemisphere). It is rich in endemic species, and botanically one of the least-known regions of the world; new species – even trees! - continue to be discovered. Cusuco National Park is in a mountainous, high-rainfall region in the NW of Honduras, at a latitude of 15º N. The aim of this study was to record tree diversity, to identify forest types and to investigate factors influencing biodiversity within the national park. The surveyed forest extends from ~1000m elevation up to the highest point at 2242m. Tree diversity was measured in eighty-two 20m x 20m permanent plots, across a full range of elevation. Girth at breast height was measured for all trees of 30 cm girth or over. Each tree was identified to species where possible; 'morphospecies' were used for unidentified taxa. Structural and topographic details were recorded for each plot, and samples of the top 5cm of soil were collected for analysis. The forest consisted of a patchwork of +/- distinct elements. A well-defined elfin forest on the highest ridge tops represented a climatic and edaphic extreme. The genus *Pinus* formed extensive stands at low elevations; however, one *Pinus* species was present up to 2100 m. Broadleaved rainforest predominated at most elevations; this was diverse and species-rich, with no obvious dominant species. The principal tree species belonged to the families Hamamelidaceae (Liquidambar), Lauraceae, Fagaceae (Quercus), Euphorbiaceae, Rubiaceae and Melastomataceae. The overall gradients in the vegetation appear to be determined by elevation and topographic situation. Superimposed on these are patterns created by disturbance, both large-scale – due to hurricane impacts and logging – and small-scale, due to tree-fall. We characterise a range of forest types and assess our results in relation to Connell's Intermediate Disturbance Hypothesis.
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T29 Building a strategy for the sustainable management of Ireland's native woodlands

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The last decade has seen a dramatic focus on Ireland's native woodlands, representing an investment of over €20 million. Restoration management has been initiated in approximately 11,000 ha of woodland, principally under the Forest Service Native Woodland Scheme (NWS), the People's Millennium Forests (PMF) Project and Coillte's LIFE Priority Woodland Habitat Project, and within State-owned woodland managed by the National Parks and Wildlife Service (NPWS). Over 1,000 ha of new native woodland have also been created. These projects are underpinned by the first National Survey of Native Woodlands by NPWS, and by a range of guidance notes and training courses developed by Woodlands of Ireland (WoI) and the Forest Service. The National Survey of Native Woodlands (2003-2009), undertaken by the NPWS and co-funded by the Forest Service, provides a good understanding of the extent and condition of the resource and a base-line for its expansion and improvement. Amounting to just over 100,000 ha, native woodlands are highly fragmented but nonetheless display considerable diversity in terms of vegetation communities, flora and fauna. Regeneration is generally poor, many woods are unmanaged, and there is little timber of merchantable quality. Invasive alien species and inappropriate grazing regimes are the main threats. The Forest Service NWS is an innovative grant package implemented in partnership with WoI, NPWS and others, aimed at encouraging landowners to manage existing native woodland and to establish new native woodland. The scheme has evolved considerably since its launch in 2001, most recently in the form of a major revision of its establishment element in August 2011. Many success factors and lessons learnt can be drawn from experiences to date, and these will be relevant to the scheme's future development and to other biodiversity-focused support measures. Armed with the knowledge and experience gained over the last 10 years, it is now possible to draw up a coherent policy and strategy for Ireland's native woodlands. A landscape-level approach is needed to achieve a critical mass of cover, to target high value woodlands and to address fragmentation, principally through the restoration of riparian woodland corridors and by reinforcing existing clusters of native woodland. Quality hardwood production, realised using appropriate silviculture, must be a co-objective alongside biodiversity on compatible sites. This will link native woodlands to owners' livelihoods and to local economies, which will be an important factor in securing the future for this vital resource.

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T30 Negative neighbourhood effects in yew woodlands

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Stands of yew *Taxus baccata* L. have declined across their native range and this species is now protected in many European countries. *T. baccata* dominated woodlands are rare in a European context and have been afforded priority status under the EU Habitats Directive. Natural regeneration is often minimal or absent from remaining *T. baccata* woodlands leading to conservation concern over the future of this unique habitat. In particular, a potential negative influence of parent trees on *T. baccata* juveniles has been reported. Improved knowledge of potential negative intraspecific effects in *T. baccata* is required to inform conservation activities. We investigated spatial patterns of *T. baccata* regeneration at 10 woodlands in the south and west of Ireland. Specifically, the influence of conspecific neighbourhood density, canopy cover and distance from seed source on regeneration success in *T. baccata* was investigated. The density of natural regeneration of *T. baccata* varied widely between sites and was related to the presence of mature conspecific trees. At a localised scale, there was a significant negative relationship between presence of conspecific canopy cover and *T. baccata* regeneration density. Although regeneration was scarce directly beneath conspecifics, regeneration was highest in nearby areas suggesting that intermediate dispersal distance maximises recruitment probability. Density of *T. baccata* seedlings and saplings was positively correlated with % cover of

the shrub species *Ilex aquifolium* highlighting the facilitative relationship between the species. Overall, a clear negative influence of conspecific adult trees on *T. baccata* regeneration was evident in this study. It is recommended that management operations focus on the establishment of seedlings and saplings around the edges of populations to conserve existing *T. baccata* woodlands.

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T31 Effects of soil, canopy and habitat fragmentation factors on vegetation in *Quercus robur* woods in the boreo-nemoral zone

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The importance of soil, canopy and habitat fragmentation factors on vegetation of oak *Quercus robur* woods in Latvia was explored using a plant trait approach. 24 plots of size 20*50 m were established in stands throughout Latvia. In the middle of the plots the soil texture, pH (KCl), depth to free carbonates, and depth of the soil humus accumulation horizon (Ap, Ah) and organic horizon (O, H) was determined in soil profiles. FRAGSTAT metrics were used to estimate fragmentation of nemoral forest stands in 1, 5 and 10 km radius areas around each plots. The vegetation was described in layers using standard assessment methods. The proportion of species in the 1-m high vegetation layer was determined for plant traits, such as life form, CRS strategy, mode of dispersal, and vegetative spread. Oak stands in forest matrix on soils with a deep carbonate layer and well developed O horizon tended to have more geophytes, species with far creeping vegetation spread and species with a boreal distribution range. In wood that previously had agricultural use, soil pH was higher and phanerophytes were more common. More typically temporal and ant-dispersed species were found on soils with a higher clay and silt content. temporal. This type of information has practical importance in guiding management for conservation of biological diversity in protected oak stands and in expanding networks of protected stands.

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T32 Enhanced avian diversity in complex managed forests in multifunctional landscapes, southern Ontario, Canada

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Forests in southern Ontario, Canada are experiencing anthropogenic pressures resulting from urbanization, recreation, aggregate extraction, and more specifically logging and reforestation. This combination of multifunctional use and associated land management strategies has produced complex forest stands that comprise a mixture of a) managed natural woodlots, b) protected forests and c) plantations and d) successional forests. This paper examines the role of these complex forest systems in enhancing bird diversity through the compilation of avian surveys conducted by the authors over a 15 year period (1997 to 2011). This work combines a number of studies (~ 40 sites) where bird count data was collected during short-term site inventories and long-term monitoring. The results reveal that in these complex forests, avian biodiversity is relatively high because of a number of factors. It was observed that: 1) the proximity of

habitats such as coniferous plantation to native deciduous forest attracts a greater number of species with specific nesting requirements; 2) species typically confined to forest interior sites use adjoining forest management units; that is, despite the change in tree species, the complete forest cover affords habitat-specific species opportunities for other life-history functions such as foraging and protection; 3) gap openings created in managed deciduous forests adjacent to protected forests provide habitat opportunities for edge species ; forest management mimics natural disturbance regimes and provides sites typical of higher biodiversity and reflecting intermediate disturbance theory; 4) coniferous plantations provide habitats with a northern affinity not frequently found in southern Ontario; these are now refugia for species that are considered species of conservation concern in this region. The presentation concludes with a set of recommendations to enhance forest interior bird diversity with forest management strategies that promote larger, more complex forest management units.

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T33 A comparison of the breeding bird assemblages associated with constant cover forestry and clear-fell rotation management systems in conifer plantations

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Conifer plantations support different bird communities during their progressive stages of growth and management. Young plantations (from planting to thicket stage) can support important populations of species typical of non-wooded and scrub habitats, many of which have undergone marked declines in the wider environment. As plantations mature other birds more typical of forests can become established, which can also include conservation priority species.

Where plantations are managed by rotational clear-felling then replanting, a forest can maintain a diversity of growth stages and can continue to support at least some of those open and scrub habitat specialists while some forest species can colonise the maturing stands of trees. In contrast, plantations managed through selective felling to maintain constant canopy cover could conceivably support a more diverse forest avifauna in that long-term woodland cover is maintained and can include a diversity of tree ages and structures at a finer scale than can develop within a clear-fell and replanting regime. New data from Scotland and Wales (to be collected in 2012) will be presented that quantifies differences in the breeding bird assemblages within conifer plantations under contrasting management regimes of clear fell rotation (CFR) and constant cover forestry (CCF). These will assess the predictions: a) CCF can support an enhanced assemblage of typically forest birds relative to CFR managed plantations (including the more mature stands within CFR); b) CFR can support a broader range of open habitat and shrub specialist birds relative to CCF managed plantations (including those with well developed regenerating shrub under storeys). The relative contributions to bird conservation of the two management systems will be considered.

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T34 Cerulean warbler response to forest management: Can forest management produce more breeding birds?

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Cerulean Warbler (*Dendroica cerulea*), one of the fastest declining avian species in eastern North America, is associated with heterogeneous canopies in mature hardwood forests. We examined three silvicultural methods with varying degrees of canopy disturbance as potential tools to manage habitat for Cerulean Warblers. The 3 harvest treatments and an un-harvested reference plot were replicated on 7 study areas in 4 Appalachian states in 2005-2010. We compared pre-harvest and four years post-harvest response of Cerulean Warblers (territory density, nest survival, and age structure). Over all study areas, Cerulean Warbler territory density remained stable in un-harvested plots and increased first year post-harvest on intermediate harvests. By 3 years post-harvest, all 3 harvest treatments had higher territory density than un-harvested plots. Male age structure did not differ among treatments but body condition was better in harvested stands. Nest survival rates were influenced by study site, year, and treatment. After accounting for regional and annual differences, nests in the un-harvested treatment had greater nest survival and more fledglings per successful nest than harvested treatments. Although patterns of density and body condition suggested that Cerulean Warblers are attracted to harvest-generated disturbances in mature forest ecosystems of the Appalachian Mountains, the lower nest success in harvested plots raises the possibility that recent harvests may function in some cases as ecological traps. Ultimately, management decisions must be based on local conditions, particularly in forests where Cerulean populations are high. Additional research is needed to better examine fitness consequences of timber harvests and to estimate population-level implications. Additionally, continued monitoring of our study sites to assess the persistence of the trends we have observed would be very useful.

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T35 Edge effects on bird functional diversity and avian insectivory in mosaic forest landscapes: a transcontinental comparison

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Bird functional diversity is expected to influence avian predation of herbivorous insects in forest ecosystems. However, both bird communities and avian insectivory depend on levels of forest fragmentation, especially through edge effects with adjacent open habitats. Here, we aimed at testing for forest edge effects on bird communities, bird functional diversity and avian insectivory in two areas of mosaic landscapes including native forest fragments in the south island of New Zealand and native pine forests in southwestern France. In each study area, we paired edge and interior plots in 12 forest stands to sample bird communities and quantify avian insectivory as the rate of bird attacks on plasticine models mimicking Lepidoptera larvae. We calculated landscape composition in 500m-radii buffers around the plots (native forest and open habitat cover, Shannon diversity index). Seven life-history traits were compiled for French and New Zealand bird species, including biogeography, body mass, mobility, foraging method, diet, nest location and clutch size. Bird functional diversity was expressed by 4 indices, namely functional richness, evenness, divergence and dispersion. We

found opposite edge effects on bird species abundance and functional richness in the two countries: edges had a positive effect in New Zealand and a negative effect in France. By contrast, we found positive edge effects on bird functional evenness and divergence in both countries. Bird functional richness and evenness increased with both landscape diversity and forest cover. In both countries, bird predation rates were higher at forest edges than interiors and increased with bird functional evenness. We suggest that forest fragmentation and edge effects in mosaic landscapes increase avian insectivory by enhancing functional diversity and trait complementation within predatory bird assemblages.

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T36 Foraging activity of breeding Hen Harriers (*Circus cyaneus*) in forested landscapes revealed by GPS

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The association between land uses and foraging activity is an important aspect of raptor ecology. This is particularly so for species such as Hen Harriers (*Circus cyaneus*) breeding in recently afforested landscapes like the Irish uplands, where the habitats they use have been subject to large scale and profound anthropogenic change. The relative importance of different open and forest habitats in providing food for adults and chicks during the breeding season has obvious implications for the management of land around Hen Harrier nests. Previous studies on habitat use by Hen Harriers have relied on data collected by direct observation by researchers in the field. This is a very inefficient use of manpower, is subject to habitat biases, and it is typically not possible to associate data collected from foraging Hen Harrier by direct observation with particular nests. These difficulties can be overcome by remote tracking methodologies, which allow the position of birds to be recorded without having to directly observe them. We describe a new system for retrieval of both tag and data without the need for recapturing adults. We used this system to collect foraging data on Hen Harriers breeding in forested landscapes, which we analyse in relation to land use and habitat features. We relate these findings to forest management of areas with breeding Hen Harrier, providing recommendations aimed at maintaining or enhancing the value of landscapes for this species.

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T37 Effects of land-use change on plant species composition on traditional agro-forest systems in the Alps

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Throughout Central Europe, forest areas are increasing. In particular in mountain regions, socio-economic changes in the past decades have caused natural reafforestation. Traditional agro-forest systems are not profitable anymore and thus abandoned with the consequence of natural succession towards forests. In the Southern Alps, larch (Larix decidua) meadows and pastures are affected by this development. They were originally managed in order to gain hay or fodder, but also the timber of the larches was used. This linkage of the two ecosystem types forest and grassland created a high variety of ecological niches, resulting in a high plant diversity in the herb layer. As abandonment is known to decrease species richness, the aim of our study is to investigate changes in species composition. Therefore, we surveyed 40 study sites throughout South Tyrol (Italy), differentiating between (a) larch meadow (b) larch pasture (c) early successional

forest stage and (d) late successional forest stage. Vascular plant species were recorded according to the phytosociological methodology of Braun-Blanquet. We analyzed selected functional traits for the most frequent plant species in order to understand how species composition alters between the four investigated stages and land-use types. Additionally, the influence of the stand-structure on species composition was addressed by measuring tree density, tree growth height, and diameter at breast height (dbh). Due to the loss of niches along the natural succession towards forests, especially small-scale habitats disappear thus plant diversity decreases within only a few decades. This can be explained by the change in functional traits such as dispersal type, life form, and light demand of plants. We discuss how ecosystem functioning and related goods and services alter with the changing management. Our findings could help to improve the forest management and nature conservation strategies in order to maintain a high level of biodiversity in mountain areas.

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T38 Fungal biodiversity in Irish forests: non-native species support similar biodiversity but different communities of fungi from native forests

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Fungi have essential functions in ecosystems, including nutrient cycling, as symbiotic partners and as plants and animals pathogens. Despite their key ecosystem functions, fungi are often ignored in biodiversity and conservation research; with a paucity of records especially evident from Ireland. Prior to 2007, there had been no systematic sampling of fungal biodiversity in Irish forests. Increasing levels of non-native tree species forests and a lack of baseline fungal biodiversity data were causes for concern regarding fungal biodiversity conservation in Ireland. Sampling of sporocarps (mushrooms) and below-ground ectomycorrhizas was carried out in 28 plots from four forest types (ash, oak, Scot's pine, Sitka spruce) between the years 2007 and 2009 in the Republic of Ireland. A total of 409 macrofungal species and 51 ectomycorrhizal morphotypes were recorded over the three years using morphological and molecular identification methods. It was found that at equal sampling intensities, there were no significant differences in macrofungal species or ectomycorrhizal morphotype richness between the oak, Scot's pine and Sitka spruce forest types. The genera Cortinarius, Mycena, Russula, Lactarius and Inocybe were the most species-rich recorded. Eleven new fungal records to the Irish mycota were found, and five of the species recorded are on the British Red-Data List. Ordination provided clear separation of the plots into their respective forest types based on their above- and below-ground fungal communities. These results provide two management implications regarding fungal biodiversity conservation in Irish forests. (1) The non-native tree species Sitka spruce, which comprises the majority of Irish forests, can support similar levels of fungal species richness as native oak forests, indicating that it may create a complimentary habitat for fungal biodiversity conservation. (2) Each forest type had its own distinctive fungal community, indicating that high fungal biodiversity may be fostered by increasing tree species diversity in Irish forests.

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T39 Risks and opportunities for biodiversity conservation in forests managed for bioenergy production

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The production of bioenergy is an important element of efforts to reduce our dependency on fossil fuels and to combat climate change. Planted forests are expected to meet an increasing part of the demand for bioenergy and biofuel feedstocks. The development of new planted forests will lead to changes in land cover that are likely to affect biodiversity outcomes. These effects and possible mitigation measures will be outlined using illustrative examples. There are many factors that influence the ultimate effects of land use changes on biodiversity. A key determinant is the degree of 'naturalness' of the preceding land cover and how distant the bioenergy 'crop' is from the natural land cover. For example, afforestation with native trees on former forest land that had been cleared for agriculture may produce conservation benefits, whereas prior clearance of natural forests or afforestation of natural grasslands will cause losses of biodiversity. Native crop species are typically better at providing habitat for native biodiversity. However, plantations of exotic trees can also provide important habitat for native forest species, and they may be a 'lesser evil' compared with alternative land uses such as intensive agriculture. There are numerous opportunities for mitigating detrimental effects of bioenergy cropping including the conservation and restoration of natural vegetation remnants, the provision of corridors to increase connectivity between habitats, and measures for the protection of rare and threatened species that may exist in the matrix. Compared with conventional plantation forestry, bioenergy forests are often managed more intensively which may cause additional detrimental impacts. For example, in order to maximise productivity, forests are likely to be planted more densely which may reduce their suitability for colonisation and persistence of understorey plants. Also, the removal of stumps and small-diameter woody debris will affect saproxylic organisms, with flow-on effects via the food web.
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T40 Legacy tree retention balances commodity and conservation objectives in intensively-managed North American aspen forests

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Residual canopy trees as biological legacies in clear-cuts may mimic characteristics of naturally disturbed forests. We examined the effect of conifer and hardwood retention on bird species richness and stand-level biomass growth in otherwise clear-cut aspen (*Populus spp*.) stands. Stand ages in 2007 ranged from 4-36 years in hardwood retention, 6-26 years in conifer retention, and 4-27 years in clear-cuts. We also investigated the influence of legacy tree retention on the quality of nest habitat for the Golden-winged Warbler (*Vermivora chrysoptera*), a species of conservation concern that depends on disturbed forest and shrub habitats. Thirty-one bird species were identified as indicators of stand age-class and legacy tree treatment. Twelve of these were regional conservation priority species with six associated with hardwood legacy tree retention, two with conifer legacy tree retention, and four with clear-cuts. Male Golden-winged Warbler pairing success was higher in young stands with legacy trees (~75%) than in clear-cuts (10%). In similarly aged regenerating aspen forests, only one nest was found in the clear-cuts. Retention of legacy trees in aspen stands provided higher quality nest habitat based on high pairing success. Legacy tree retention contributed to higher stand biomass for the first 30 years following harvest, and stands with legacy trees maintained greater carbon stocks during the early stages of stand development, thereby dampening carbon ecosystem fluxes related to harvesting. However, conifer but not hardwood legacy trees appeared to at least temporarily suppress aspen growth and biomass accumulation. Our results also suggest that legacy trees may hasten the recovery of late seral understory plant species. Consequently, legacy tree retention might help strike a balance between commodity and conservation objectives in some intensively managed forests.
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T41 Long term effects of whole-tree harvesting on productivity, soils and plant community dynamics in managed quaking aspen stands in the US Upper Midwest

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Aspen is a Populus species common in the US Upper Midwest region that reproduces clonally from root suckers when harvested. The species is far more abundant on the present landscape than found prior to European settlement. Aspen is favored by vigorous disturbance because of abundant clonal suckering and rapid early growth that excludes competitors, and is frequently managed using even-aged silvicultural systems on short rotations (e.g., 40 years) relative to contemporary cover types. The prime market for aspen is the production of pulp and fiberboard, and aspen is also a species of interest for the emerging bioenergy market. Since the expansion of large pulp and paper mills in the Midwest about 40 years ago, logging residues from aspen harvest have been recovered in some stands for use as fuel in combustion for combined heat and power. The long-term effect of removing aspen topwood, in additional to conventional roundwood harvest, is poorly understood, however, particularly from the perspective of biodiversity. We hypothesize that topwood removal has a number of interrelated effects that are consequences of changes in amount, structure and configuration of down dead wood, direct losses of carbon and nutrients held within the removed residues, and indirect changes associated with increased disturbance from equipment used to collect residues and transport them to the chipping equipment. We present results from the first year of a multi-year retrospective study involving a 40-year chronosequence of aspen stands harvested both with and without the recovery of logging residues on a single soil taxa, and a perpendicular study at a single time since harvest across a range of soil conditions. We sampled plant species across the chronosequence to identify fundamental shifts in community composition and structure that relate to residue removal and to identify the rate at which the plant community responds to disturbance.
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T42 Stand structure as indicator of forest biodiversity in temperate mixed forest: a multi-taxon approach

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The effect of stand structure on forest biodiversity was studied in managed Hungarian mixed forests including functionally different organism groups such as herbs, seedlings, bryophytes, lichens, fungi, saproxylic and carabid beetles, spiders and birds. Species richness, composition and functional diversity of the groups were studied as well. Besides the factors related directly to forest management (tree species composition, size distribution of trees, dead wood, shrub layer), indirect factors were also included as potential explanatory variables such as forest history, landscape factors, microclimate, light, soil and litter conditions. Tree species diversity increased the biodiversity of vascular plants, bryophytes, lichens and saproxylic beetles. Dead wood was a key factor for saproxylic beetles, fungi, bryophytes and birds. Birds were very sensitive to the presence of overmature trees. Shrub layer considerably increased the diversity of bryophytes and lichens. Light heterogeneity was the most important variable for vascular diversity, but it was also significant for epiphytic lichens. Microclimate influenced significantly the diversity of cryptogams: fungi and bryophytes were related to more cool and shaded stands, while epiphytic lichens preferred more open conditions. Litter

cover was a positive factor for the diversity of spiders but negative for ground floor bryophytes. Variables related to forest history and landscapes were less influential than stand level factors. Based on this study, the easily accessible stand structural variables are better surrogates of general forest biodiversity than a selected organism group or indicator species. The explored relationships are important for management maintaining high forest biodiversity. The diversity of many organisms groups can be predicted suitably by the models of this study based on some simple stand structural variables for the studied region.

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T43 Tree species diversity, composition and abundance as indicators of understory vegetation diversity in French mountain forests: variations of the relationship in geographical and ecological space

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Tree species is one of the main attributes of forest ecosystems, that modifies resources levels (light, nutrients, water) that affect understory vegetation composition and diversity. This is therefore no surprise that tree species diversity and sometimes abundance or composition are used as biodiversity indicators in various monitoring schemes – e.g. European-level and French level monitoring of sustainable forest management. In a previous study, we have found in some French lowland forests that tree species abundance – and especially late-successional or undergrowth tree abundance – was a better indicator of part of floristic biodiversity than tree species richness and diversity. We here continue this test by analyzing other data from mountain French forests, with a special emphasis on the magnitude of the relationship and its variation in geographical and ecological space. We developed Bayesian statistical models to test these indicators for the richness of ecological groups of understory vegetation species, classified according to their successional status and/or their shade tolerance. These results highlight that if we want to relate pressures to states of biodiversity in an inferential and quantitative perspective it is important to include a potential variation of uncertainty in the variables in the analysis.

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T44 First large-scale assessment of the amount of CWD in French forest reserves

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Deadwood, whether expressed in volume, diversity or continuity, is nowadays widely acknowledged as being an important component of forest ecosystems, and has therefore been addressed in most recent studies dealing with forest conservation and management. However, and despite the growing use of the concept of naturalness in the management plans of French forest reserves, the dynamics of deadwood remains greatly unknown in West European temperate forests. In this context, and in order to answer a growing demand arising from the managers of forest reserves, a specific long-term monitoring scheme has been implemented in all main forest habitats since its launch in 2005. Our talk will present some preliminary results of this country-wide monitoring based on data from 36 Biological Reserves and 18 National Nature Reserves. In this network, a comprehensive data set of living and dead tree measurements has already

been collected on >5.000 permanent plots covering a wide range of situations. Although most of the sites showed significant amounts of deadwood (mean: 38.1 m3/ha), we will focus our presentation on the important differences that were found between sites and within sites. We analyze the relationships between these differences and habitat types, altitude and management practices. Future surveys will allow us to better understand the driving forces behind these differences and will provide us with management tools to assess how these values will/can increase in the future.
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T45 The ordering of trees communities by using diversity profiles

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The concept of diversity arises quite naturally in various subject areas. In the framework of forest monitoring and management, the diversity concept relies on the apportionment of abundances (or some related quantities such as biomass or coverage) into a number of plants categories forming the community under study. A number of measures have been proposed to quantify the diversity of ecological populations as functions of the species abundance vector, nevertheless it is well known that a single diversity index is not suitable for comparing ecological communities in that the use of different indexes may lead to different orderings. In order to avoid inconsistent rankings, intrinsic diversity profiles can be used for ranking biological populations according to their diversity. The goal of this work is to obtain a partial diversity ordering for the trees populations settled in seven zones in central Italy. The zones were purposively selected in order to cover coppice zones of the same features (*Castanea sativa*), characterized by approximately the same geological and fitoclimatic aspects, but with different age, microclimate conditions and number of cuts. The profiles are estimated on the basis of independent replications of plot sampling. Asymptotically conservative joint confidence bands around the diversity profiles are constructed by means of the Richmond method. Moreover, the partial ranking of diversity among selected zones is obtained by performing (7:2) paired comparisons between each couple of selected zones.
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T46 Applying a range of forest biodiversity indicators to investigate the influence of mixed tree species stands compared with single tree species stands across spatial scales

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In this study we investigate how a number of structural, compositional and functional indicators of biodiversity respond in mixed tree species stands compared with single tree species stands. Mixed tree species stands comprised plantations of oak (*Quercus spp*.) intimately mixed with Scots pine (*Pinus sylvestris*), while single species stands were plantation monocultures of oak or Scots pine. A range of biodiversity indicator species groups were sampled. These included: vascular plants, bryophytes, carabid beetles, spiders, hoverflies, and ectomycorrhizal fungi. Several spatial scales of inquiry were used to examine the effects of not only within-stand, but also between-stand heterogeneity on the biodiversity indicator species groups and biodiversity indicators of structure, composition and function. Ground-dwelling carabid beetles, for example, were studied at three spatial scales: (1) a microhabitat scale, achieved by setting up traps in open areas or under trees within each forest stand, (2) a macrohabitat 'local' scale represented by three stand types

(pure oak stand, pure Scots pine stand, oak/Scots pine mixed stand) replicated within a given forested area and (3) a macrohabitat 'regional' scale represented by sampling in an identical manner at spatial scales (1) + (2) in two separate forests; i.e. Thetford Forest, East Anglia and the New Forest, Hampshire. We address the following specific questions in our study: 1) Do all biodiversity indicators respond in the same way to increased levels of forest stand heterogeneity? 2) What is the relative importance of microhabitat and macrohabitat factors for each of the biodiversity indicators applied in this study?

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T47 Preliminary results of implementation at wide scale of a taxonomic biodiversity indicator: the Potential biodiversity index (PBI)

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Potential biodiversity index (PBI) is an indirect composite indicator which aggregates ten key factors for which relations with forest taxa are established. PBI is relevant at stand scale and concerns only taxonomic biodiversity. A scoring system was developed with the aim to give a score directly in the field, without complex measurements, in an average time of 10 to 20 mn/ha. It differentiates sub-score for a set of 7 factors connected to the stand management and sub-score for a set of 3 factors connected rather to the forest station. PBI is a tool for forest managers who wish to integrate easily ordinary taxonomic biodiversity in their everyday management. It is also a teaching aid which contributes to the evolution of forestry diagnosis and practices. PBI was built by using scientific literature and expertise of numerous specialists in taxonomy, and also with the collaboration of a wide diversity of potential users. PBI is included in the French national strategy for biodiversity and environment ministry provides financial help to a wide program of communication and training. PBI is already used by owners, managers of production forests but also of protected areas, advisers, logging companies, experts and also researchers. We realized more than 800 PBI diagnoses in a wide range of forest types throughout the France. PBI reflect structural variability of French forests and also it seems to be sensitive because forests which have not been logged for several decades received scores higher than managed forests. Moreover, we are calibrating the PBI with a pluritaxonomic approach by using a database which contains roughly 500 plots.

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T48 Incorporating evolutionary relationships into regional assessments of plot-level forest biodiversity

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Evolutionary diversity metrics may be more biologically meaningful indicators of forest biodiversity than traditional measures such as species richness, which treat all species as equally important. This is because measures that account for evolutionary (phylogenetic) relationships among species should be better surrogates of functional diversity within forest communities, given that taxonomically distinct species should contribute more to the diversity of features present within a community. One such measure, phylogenetic diversity, has been linked to a variety of plant ecosystem processes, goods and services, supporting the argument that it is a more useful conservation criterion for management decisions. To investigate patterns of forest functional biodiversity across the United States, we calculated five plot-level evolutionary diversity measures on approximately 125,000 permanent, standardized forest inventory plots. Most

measures were not well-correlated with species richness, while others were decoupled with it at small and medium scales. Two evolutionary diversity measures (phylogenetic diversity and phylogenetic species richness) were consistently better correlated than species richness with plot-level measures of forest productivity, including live biomass, stand density index, and relative density, although the results varied by region. Using data remeasured over time on a subset of the forest inventory plots, we detected broad-scale patterns of phylogenetic diversity change that were consistent with the expected early effects of climate change. Specifically, phylogenetic diversity change was greater among seedlings than trees, was associated in some locations with latitude and elevation, and was greater among species with high dispersal capacity. These findings demonstrate that demographic indicators of evolutionary diversity can refine our understanding of climate change impacts on forest community biodiversity and function across broad regions. The importance, statistical power, and geographic extent of such indicators will increase as repeated measurements occur on all 125,000 inventory plots across the United States.

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T49 A regionalization and biodiversity assessment of the Canadian boreal forest using remote sensing

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To successfully develop and apply conservation initiatives across the Canadian boreal forest requires biodiversity data that is both accessible and reliable. However, conventional methods for measuring biodiversity, while useful, are spatially constrained, making them difficult to apply over wide geographic regions. Conveniently, remote sensing methods and imagery from spaceborne/airborne platforms offer an alternative, viable, and cost-effective means of characterizing certain aspects of biodiversity over large areas in a way that is explicit, repeatable and multi-scale. This research develops a suite of remotely-derived indirect indicators of biodiversity at a 1 km spatial resolution that are specific to the Canadian boreal forest (e.g., seasonal snow cover, topography, vegetation production etc.) and examines the relationship between these indicators and species richness (tree, mammal, bird and butterfly species). Using a quantitative cluster analysis approach, we also demonstrate the utility of the indicators for defining fifteen environmentally unique regions (i.e., regionalization or clusters) over the entire boreal. Fifteen clusters were selected as they represent a level of organizational detail useful for aiding large area conservation planning within the boreal and commensurate the continentally derived terrestrial ecozones regularly used in Canada. Our results reveal that the indicators explained much of the variance in tree (92.5 %), bird (84.6 %), and butterfly (53.2 %), and that most of this variance in species richness was explained by spring snow cover. Results further show that the clusters represent a range of distinct environmental conditions, specifically the extensive area of wetlands known as the Hudson Bay Lowlands, MacKenzie mountain range, and the highly productive evergreen and mixed wood forests in the Atlantic maritime. The most important indicators for discriminating between the different cluster groups were seasonal greenness, and wetland land cover types.

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T50 Remotely sensing biodiversity in plantation forests

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Structural complexity of forests has been proposed as an indicator of biodiversity in the context of sustainable forest management. These indices refer to structural habitat characteristics, e.g., sub-canopy and mid-canopy vegetation layers, which are known to enhance biodiversity where they are present and thus indicate the health of a forest. The advantage of a structural indicator approach is that once relationships have been verified between structural indicators and biodiversity attributes, it reduces the need for on-going intensive monitoring of individual species. The disadvantage is that structural indicators, such as stand complexity, have traditionally been difficult and expensive to accurately quantify over large areas. We investigated the use of Light Detection and Ranging (LiDAR) to measure stand structural complexity as an indicator of plant, bird and invertebrate biodiversity in plantation forests. A total of 35 LiDAR sites were selected throughout New Zealand, 17 sites form part of an intense sampling gradient in the central North Island, whilst an additional 18 sites were used to assess biodiversity in different regions throughout New Zealand. We present the results of novel new analyses that correlate vertical and horizontal attributes of stand structural complexity and biodiversity in an intensely managed plantation forest ecosystem.
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T51 European forest types and forest Europe SFM indicators: a snapshot approach for monitoring forest biodiversity at European level

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The MCPFE-Forest Europe process adopted a set of headline indicators to monitor the sustainability of forest management in the countries of the Pan-European Region. In the framework of the State of Forests and Sustainable Forest Management in Europe 2011 pilot reporting by European Forest Types (EFTs) has been conducted for six indicators providing a snapshot of key structural and compositional factors affecting biodiversity variation over large areas (forest area, growing stock, age structure and/or diameter distribution, tree species composition, naturalness and deadwood). The EFTs classification allows the breakdown of country forest area into a discrete number (14) of smaller and more ecologically homogeneous units, thus helping to unveil the variability in the value taken by the indicators across different EFTs in a given forest territory (country or country groups). This is expected to facilitate the analysis of data on pan-European indicators, as well as the interpretation of trends at country/regional level. The main findings from the pilot application of EFTs reporting will be presented in order to evaluate the usefulness of this snapshot approach for stimulating sound policy decision and improved communication with the public. The potential of framing indicators values into EFTs will be discussed with reference to the following issues: (1) addressing question; (2) driven monitoring at the country/regional level: *e.g.* are forest gains due to extension of introduced tree species or expansion of native tree species? Is there any significant loss of valuable forest habitats? (3) evaluating progress of forest management toward more favourable conditions for biodiversity development in individual EFTs: structural variation, presence of old forest stages in even aged forest, presence of large trees in uneven aged forest, promotion of multispecies stands, accumulation of deadwood, increasing proportion of forests regarded as ‘undisturbed’.
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T52 Criteria and indicators for high conservation value forest: adapting forest stewardship council principles for practical forest management

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The concept of High Conservation Value Forest (HCVF) was developed by the Forest Stewardship Council (FSC) to identify forest areas of global conservation value. Protection of HCVFs is one of ten Principles adopted by FSC in determining whether forestry bodies are successfully implementing Sustainable Forest Management (SFM). Since SFM Certification represents a significant market advantage to forestry bodies, the HCVF concept promotes integration of practical nature conservation with business objectives. Coillte, Ireland's state forestry company, has maintained FSC Certification since 2001. FSC certification in Ireland is currently audited against a generic standard and checklist. FSC Ireland is in the process of developing country-specific criteria and indicators. Transposing global principles into national indicators that can be practically implemented presents significant challenges. We present the process undertaken to revise the current draft definition of HCVF in Ireland and develop a set of workable indicators that reflects national biodiversity conservation objectives. HCVFs are characterised by one or more High Conservation Values, including presence of protected areas, outstanding concentrations of endangered species, and presence of rare or threatened ecosystems. We used international and national guidance and existing research to define what constitutes HCVF in Ireland. We developed indicators to aid in identifying HCVFs remotely or in the field. These included, among others, location within a statutory Nature Reserve; presence of three or more endangered species; presence of structural, historical or functional characteristics likely to support concentrations of endangered species; and presence of high-quality, rare native woodland types. The proposed HCVF indicators were tested using field survey, GIS analysis of existing data, and research on potential ancient woodland (pre-1830s) in Coillte's Midlands District. We recommend that our proposed definition and indicators be formally adopted by FSC Ireland, and that organisations seeking FSC certification should develop management systems and field methods for evaluating and monitoring HCVFs.
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T53 Biodiversity indicators for forest industry

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There is a need to develop environmental indicators that describe the use of bio-based raw materials and consequent changes in forest ecosystems and link these indicators with industrial production processes and products. Loss of biodiversity is identified as one of the current key environmental concerns. Still it is seldom included as impact category in Life Cycle Assessments (LCA) on forest biomass production systems even though there are methodologies for analyzing the biodiversity in LCA context. Biodiversity impacts by forestry and forest industry mainly relate to the raw material production phase, i.e. to forests and forestry practices. Forest industry can also have biodiversity impacts abroad, if the raw-material production occurs there. The focus of the selected indicators is on Finnish forestry and forest industry, mainly on forest management. Also, a global approach is taken when possible. The aim is to produce indicators that are applicable throughout the whole supply chain (Life cycle approach). The Life cycle assessment, LCA, is used to assess environmental impacts associated with all the stages of a product's life from-cradle-to-grave. The goal of LCA is to compare environmental and social damages assignable to products and services, to be able to choose the least burdensome one. The indicators are selected in a process including stakeholders and experts. The usability of the indicators is evaluated with criteria including data availability, high policy relevance, sound indicator quality, effective dissemination and long-term institutionalization. Efficient participation of stakeholders is beneficial for both producing a usable indicator and for early "marketing" of the indicator. Stakeholders representing wide variety of interest groups and biodiversity and LCA experts are included in the process. The preliminary set of indicators will be presented in the conference.
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T54 A comparison of the initial responses of plants, invertebrates and birds to the afforestation of grassland habitats

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Ireland has experienced major changes in land use over the last few decades due to the large-scale conversion of open, agricultural and semi-natural habitats to forest plantations. With the governmental objective of further increasing the country's forest cover from its current 10% to 14.5% by 2030, these changes are ongoing and likely to affect the floral and faunal diversity of the converted habitats. Afforestation may benefit biodiversity, particularly in intensively managed landscapes; however, the effects of afforestation on biodiversity depend on habitat characteristics and the tree species planted. In order to obtain a more general picture of the initial effects of afforestation on biodiversity in Ireland, different taxonomic groups were studied and their responses to the pre-planting vs. (5-8 years) post-planting environment were compared. Both chronosequence plots and permanent plots were surveyed and data on the diversity and abundance of vascular plant, non-vascular, bird, spider and hoverfly species were collected. In addition, structural and abiotic data were recorded for each site. Diversity and compositional data for the different groups were then compared to each other by employing correlation and procrustes analyses. Differences in diversity and abundance were detected for all taxonomic groups, and all taxa showed noticeable shifts in composition when comparing pre-planting with post-planting environments. However, preliminary results indicate that the investigated taxonomic groups responded to afforestation in different ways. For example, the change in vascular plant species richness showed an opposing trend to the change in spider, hoverfly and bird species richness in improved grasslands after afforestation. Further, the change in spider abundance contrasted with the change in bird abundance after afforestation. The implications of our findings for the use of surrogate taxa as biodiversity indicators will be discussed.

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T55 Compositional shifts in the understorey vegetation after the conversion from mixed deciduous forest to spruce monocultures

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It is generally assumed that the overstorey composition in forests plays a dominant role in determining the understorey species diversity and composition. Tree species have an effect on the herb layer by influencing for instance the light availability and by competing for soil nutrients and water. Furthermore, the quality of the tree litter profoundly influences the nutrient availability and other soil characteristics such as the pH and soil fauna. Therefore, we expect herb layer vegetation shifts following a conversion to another tree species. Since the 1950s, Norway spruce (*Picea abies*) monocultures are being planted as small islands in a matrix of mixed deciduous forest in the south of Belgium. We investigated the vegetation and the soil characteristics in forty spruce monocultures and paired, adjacent mixed deciduous stands in order to assess the impact of the past conversions to spruce on the soil and herb layer vegetation. The pH of the topsoil lowered significantly and the tree litter biomass increased due to the conversion to spruce. Nevertheless, the diversity in the deciduous stands did not differ significantly from the spruce stands. The mean local species diversity (α-diversity) in a plot as well as the total number of species occurring in the deciduous stands (γ-diversity) was equal to these of the spruce stands. Yet, the spruce monocultures showed a different composition from the

deciduous matrix, contributing to a larger regional species pool and higher across site β-diversity. Indicator species in deciduous were mostly forbs and in spruce stands they were graminoids and ferns. The understorey vegetation in spruce stands contained more species that were light-demanding and acid tolerant. The conversion to spruce seems to have caused an ecosystem shift from a mesotrophic to an oligotrophic state. This resulted in a changed understorey composition, but understorey diversity per se did not change significant.

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T56 Effects of tree species and functional diversity on the resistance against insect herbivores

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A major challenge in forest research is to assess the functional significance of biodiversity for ecosystem functioning in European forests. Whereas identity-effects of single tree species on certain ecological processes are well known, knowledge on the biodiversity ecosystem functioning (BEF) relationship is still scarce. Observational and comparative studies have been vital in describing correlations between biodiversity and ecosystem processes across existing forest stands, but are criticized due to the potential of co-varying factors to confound interpretations and for their limited ability to isolate cause and effect in the BEF relationship. The manipulative tree diversity experiment BIOTREE serves as a complementary approach to assess the functional importance of different elements of tree diversity (i.e. tree species and tree functional diversity) and to further explore underlying mechanisms while keeping confounding factors constant. Over a period of two years, we investigated resistance to pest insects, an important ecosystem function that has received limited attention in forest biodiversity studies so far. This was done for different herbivore guilds at two of the BIOTREE sites, along a gradient of (1) tree species and (2) functional diversity, testing the hypothesis that more diverse forests are more resistant to pest insects. Preliminary analyses revealed pure stands to suffer more damage by leaf miners and sap feeders than mixed stands in 2010, whereas the opposite was true for skeletonisers, leaf rollers and chewers. However, damage patterns along the diversity gradient varied across host species, with e.g. *Fagus sylvatica* (L.) and *Pseudotsuga menziesii* (Mirb.) Franco showing less sap feeding damage at higher tree diversity while the reverse was observed for *Picea abies* (L.) H. Karst.Carefully assembled forests stands may therefore improve insect pest control by e.g. reducing the concentration of host trees or by providing a more diverse habitat thereby improving the top down control by natural enemies.

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T57 Conservation of deadwood could conserve microscopic organisms such as mushroom mites

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Usually macro-organisms are studied to understand how to conserve biodiversity. Nevertheless, microscopic organisms often provide functional relationships in ecosystem microhabitats, including in deadwood and soils. Another such microhabitat is wild mushrooms, which have important functions, such as decomposing dead wood, and also by providing microhabitats and nutrition for invertebrates, including habitats for micro-invertebrates. We studied fungal mites to assess the idea that microscopic organisms may also follow some common ecological rules, such as area-space relationships and habitat stability and heterogeneity as affecting their species richness. Mite community structures on mushrooms are unique; for instance less than a half of the same mite species were also collected from the surrounding soils. We collected mites from wild mushrooms in deciduous broad-leaved forests at different stand ages, including old-growth stands. Mite species richness was significantly correlated with mushroom size in the old growth forest. Mite species were significantly richer on perennial mushrooms, such as wood-decaying fungi, than they were on ephemeral fungi. The effect of mushroom species abundance on mite richness was not clear because only one mite species was collected from most mushroom samples. However, species richness of mycophylous mites, most of which were phoretic on insects, was significantly correlated with insect presence. However, predaceous mites, including those that eat arthropod eggs, were not correlated to insect abundance or presence. These results suggest that insects on mushrooms might as key vectors for mushroom mites. The number of species of wood decaying mushrooms increased with stand age for secondary forests, probably because the amount of resources for mushrooms increased, including dead branches and larger dead wood. Therefore, we suggest that maintenance of deadwood biomass could conserve mushroom mite diversity providing habitat (mushrooms) and dispersal agents (saproxylic and mycophilous insects) in the forest ecosystem. We also concluded that most ecological rules important to larger organisms also apply to mite communities.
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T58 The mite (*Acarina*) fauna of Irish forests - a study of the contribution of forests to the Irish fauna and of the differences associated with tree species and microhabitat

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Mites are considered to be hyperdiverse with current estimates of the number of extant species ranging from 500,000 to a million. In addition, mites contribute significantly to the flow of nutrients in soils. An extensive literature exists on the Irish fauna and research, particularly at UCD, has extended our knowledge of the faunas of individual habitats and several species new to science have been described. However, it is still apparent that neither the number of species present in Ireland nor the reasons for the extent of the biodiversity are known. The diversity of mites in forests is generally perceived to be high and the three dimensional structure of the forest vegetation provides opportunities for coexistence of many species. For example, a distinct assemblage of mites appears to inhabit the canopy of trees. As part of the COFORD funded project, FunctionalBio, we have therefore examined the mite fauna occurring in the soil, surface vegetation and canopies of a variety of tree species and shown (i) that the mite fauna varies significantly between forests types, (ii) that this pattern does not appear to simply reflect a difference between forests of exotic or native tree species where mite species may have co-evolved, (iii) that significant variation exists between the fauna of microhabitats within the forests and, (iv) through an extensive analysis of the overall Irish fauna, it can be seen that the presence of forests contributes significantly to the biodiversity of the Irish fauna.
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T59 Spiders, decomposition rates and global climate change

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Changes in rainfall due to climate change will likely alter rates of litter decomposition through direct effects on primary decomposers. Less appreciated is the potential impact of altered rainfall on the indirect effects of predators such as spiders on the rate at which deciduous leaf litter decomposes. Field experiments have revealed that spiders can initiate trophic cascades impacting decomposition. Early experiments, in which natural spider densities were reduced, revealed that spiders can exert either positive or negative effects. These experiments revealed that one interaction pathway of this cascade involves Collembola, a major microbi-detritivore. Differences between years in rainfall suggested that the sign of the trophic cascade (i.e. whether spiders enhance or inhibit decomposition) is related to changes in rainfall. A large-scale field experiment, in which average rainfall was experimentally perturbed according to the two extreme predictions of climate-change models for North American deciduous forests, confirmed this hypothesis, but with a caveat: how rainfall affects the spider-induced trophic cascade may depend upon small-scale variation across the forest floor in moisture levels of the leaf litter and underlying soil layers. The experiment was replicated at two sites. On the drier site, spiders had no indirect impact on decomposition under either high or low rainfall. In contrast, on the moister site, spiders increased decomposition rates under drought conditions, but had no, or possibly a negative effect on decomposition, in the high-rainfall treatment. Additional research is needed to confirm that spatial heterogeneity will alter the impact of rainfall on this trophic cascade. Also, it will be fruitful to search for other interaction pathways by utilizing approaches other than manipulative field experiments – such as molecular techniques to construct quantitative food webs – in order to understand more fully this complicated relationship between changing abiotic factors and the complex trophic interactions of the forest floor.

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T60 Invertebrates in urban forests: diversity, distribution and management recommendations

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Invertebrates respond in many ways to urbanisation. Our research from several cities shows that specialist forest carabids are disappearing from urban forests but exact responses to human effects differ. In Helsinki (Finland) most of the species remaining in urban forests do not respond to edge or trampling effects while in Edmonton, (Canada) carabids do respond to these effects, possibly because this relatively young city has not yet lost its entire forest specialist fauna. Furthermore, in Helsinki, carabids were affected by edge contrasts. Generalist and open-habitat species favoured high contrasting (asphalt-forest) edges while forest species avoided such edges. In Helsinki, many forest species are also found in grasslands indicating that these species are in fact generalists and that the urban carabid fauna consists mainly of generalist species. Also golf courses have diverse and distinct carabid assemblages. Moreover, in contrast to rural forests, urban carabid communities are dominated by one or a few species, such as *Pterostichus melanarius* in the heavily trampled sites in Helsinki. Isopods are a common element of the urban invertebrate fauna. In Finland, these species of more southern forests mostly occur in urbanized habitats and do not easily enter boreal coniferous forests. Thus, the occurrence of isopods also suggests functional contrasts at the urban – rural interface. Our study on dead wood in parks and urban forests suggests that dead wood primarily serves as a shelter for invertebrates while xylophagous specialists are absent. Overall, our studies demonstrate that (a) invertebrates reflect forest conditions in cities, and (b) careful planning is needed to ensure that forest invertebrates thrive in cities. For instance, thick edges may promote the occurrence of carabid species in urban forests, as it does for understorey vegetation. Additionally, it is important to minimise trampling effects in order to promote diverse carabid assemblages in cities.

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T61 Modelling the impact of forest management on deadwood and associated saproxylic beetle diversity

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Deadwood is a major component of forest biodiversity providing habitat for a large proportion of forest species, notably saproxylic beetles. However changes in forest management such as shorter rotation periods may affect the provision of this critical resource. Based on field inventories in 181 pine plantations, wood decay functions were calibrated. In the same forest stands, interception traps were set up to sample saproxylic beetles. We found that the saproxylic beetle species richness was significantly and positively correlated with the total volume per ha of deadwood from anthropogenic origin. An empirical tree growth model coupled with a stem profile model and a virtual logging tool gave the volume of branches and of logs with no commercial value as well as the diameter of stumps. Combined with decay functions, this framework allowed evaluating the volume of anthropogenic deadwood produced by successive thinnings and clear cut and then the dynamics of deadwood along a complete forestry rotation. We used this model to simulate the effect on deadwood of two main changes in forest management that are contemplated to adapt plantations to climate disturbances: increased thinning frequency and reduced rotation period. We observed that these new management alternatives may have dramatic effects on saproxylic beetles species richness at the stand scale but also on beta and gamma diversity of saproxylic beetles at the landscape scale. Nevertheless we also showed that relevant combinations of different forest managements within the same landscape may mitigate the adverse effects of intensive silviculture at the stand level. These results illustrate the interest of forest growth modelling and landscape planning for improving the maintenance of biodiversity in plantation forests.
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T62 Conserving saproxylic beetles across stand age gradients of plantation forests in a human modified landscape

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Plantation forests are increasing in many countries. These plantations have primarily been established to fulfill demand for wood products, but recently are also required to contribute to biodiversity conservation. In Japan, conifer plantations constitute 42% of the forest. These even-aged mono-specific plantations were mostly planted between 1950 and 1970 and are now approaching commercial harvesting age (40-60 years). Because Japan has long history of plantation, studies from Japanese plantations would provide some suggestions to the future of plantations in other countries where plantations are expanding. We sampled saproxylic beetles in larch and fir plantations and natural forests of various ages in Hokkaido, northern Japan. Species composition of longicorn beetles (Cerambycidae), which is known as an indicator family of saproxylic beetle diversity, did not differ between plantations and natural forests when stands were very young, but gradually became different after canopy closure. However, the species composition in plantations came close to natural forests when the plantations reached its harvesting age. This result suggests that extending harvesting age is an effective way to conserve saploxylic beetle diversity within plantations. Because most of the plantations in Japan are approaching the harvesting age, only a part of them can be harvested to reduce bias in stand age distribution. Thus, we propose that harvesting age of some plantations should be extended both to conserve biodiversity and to sustain timber yield.
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T63 Saproxylic diversity and its contribution to wood decomposition processes in an intensely managed forest ecosystem

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As a substrate deadwood is frequently the focus of research that quantifies the effect of deadwood type, size and decay stage on the diversity of saproxylic species. These studies have illuminated a huge variety of deadwood dependant taxa, many that are seriously affected by forest management activities that reduce habitat availability. However, dead wood is not just a habitat it is also a central nutrient pool in forest ecosystems where it stores vast quantities of carbon and other nutrients that are gradually decomposed and recycled by the growing forest. Although many have studied the diversity of saproxylic organisms associated with these deadwood pool; few have quantified the extent to which this diversity of saproxylic taxa contribute to deadwood decomposition rates. In this talk we present the results of two studies; 1) The change in composition of saproxylic invertebrates along a ten year chronosequence of deadwood, and 2) a 3 year study of deadwood decomposition rates with and without the influence of major invertebrate wood boring species. Both studies were undertaken in intensely managed *Pinus radiata* forests in New Zealand. Our ten year chronosequence documents distinct changes in the community of saproxylic species present in dead *P. radiata* over time. Because these trends reflect actual time since the deadwood was created it provides an opportunity for forest managers (if appropriate silviculture data is available) to model saproxylic resources throughout the landscape and evaluate the potential impact of alternative management strategies. Our three year deadwood decomposition experiment has just finished and at the conference we will present the first results that quantify the potential impact of losing particular saproxylic species on the decomposition rates and nutrient cycling of deadwood in a forest ecosystem.
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T64 Impact of post-harvest biomass removal on epigaeic invertebrates in jack-pine forests of Western Quebec, Canada

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In Eastern Canada, residual woody biomass recovered following forest harvest is being considered as a possible source for bioenergetic feedstocks. In some clear cut silvicultural systems, trees are delimbed and cut to length on site and non-merchantable parts of trees are often placed on machine trails to limit soil compaction. Post-harvest recovery of residual biomass (such as tops, large limbs and finer woody material) from these skid trails may have consequences for litter invertebrate biodiversity if volumes of deadwood are sufficiently depressed and any habitat buffering effects of deadwood are eliminated. Here we report on the community level responses of over 180 species of leaf-litter invertebrates (ground beetles and spiders representing 16,000+ individuals) collected in jack-pine forests of Western Quebec, Canada to the following treatments; clear cut harvesting with no additional biomass removal, clear cut harvesting with removal of residual biomass along machine corridors and clear cut harvesting where biomass was removed throughout experimental plots. Invertebrates were collected throughout the summers 2010 and 2011. Increased levels of biomass removal significantly reduced volumes of all diameter classes of deadwood greater than 3 cm and caused significant differences in invertebrate composition. We then forecasted future invertebrate composition to further reductions in woody biomass that would result from decomposition over a 30 year period using general linear models. Our results suggest that changes in invertebrate communities are greatest when volumes of intermediate decayed logs become maximal.
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ABSTRACTS

Poster Presentations

P1 Natural and anthropogenic disturbance influences on aquatic biological diversity in Western Oregon

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We examined aquatic biological diversity in small streams of forested landscapes in western Oregon USA using published work and three data sets. We focused on aquatic insects because species-level taxonomy is reasonably complete compared to other groups. Two comprehensive aquatic insects studies in W Oregon are available, with richness values of 325 taxa at one site and the second with beta diversity (6400 ha watershed) of 425 taxa. We use these values as the likely upper end of richness in this ecoregion. We examined two disturbance types: one natural, debris flows, and one anthropogenic, canopy removal. In the three studies overall richness was 159, 165, and 192 taxa with alpha richness ranging from 34 to 80 taxa. Each study had similar levels of taxonomic resolution with the inclusion of Chironomidae to genus or species. Rare species were an important contributor to richness as 20-30 % of taxa were found at only one site within each study (6, 11, and 19 sites). We paired eight strongly disturbed sites with a less disturbed neighbouring site. In all pairs, disturbed sites had higher overall and Chironomidae richness. In addition, EPT richness was higher at disturbed sites in all but one pair. We conclude the effort likely required to approach full aquatic insect richness is beyond typical efforts, due to the predominance of rare species. This is particularly relevant to the effort in the most common assessment of aquatic insects – bioassessment. Secondly, richness is not the best indicator to evaluate disturbance impacts, it is better to consider which taxa are present rather than how many. Additionally, since alpha richness, which was a fifth to a half of beta/gamma richness in each study, efforts to measure full landscape aquatic richness, even when only targeting small streams, needs to be both intensive and extensive.

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P2 Fish assemblage use of constructed woody microhabitats in sand-bed streams of the upper Gulf Coastal Plain, USA

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We investigated fish use of standardized, constructed woody microhabitats (cane bundles) in four north Mississippi sand-bed streams with different degrees of channel degradation and natural instream woody cover. The streams described a disturbance gradient: Lee Creek (deeply incised, least depth and wood), Cypress Creek (channelized, low depth and wood), Puskus Creek (natural channel, moderate depth and wood) and Chewalla Creek (natural channel, deepest, highest wood). We deployed replicate cane bundles over one year (six samples). We focused on three measures of microhabitat use: fish occupancy, abundance, and assemblage structure. Across all streams, we captured 30 fish species representing eight families. Fishes used bundles least in the most disturbed stream (7% occupancy) but showed similar occupancy in the others (20-27%). Mean fish abundance in bundles differed greatly between the two most disturbed streams but was intermediate and similar in the least disturbed streams. Fish assemblages in bundles were distinct among streams. Pairwise effect sizes in assemblage similarity described a gradient from the most to least disturbed stream. Small wood in these sand-bed streams is obviously an important but dynamic component of fish habitat, but responses of fishes to that habitat are mediated largely by the disturbance history of the stream.

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P3 Debris from the natural forest watershed in a mountain region in Japan

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The watersheds in mountain regions are important in the regional environment as the place in which water and much woody organic matter (litter, stems, branch, and bark) are produced. These watersheds are also important for the global environment because water, woody matter, and its carbon-based components are circulated in the ecosystems of forest, river, sea and atmosphere. It is not enough for us to simply understand the circulation of water and woody matter. For woody matter of watersheds of mountains, three unresolved questions remain. "When does woody matter move?" "What does woody matter move?" "How much does woody matter move?" Recently much research is been focused on large natural forested watersheds in mountainous regions. The structure and dynamics of forest, material movement and influence of the global environment are being investigated. Here we report the transported CPOM (Coarse Paticulated Organic Matter: stems, branch, bark, leaf, others and fine) measured from about 8 hectar watershed of a mountain region in Japan from 2001 to 2010, for 10 years. The dry weight of the transported CPOM from the watershed was 1.8～13.2 kg/ha/yr. That of CPOM from 2001 to 2003 was 1.8～3.0 kg/ha/yr. That of CPOM from 2005 to 2010 was 3.5～5.7 kg/ha/yr, and was two times of the former three years. The CPOM dry weight of 2004 was 13.2kg/ha/yr because of precipitation with some typhoons. The values of dry weight of the transported CPOM of Yusen watershed are also in reasonable agreement with those of the Hubbard Brook Experimental Forest (2.5～18.5 kg/ha/yr) for 8 years, from 1965 to 1972.

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P4 Indicators of biodiversity in plantation forests

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Forests contain a large portion of global diversity and play a central role in the functioning of the biosphere. The importance of managing forests sustainably and in a manner compatible with biodiversity conservation is recognised internationally. Though plantation forest area is seen as an indicator of decreasing diversity under Sustainable Forest Management (SFM), plantations may be of great importance to biological diversity in those regions where little semi-natural woodland remains. Identification of plantations which are potentially of high biodiversity value and of management practices which can enhance biodiversity are essential if the goals of SFM are to be met. Since a complete assessment of biodiversity is rarely possible, other than at very small scales, there has been an increasing interest in using indicators as surrogate measures of biodiversity. This concept is based on the principle that easily measured features, which affect or derive from variation in biodiversity, can be used as an index of biodiversity. Potential indicators have previously been developed using data on plants, invertebrates and birds from spruce (*Picea spp*.) and ash (*Fraxinus excelsior*) dominated plantations in Ireland. This paper reports on testing these indicators using independent data from Scots pine (*Pinus sylvestris*), oak (*Quercus spp*.), Lodgepole pine (*Pinus contorta*) and Sitka spruce (*Picea sitchensis*) dominated plantations in order to assess their broad applicability. The indicators identified will constitute useful tools in the identification of high biodiversity value plantations and will inform management practices to enhance plantation forest biodiversity.

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P5 Monitoring French forest reserves to better understand deadwood dynamics

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Although the importance of deadwood for the conservation of forest dwelling species is now well-established by scientists and increasingly acknowledged by policy makers, the natural dynamics of deadwood in Western European temperate forests remains poorly known. To fill this gap, a long-term monitoring scheme has been implemented in French protected areas (mostly in National Nature Reserves and Strict Biological Reserves). By precisely monitoring (on average on a 10-year time scale) the flows of living biomass and deadwood, this protocol provides information on the distribution, origin, and ultimately (after the second and later measurements) on the turnover and equilibrium state (at the large spatial scale of the forest mosaic for any given forest stand) of deadwood. Furthermore, the use of permanent plots enables a spatial and temporal monitoring of stand dynamics and helps us to assess the "state of conservation" of any given stand or forest. Finally, this scheme provides a unique opportunity to simultaneously implement various taxonomic surveys in order to better apprehend the link between dendrometry and biodiversity on a country wide scale. Since its launch in 2005, 70 reserves have been implemented, covering all main forest stands and constituting to date a database of more than 5.000 permanent plots distributed all over France.

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P6 Using of model group of animals for biodiversity study in forest ecosystems – case of insect order Psocoptera

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A complex psocopterological research (Order Psocoptera includes in Central Europe only 80 species) was initiated recently in territory of the Czech Republic, Slovakia and the Ukraine in 1997 (database currently contains approximately 10,000 database items in nearly 40,000 specimens of Psocoptera). The aim of the systematic study of psocids was to define the species diversity and characteristic species composition of psocids in different types of forest ecosystems with bioindication value of particular species, and also determine whether it is possible Psocoptera used as 'a model group'. As a framework for study were used units of forest site classification system (this system are used in the Czech Forestry for evaluation of environmental conditions and are the basis for forest management; they are units of potential natural vegetation) especially vegetation tiers (i.e. units of permanent ecological conditions, taking into account the gradient of ecological conditions in the vertical direction). The results of DCA analysis show influence significant factors: influence of vertical zonality and hydricity. Some notable files habitats were found in the results of the DvClA analysis. The results DvClA and DCA-analysis show the environmental groups of psocids that are characteristic of certain types of forest ecosystems. Characteristic species combination of Psocoptera was found for each vegetation tier. Some species of psocids were identified as a indicator species. Especially *Caecilius despaxi* has important indicator "value". Dominancy of this species in the vegetative tiers is same as the dominancy of *Picea abies* in natural forest ecosystems. Existing material can in future be used as a comparative basis for evaluating the dynamics of forest ecosystems and changes due to climatic factors of potential global climate change.

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P7 Virgin forest beetle fauna in the pheromone trap catches during the 7-year bark beetle outbreak in the National Park “Mt. North Velebit”

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Beginning in 2005, a bark beetle monitoring study via pheromone traps was initiated within the area of a newly established National Park “Mt. North Velebit”. Two target species were the eight-toothed spruce bark beetle (*Ips typographus*) and six-toothed spruce bark beetle (*Pityogenes chalcographus*). Seasonal appearance and their respective population size was obtained through the weekly pheromone trap catches during the period 2005-2011. Seasonal dynamics and population buildup of the two main predatory beetles, *Thanasimus formicarius* and *Nemosoma elongatum* were also closely followed. Special attention was given on the non target beetle fauna that accompanied the two target bark beetles in the catches. Some of the important virgin forest species appeared in low numbers, ranging from one individual up to several hundred specimens in some localities and in some years. Within the most important findings, we consider the first record(s) of *Platypus oxyurus* in the wider area of Balkans (excluding Greece) and small number of *Cucujus cinnaberinus*, a beetle generally not commonly found in saproxylic fauna screenings of this kind. A spatio-temporal analysis of the predator/bark beetle population dynamics is given along the list of collateral beetle fauna, reflecting the buildup of dead wood in the natural disturbance process dominated by bark beetle outbreak.
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P8 Diversity of epigean coleopteran associated to hualo and radiate pine stands in region of Maule, Chile

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On the coast of the Maule Region (Chile) shows a landscape dominated by *Pinus radiata* D. Don of native forest dominated by "hualo" (*Nothofagus glauca* (Phil.) Krasser) (Fagaceae) which has been heavily deforested and fragmented. This study determined whether there were differences in the diversity of epigeal beetles in stands of pine, hualo and mixed (hualo - pine) in two seasons in a coastal area of the Maule Region, Central Chile. We determined the abundance, richness, similarity (Jaccard index) and diversity (Shannon index (H ')) of epigeal beetle species in three types of mature forests: pine, hualo and mixed, both in spring (2010) and summer (2011). In each stand was randomly drew three lineal transects (repetitions) of 100 m, which installed 10 pitfall traps every 10 m. For each indicator an analysis of variance and differences exist the Kruskal Wallis nonparametric tests were applied. The relative abundance was significantly higher in the pine stand on the other stands in spring and was reduced in summer. In spring the richness was significantly lower than in summer, being higher in mixed and hualo stands. In summer both the pine stand like hualo was of greater value than the mixed stand, with significant differences. In spring the similarity was greater between the pine and mixed stands (0.46), while in summer only of mixed and hualo stands showed similarity, and was lower than in spring (0.20).
In spring the index H 'was significantly higher in the mixed stand, and in summer in the hualo stand. These differences in diversity could be attributed to such factors as the structure and composition of plant species in different stands, which also affect the quality and quantity of resources available for the establishment of species of beetles, as well as microclimatic conditions, soil and habitat, among others.
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P9 Effects of residue post-harvest treatments in radiata pine on the diversity of epigeal coleopteran, region of Maule, Chile

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The effect of post-harvest silviculture practices on the insect diversity has been poorly documented in Chile. This study evaluated the effect of post-harvest residue management treatments in *Pinus radiata* plantations of one year-old on the epigeal coleopteran diversity in a coastal area with fragmented habitat of the Maule Region, central Chile. We determined the abundance, species richness and complementary of epigeal coleopteran species in three residue post-harvest treatments (one residue, one with residue removal and other residue by burning) in plots of 25m x 25m each in spring (2010) and summer (2011) and compared in terms of changes in the diversity of beetles. In each area, randomly drew three lineal transects (repetitions) of 20 m, which were installed three pitfall traps. Additionally, diversity was measured using the Shannon- Weiner index (H ') and was classified according to trophic guild (phytophage, predator and saprophage). For each indicator an ANOVA and TukeyHSD test were applied. Residue treatment had a greater abundance (70%) and species richness of epigeal beetles (50%) over the other two treatments in both spring and summer, with significant differences (P <0.05). Complementarity showed greater similarity between treatments with residue removal and residue in spring, while the highest similarity was between treatments with residues and burned residues in the summer, in both cases not significant. The H' index was higher in the residue remove treatment of in spring and residues treatment in summer, without significant differences. According to the trophic guild, both predator and phytophage and saprophage recorded a higher number of individuals in residue treatment, being significant (P <0.05) differences in spring and summer, with the exception of the guild saprophage in the summer. These differences would be explained mainly by the increased availability of food and habitat caused by this treatment.

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P10 Biological diversity of Calamagrostis type alvar forests in Estonia

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Alvar forests are an extremely interesting research object in Estonia and the whole world due to their uniqueness and very limited occurrence, being one of the rarest forest types in Europe and found in Estonia only in limestone areas in the west and on islands. Elsewhere, alvar forests occur only in southern Sweden and Canada. In Europe, alvar forests represent so-called responsibility communities – communities which are abundant in some places but lacking in others and thus need protection. Alvar forests only encompass ca 60,000 ha, which constitutes 2.8% of Estonian forests, out of which 62% in turn are under protection. The purpose of this research was to study whether the management of alvar forests has an effect on biological diversity. A structure and ground vegetation analysis was carried out in this research on the basis of sample plot data collected from Calamagrostis type pine forests. The sample plots were located in both naturally regenerated and man-made stands, and in managed and unmanaged stands in three age classes (I: ≤ 100 years, II: 100-140 years, III: ≥ 140 years). The results of the analysis showed that stand structure in moderately managed stands is more diverse than in unmanaged stands, as small gaps with natural regeneration appear after thinning, which diversify stand structure. The analysis also revealed that the species composition of ground vegetation varies depending on stand origin, management and age. Therefore, the Shannon diversity index is higher in artificial stands (F=10.87, p=0.002) and unmanaged stands (F=10.9, p=0.002) and within the age group of 100-140 years (F=6.69, p=0.007). The average number of species in an artificial stand is 18.23, 15.6 in a naturally regenerated stand, 15.03 in a managed stand, and 18.15 in an unmanaged stand; according to age classes I, II and III, the numbers are 17.15, 17.66, and 15.13, respectively. Consequently, in order to ensure sustainable management and effective protection of alvar forests, they first need to be examined in detail and their diversity explained.

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P11 Modeling tree microhabitats occurrences as a management tool for the conservation of biodiversity. A study case in montane beech-fir forests

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Tree microhabitats are key elements of forest complexity and their counting can be used as a surrogate of taxonomic biodiversity. Previous studies have shown the influence of the tree species and the diameter on microhabitat occurrences. Using data from 1684 live trees observed in 9 forests, we modeled the presence/absence of eight microhabitat types according to the diameter at breast height, by using logistic functions, for both European beech and silver fir. Furthermore, we calculated, by using recursive partitioning method, optimized diameter thresholds which correspond to the strongest probability to shift from absence to presence of each microhabitat type. However, a single tree cannot carry neither all the microhabitat types nor insure a high density of microhabitats required by certain taxa. It is then of great importance to estimate the minimum number of trees required to ensure a sufficient supply of microhabitats in managed stands. To do so, we computed rarefaction curves based on the number of trees, for both the number of microhabitat types and the number of microhabitat for each microhabitat type. Analyses are still in process. We will discuss implications for forest managers, in particular by relating ecological diameter thresholds we found with management diameter thresholds which are used by all managers in French forestry to describe and manage stands. We will present examples of practical applications which could allow forest managers to assess easily both the diversity and the density of microhabitats in managed forests and also verify the suitability of the current standards about conservation of microhabitat-bearing trees. This model could also help forest managers to optimize the number of retention trees, by analyzing several scenarii of stand structures.
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P12 The forest heterogeneity index: a new spatially-explicit assessment method for species biodiversity monitoring in forest landscapes

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Despite worldwide efforts to improve sustainable management of natural resources, forest biodiversity is still threatened. The failure of conservation strategies, as it was the case for the CBD 2012, is mostly due to a lack of knowledge on the spatially explicit distribution of high biodiversity value areas. Spatial explicit indicators and models are needed for conservation planners and foresters in order to target conservation priorities based on resources location. Within this context, we developed a Forest Heterogeneity index (FH index) based on spatially explicit multi-scale analysis of forest heterogeneity at the landscape level. The index was computed and tested in heterogeneous mountain forests of the Vercors Mountain range in the French Alps. It encompasses three scales of analysis: i) local scale (within forest stands structural complexity); ii) intermediate scale (diversity and spatial arrangement of patches in management units) and iii) large scale (diversity and spatial arrangement of patches for the whole forest). Heterogeneity at each scale is assumed to reflect a subset of habitat diversity related to a given species biodiversity. The analysis across scales provides a holistic view of forest biodiversity. The index developed constitutes a good surrogate for biodiversity value and represents a practical tool for conservation. Several possible applications of the FH index for biodiversity conservation and management are presented.
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P13 Towards the validation of a new forest biodiversity indicator: observer effects on tree microhabitats censuses in a French unmanaged forest

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A growing field of forest research deals with the improvement of forest biodiversity indicators. Validation of biodiversity indicators requires an analysis of their applicability, their range of validity and the magnitude of the correlation with the biodiversity they are supposed to represent. In this process, assessing the magnitude of observer effect is an essential step. In this context, we tested observer effects (probability of detection, probability of invention/false detection) on the censuses of tree microhabitats related to woodpecker cavities, cracks and bark characteristics. Within two 0.5ha plots in a forest reserve that has not been harvested for at least 150 years, 14 observers visually observed microhabitats on 106 Oak (*Quercus petraea* and *Q. robur*) and Beech (*Fagus sylvatica*) trees. We compared the censuses of these observers with an independent consensual census using parametric and Bayesian statistics. The mean number of microhabitats per tree varied widely between observers from 1.4 to over 3. Only three observers reported a mean number of microhabitats per tree statistically equivalent to the consensual census. The probability of detection also varied between observers among microhabitats (from to 0 to 1) as well as the probability of invention (from 0 to 0.7). These results show that microhabitats censuses are particularly prone to observer effects and should be used with caution. Such strong observer effects raise the question of the relevance of microhabitats as biodiversity indicator. However, we recommend to control for observer effects by (i) multiplying the number of training sessions and consensual censuses; (ii) recording microhabitats with two observers whenever possible, but the efficiency of this method remains to be tested; (iii) planning the fieldwork so that the factors of interest are not merely confused with observer effects and; (iv) integrating observer identity in statistical models whenever analysing such data.
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P14 Evaluating landscape metrics as predictors of forest bird diversity in wooded habitats

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Most woodpecker species (Picidae) are suitable indicators of forest quality and important umbrella species for biodiversity conservation. The size and perimeter of landscape patches are crucial for their density and distribution. To assess which patch size metric could be used as predictor of bird diversity we examined its effects on woodpecker breeding densities. We surveyed birds, using the point count method, at 80 randomly selected sampling areas during the bird breeding season of 2008 and 2010 in a wooded landscape of central Greece. We examined the possible relationship between the estimated breeding density of woodpecker species appeared in the study area and all explanatory variables that were Radius of Gyration Coefficient of Variation (GYRATE_CV), Landscape Shape Index (LSI), largest patch index (LPI) and altitude. A General Linear Model (GLM) was applied to explore the variables affecting the abundance of woodpecker breeding pairs. Four woodpecker species out of 104 bird species were recorded: *Dendrocopos major*, *Dendrocopos medius*, *Dendrocopos syriacus* and *Picus viridis*. Results suggested that *D. major* was significantly related to GYRATE_CV ($F = 10.614$, $P = 0.002$) and LSI ($F = 4.324$, $P = 0.041$). In addition, the interaction of the above two landscape metrics with altitude was significantly related to *D. major* density. There was also a significant relationship between *P. viridis* density and altitude ($F = 4.518$, $P = 0.037$), *P. viridis* density and the interaction between altitude and GYRATE_CV ($F = 6.130$, $P = 0.001$) and *P. viridis* density and the interaction between altitude and LSI ($F = 11.863$, $P = 0.016$). Regarding the metric LPI, there was no significant relationship with woodpecker species. Conclusively, both metrics GYRATE_CV and LSI could be used as predictors for woodpecker presence, and consequently for forest bird diversity. We recommend these landscape metrics to be used as management tools in forestry management to ensure suitable habitat for woodpeckers.
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P15 The state of overmature forest patterns in the North Vidzeme biosphere reserve, Latvia

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In Latvia sustainable forest management is a primary goal set by the State Stock Company “Latvijas Valsts Meži”. Landscape-level sustainability is also the goal for the North Vidzeme Biosphere Reserve, which was chosen as a study area. We used stand age as a criterion for selection of stands of the common tree species – Scots pine, silver and downy birch, Norway spruce, black alder, Eurasian aspen, pedunculate oak and European ash. Forest inventory data from 2011 was used as the main source of information. This study utilized an analytical approach to the assessment of spatial patterns of mature and overmature stands. FRAGSTATS was used to calculate spatial pattern metrics. Mature stands, which are those that have reached legal cutting age, represent a reserve for the overmature stands, thus ensuring integrity of biodiversity structures. The results showed the potential of mature forest to facilitate biodiversity in the nearest decades from the aspect of stand spatial pattern properties. The overmature spruce and birch stands over time can be supplemented from the reserve of mature stands, but old aspen woodland was evaluated has having the least potential for continuity in both state and private forest. Less than 5% of overmature stands are strictly protected, although WKH area reaches 25% in state-owned stands. This work has been supported by the European Social Fund within the project «Support for Doctoral Studies at University of Latvia».
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P16 What are the effects of skid trail and tree stand attributes on ground flora diversity?

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Skid trails play an important role in forest management. They have the potential to impact soil properties (e.g. soil compaction, organic matter removal) and floristic diversity. The present study is intended to investigate the effects of skid trail and tree species on ground flora diversity in oak forests at the scale of large floristic sample plots. To achieve this goal, statistical models of ground flora diversity will be compared that include (1) the presence of skid trails around the floristic sample plots; and/or (2) tree stand attributes (e.g. different age classes, varied volume or basal area of trees species). To better understand the changes in ground flora, we will classify floristic species into different ecological groups based on their life form (tree, shrub, herb…), light requirements (Ellenberg indicator values), or invasiveness. The investigation was implemented in managed forests of Montargis in 1998. We selected 96stands representing either even-aged (respectively 29, 49, 64 and 104 years old, 12 stands for each type) or coppice-with-standards stands (respectively medium, larger and irregular diameter, with 19, 14 and 15 stands for each type). A circular plot with 22cm radius was set for tree species investigation, within which a nested 400 m2 quadrat for underground flora species (with height below 2m) measurement. In each plot, the number, direction and distance of skid trails intersections with the 400 m2 square were recorded (totally 187 skid trails). The diameter at 1.3m of tree species and the presence, percent cover, abundance of underground flora species (with height below 2m) were recorded, respectively. Species richness, abundance and Shannon-Wiener indices will be calculated for ground flora. Generalized linear mixed models will be used for data analysis and comparisons. Our research should provide useful information for forest management and will introduce a series of other investigations on the same topic.
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P17 Saproxylic beetle response to the intense reduction of canopy closure by felling as the first step in the restoration of the coppice management

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The restoration of the coppice management in lowland forests of Central Europe is believed to increase saproxylic beetle diversity and to enhance rare and endangered species. Three study sites in oak and oak-hornbeam mature stands in the south-east of the Czech Republic were founded to restore coppice management and to study reactions of insects. This contribution brings the results from research of certain saproxylic beetle taxa (Buprestidae, Elateridae, Eucnemidae, Throscidae, Bostrichidae, Anobiidae, Cerambycidae and Scolytinae) in one of the mentioned stands. In this stand the coppice management restoration started in winter 2008/2009 with strong thinning of three different felling intensities, when all felled trees were removed from the stand. Beetles were sampled by flight intercept traps (18 traps in the thinned stand and 9 in neighbouring control uncut area). The beetle trapping started in growing season before the thinning and continued in next two growing periods. In total, 2031 specimens representing 116 species of the studied saproxylic beetle taxa were sampled. The done thinning dramatically increased intensity of sun-light in the stand and had highly significant effect on species composition of the saproxylic beetle assemblages. Overall abundance and diversity of the studied taxa increased significantly after the thinning. This increment came immediately in the first growing season after the felling and there was no significant difference among the used felling intensities – probably since all of them were quite high. However, there was slightly lower increase in diversity in the two highest felling intensities (over 60% of original wood volume removed), which suggests that thinning should not be too strong in order to maintain sufficient amount of wood habitats. In conclusion, short-term positive effect of strong thinning on saproxylic beetle fauna abundance and diversity was confirmed in the present study. This study was supported by the project TARMAG SP/2D4/59/07.
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P18 Effects of treatments in restoration of natural forest structures in Estonia

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An effect of forest management is considered to be a structural homogenization and compositional simplification of forests over time. There is an opportunity to increase forest diversity by converting managed forests to more natural state. In Estonia it can be seen as flipping the trend in forest management in cultivated, even-age coniferous forests of *Pinus sylvestris* and *Picea abies* toward more complex structures by highlighting special efforts attention of forests spatial properties and deadwood quality. The goal of this study is to investigate effects of ecosystem naturalness restoration in Estonian hemiboreal forests. Study questions we addressed are: (1) what were the initial effects of treatments on biological diversity and (2) were there significant differences between treatments. To address these questions we focused on detection of small changes in early stage after restoration treatment and modelling further development of ecosystem properties. Studied treatments were G (Gap cutting), DW (Deadwood input), GB (Gap cutting with burning), GDW (Gap cutting with deadwood input). Species richness (evaluated by Shannon index) was increased most with treatment G in lichens, with treatment DW in mosses and insects and treatment GB in herbs. Treatment effect was come evident by using MRPP in PCord- herbs, mosses, lichens, and insects. In pairwise comparisons came evident on plant species analyse treatment GB, which significantly were different from control area and the rest of the treatments. In analysis of mosses the treatment GB differentiate from the treatment DW. On the lichen analysis did not became evident differences between control area and treatment GDW, all the rest of the treatments were different. The MRPP for insects did not presented difference between treatments G and GDW. The treatment GB increased the number of *Pinus* seedlings. Treatments GB and GDW increased the number of *Betula* seedlings and G increased number of *Picea* seedlings. The number of other tree species seedlings, mainly *Populus tremula* and *Quercus robur*, did not differ by treatments.
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P19 Forest biodiversity and culture: experiences of New Zealand Māori

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Research in New Zealand investigated the expectations of indigenous people (Māori) who have exotic species forests planted on their ancestral land. The investigation aimed to examine the relationship between enduring cultural values and biodiversity in two similar but contrasting case studies. The study used document analysis and in-depth interviews to identify the existence of non-negotiable cultural values for land management, the relationship between cultural values and biodiversity, and the resulting opportunities for forest management. In both cases commercial forest leases exist over large areas of tribal land. Māori families maintain collective ownership of the land however forest management is undertaken by a distinct third-party entity. The results found that the participants in the research held a similar range of cultural values both within and between case study areas, and also in relation to their ancestors. The comparison of historical data with contemporary interviews allowed the research to reveal the existence of forest management goals fundamental to cultural wellbeing; the land must be sustained for future generations, the forest must protect aquatic and terrestrial biodiversity, and the land owners must share equally in the economic, environmental and social benefits of the forest. In this research, such matters of fundamental and enduring importance are described as 'resilience pivots'. If the resilience pivots are not maintained, the land-use becomes incompatible with culture. In both case studies, resilience pivots were intrinsically linked with the forests' ability to provide for biodiversity and ecological services. These finding provide a clear direction for forest managers: forest regimes which sustain the land, protect or enhance biodiversity and provide collective benefits are compatible with the participants' core cultural values. Forest regimes must therefore be carefully considered and evaluated with biodiversity in mind.
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P20 Climate change may adversely affect the natural regeneration potential of native broadleaf species in Ireland

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Climate change is likely to result in longer periods of more favourable temperatures for tree growth in Ireland, but more frequent droughts may reduce the potential gains. Furthermore, since winter temperatures will be milder also, there may be insufficient chilling to release dormancy. In particular, germination is the first and most sensitive stage in the life cycle of a tree, yet the potential impact of climate change on this stage has received little attention. Some tree species, such as rowan (*Sorbus aucuparia L.*) and blackthorn (*Prunus spinosa L.*), have a complex seed dormancy mechanism, so they may be particularly prone to climatic perturbations. These tree species are an important part of the natural forest and hedgerow ecosystems in Ireland. Under natural conditions, rowan usually germinates in the spring following seed shedding, whereas blackthorn germinates in the second spring after seed dispersal. The effects of different combinations of warmth (ca 20 ºC) and chilling (3-5 ºC) treatments on the germination response of rowan and blackthorn seeds under controlled conditions were examined in this study. The results revealed that rowan seeds did not require warmth prior to the >110 days chilling needed to release dormancy, but short periods of warmth slightly reduced the amount of chilling needed. Blackthorn seeds required >40 days of warmth followed by >140 days chilling to release dormancy; additional warmth did not substitute for chilling. Climatic data were used to predict the impact of climate change on the germination response in both species. These data suggest that climate change is likely to reduce the regeneration potential of these species compared with other species, such as alder (*Alnus*) and birch (*Betula*), species that have less complex dormancy mechanism with low chilling requirements.
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P21 The role of biotic interaction for the early establishment of oak seedlings in coastal dune forest communities

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Although we are aware that forest management should adapt to current changing climate, the task is still challenging due to the difficulty for predicting local species and communities responses to climate change. We aim to focus on one aspect of climate change-adapted forest management which has rarely been addressed, the adaptation of sylvicultural techniques to changes in interactions between tree recruitment and understory species due to climate change. We used a space for time design taking advantage of the coastal dune forest community system of the south west of France including a 240 km-long natural gradient of increasing water stress on similar sandy soil conditions. We transplanted at both extremes of the gradient seedlings of three oak species of contrasted functional strategies both in forest and gap plots and with and without understory shrubs. We also measured Vapor Pressure Defficit in all treatment conditions. We found strong canopy and climatic conditions effects on interactions between understory shrubs and oak transplants. Competition was dominant in the forest plots of the wettest site and facilitation in the gap plots of the driest site. Oak survival without shrubs (but not with shrubs) was strongly related to VPD values, which suggests that the positive effect of shrubs in the most stressful conditions was due to decreased atmospheric stress below their canopy. In contrast, we found that understory shrubs/oak seedlings interactions were weakly affected by oak species functional strategies. Our results provide strong evidence that future oak regeneration management should take into account changes in interactions with understory shrubs due to climate change. In particular we recommend conserving understory shrubs in the most stressful sites in order to maintain a sufficient oak regeneration for the long term dynamics of coastal oak forest communities under changing climate.

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P22 Study of the presence of yew (*Taxus baccata L.*) in deciduous hardwood forests in Galicia (NW Spain) as indicator of the biodiversity of these ecosystems

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The yew (*Taxus baccata L.*), family Taxaceae, is one of the few native gymnosperms. Located in shady moist and fresh, from about 800 m. It is a large tree, but with very slowing growth. At present, usually found as isolated trees, and sometimes mixed with other species, forming small stands. Their presence in native hardwood forests in Galicia is always sporadic, appearing especially in the mountainous eastern provinces of Lugo and Ourense. The forest interest of the species resulting primarily on the need for its conservation and can be considered as a threatened species due to intensive human intervention on the stands are composed of yew trees. However, the yew is also part of the species present in mixed deciduous Atlantic forest and it is the only conifer that is found naturally in these ecosystems. In general, currently, within the study area has been reduced grazing pressure on natural broadleaved forests, which, coupled with the abandonment of rural areas, has been promoting the natural regeneration of these species. In this study, we analyze this situation in relation to maintaining and increasing the biodiversity of these unique forests, concluding that there is a positive progression of the species in some areas, forming almost pure stands of yew in deciduous hardwood stands, as for example of *Quercus petraea* (Matts.) Liebl.

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P23 Carbon sequestration: alternative for management and biodiversity conservation of tropical forest fragments in Tabasco, Mexico

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For the mitigation of global warming, carbon sequestration for tree species is a viable mechanism to store carbon and reduce CO2. To determine the base line of carbon sequestration, plots of 100 m2 were sampled in tropical medium height forest fragment, tropical forest successions called acahuales of different age and height (acahuales medium and height) and forest plantation. Trees ≥ 5 cm dap and total height were tally, tree id were recorded too and verified in the UJAT herbarium. Areal biomass and carbon sequestration were estimated for individual trees of the different kinds of vegetation types in the forest protected area of Reforma (ANP Cascadas de Reforma), and three different communities of the municipality of Balancan, Tabasco in Mexico. Carbon content was calculated in accordance with equations of Chave et al. (2005). The 25 hectare fragment of tropical medium height forest and the advance successions fragments of tropical forest and better conserved sites had more carbon sequestration per hectare and diversity (322 ton C/ha and H`3.9). The 3 years old forest plantation of *Gmelina arborea* has a high carbon sequestration and it will increase when it gets 10 years old and a commercial dap of 35 cm dap. Carbon content in the types of vegetations sampled is associated to species, wood density, vegetation age, forest development and human intervention in the types of vegetation. Carbon sequestration can be planned as strategy to conserve the natural protected area of Reforma, medium tropical forest fragments and advanced succession in the River zone of Balancan, Tabasco, Mexico. Forest plantations with fast growing species can be an option for deforested areas and pastureland. Considering that the medium height tropical forest and its advanced successions have a bigger diversity, store carbon and it has other environmental services, it is essential its management and conservation.
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P24 Modelling processes that change the availability, connectivity and diversity of aquatic habitat at landscape scales

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Native aquatic species in the Pacific Northwest are adapted to the dynamic disturbance processes that characterize the region and result in a diversity of in-stream and upslope habitats. Aquatic habitat diversity from the headwaters to the mouth is reflected in the diverse life histories of native species. For example, phenotypic plasticity in Pacific salmon allows these species to exploit the range of available freshwater and estuarine habitats. Alterations in disturbance processes associated with land management and climate change pose challenges to species adapted to natural regimes. We present two case studies that contrast different types of landscape alteration and different methods for modelling current and future riverscape condition. The first example is fire management in the western United States. Over the past century, effective fire suppression by land management agencies has altered natural fire regimes thereby modifying landscape processes that naturally enrich streams. For several species of native salmon in the Wenatchee River watershed, WA, we modelled (using Bayesian belief networks) habitat connectivity, quantity, and quality, and proximity of potential re-colonizing subpopulations, in response to predicted fire intensity. The second example is the potential effect of sea-level rise on the complexity, diversity and location of estuarine aquatic habitats. For anadromous aquatic species, the estuary offers a productive juvenile rearing environment and allows for the development of salt-water tolerance, critical for marine survival. We used a geospatial, remote-sensing approach (utilizing LiDAR) that quantified the potential effect of sea-level rise on the quantity, availability, and distribution of estuary and estuary-river ecotone habitats for Pacific salmon in Oregon. Both fire management and sea-level rise are landscape scale issues that require modelling approaches that target the characteristics of the process and the potential effect on aquatic habitat.
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P25 Coppice forest abandonment: boon or bane for herbaceous diversity? The case of sub-Mediterranean woods in the Italian Alps

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Rationale: Current nature-oriented silviculture in Europe aims at minimizing disturbance. Therefore, high forest management prevails and has widely replaced coppice forest management in Europe. However, it remains subject of discussion whether coppicing has a positive or negative effect on herbaceous diversity. In 2010, 21 million ha of Mediterranean forests were still managed as coppice. Despite that, socio-economic changes have caused the abandonment of many coppice forests. The consequences of this abandonment for herbaceous diversity, however, have been poorly studied and discussed controversially. Methods: In this study, we investigate changes in vegetation during the coppice cycle and after coppice abandonment, i.e. exceeding the typical rotation age of 20-30 years. Three chronosequences were studied in different colline, deciduous woods at the foot of the Alps: two were placed in *Ostrya carpinifolia-Fraxinus ornus* coppice woods (one on siliceous (n=18) and one on calcareous bedrock (n=21)), and the third in a *Castanea sativa* coppice wood (n=30). Vegetation sampling followed the Braun-Blanquet method, recording each layer separately. Plant traits and social behaviour types are included to understand functional changes of species composition. Data analyses employed different multivariate statistics. Key findings: First, total species richness decreased with increasing stand age. Second, at the same time functional diversity changed, that means while open land species decreased during the coppice cycle, forest species increased, especially after coppice abandonment. Third, the abundance of species with conservation value differed along the chronosequence. Conclusions/management recommendations: Based on these results, we discuss the consequences of coppice abandonment for plant species composition from a functional and conservational point of view. Furthermore, we argue if coppice management restoration can enhance herbaceous diversity, e.g. by supporting disturbance-dependent species.
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P26 Composition of aquatic buffer zones in Irish forestry

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The Forest Service, Department of Agriculture, Food and the Marine introduced guidelines in 1991, subsequently revised in 2000 which stipulated the establishment at forest planting of aquatic buffer zones (10 – 25 m) in riparian zones along all rivers, streams or lakes that are shown on Ordinance Survey 6" maps. Once established, aquatic buffer zones (ABZs) play an important part in conserving biodiversity, in addition to protecting water quality. To assess the diversity of ABZs species composition, sites were chosen across three forest type (afforested, reforested, and non-forested controls) on six soil types (peat, peaty podzols, peaty gley, well-drained mineral, mineral gley and mineral alluvium) for a total of 18 treatments. At each site six stations (10m x 10m quadrats) were sampled 100m apart upstream on both banks. Three reléve's (2m x 2m), 2m apart, were carried out along a line transect through the middle of each station. All vegetation within the reléve was recorded and percentage cover estimated by eye. Abiotic variables including pH, stream width, slope, soil organic matter content were also recorded. Analysis of reléve data was carried out using a range of similarity tests to determine treatments that had significantly different species composition. The grouping demonstrated a significant division between peaty and mineral soil types. Further statistical analysis found that *Molinia caerulea*, was responsible for the largest portion of the dissimilarity being more abundant on sites with peaty soil. Of the abiotic factors variability in stream width, pH and organic matter content were most correlated with groupings. In regard to peaty gley, mineral gley, mineral alluvium soil types, a notable difference in species composition was detected between reforested and afforested sites. Arising from these results, it would appear that soil rather that forest type is the determinant factor in the diversity of species composition observed in ABZs.
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P27 Floristic biodiversity in deciduous and semi-deciduous oak forests in the Northwest Spain

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The ecosystems of oak forests in the NW Iberian Peninsula represent climax vegetation and they present a high floristic biodiversity of vascular plants. This word presents data from near to 200 botanical samples randomly collected in forests of deciduous and semi-deciduous oak as *Quercus robur* L. (98), *Q. petraea* (Matts.) Liebl. (50) and *Q. pyrenaica* Willd. (41). Within these forests, 187 different species or subspecies were identified, in addition to 20 genera and 68 families. All of them were present in the forests of *Quercus robur*. Other significant results were the following: 1) A total of 126 different species occur in more than five relevés; 2) The largest number of species corresponds to Poaceae (22), Fabaceae (19) and Rosaceae (14) families; 3) The biological spectrum is dominated by hemicryptophytes, with mainly Atlantic and Sub-Atlantic floristic elements. The distribution of forests was studied by using TWISPAN (Two-Way Indicator Species Analysis) software, obtaining like pseudo-species, with shrubby and three form, the following ones: *Fagus sylvatica* L., *Castanea sativa* Mill., *Sorbus aucuparia* L., *Corylus avellana* L., *Crataegus monogyna* Jacq., *Pyrus cordata* Desv., *Erica arborea* L., *Frangula alnus* Mill. and *Cytisus scoparius* (L.) Link. The most relevant conclusion that can be drawn from this study of oak forests distribution according to the presence or absence of certain floristic species is that the results confirm the need to describe a larger number of relevés, avoiding zones in which the soil cover is altered due to grazing or other causes of anthropogenic nature. In addition, the study must be limited to a scale that is smaller than the oak species area, trying to obtain a larger homogeneity of environmental conditions, because the study area represents a transition zone between Eurosiberian and Mediterranean regions.
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P28 The dynamic nature of woodland key habitats: case study from Järvselja in Estonia

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The current study presents a re-inventory result of woodland key-habitats in the Järvselja Training and Experimental Forest Center in Estonia. The concept of woodland key habitats is described and analyzed, a comparison is given in evaluating forest inventory results with the initial inventory results. Studied forest area is 298.4 hectares including of 8.41 hectares of woodland key habitats. During the inventory three new key habitats were found and one key habitat was considered out of concept on the study area. Results indicate that following the current concept of key habitats there are some habitats undescribed and some which do not have a sufficient meaning in Järvselja Training and Experimental Forest Centre. The concept and the meaning of woodland key habitats have changed over the years and therefore all of the existing described habitat areas needs an assessment. The need and a description of a particular woodland key habitat depends on the nature protection legislation and practices on that particular moment. This emphasizes that woodland key habitats needs continuous attention and systematic assessment on the forest landscape for sufficiently fulfilling set goals.
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P29 Quantitative analysis and mapping of High Conservation Value Forests (HCVFs) in Italy

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Forests perform many interdependent functions. Sustainable Forest Management (SFM) is concerned with the preservation of biodiversity, the protection of soil and water resources, and with the contribution of forests to the global carbon cycle as well as the production of timber and Non-Wood Forest Products (NWFPs). Forest certification can be defined as an effective tool for the improvement of SFM. One of the certification schemes most recognized is that one the Forest Stewardship Council (FSC). In 1999, the FSC introduced, the concept of High Conservation Value Forest (HCVF), which key is the identification, within forests, of High Conservation Values (HCVs) according to an ecosystemic, socio-economic, biodiversity and landscape standpoint. There are six types of HCV. The intent of the following paper is to provide clarifying elements and greater detail with regards to the application within the Italian territory of the Criteria defined by the FSC for the identification of HCVFs. The approach used was to map the areas according to the values present within the national territory and through an analysis carried out in a GIS environment. The various HCVFs areas were identified on the basis of the CLC 2006, in order to distinguish the different forest categories present in Italy. Forest identified as HCVFs vary according to the value considered. In fact, when HCV1 was considered, about 40 % of the Italian forests were identified as HCVFs, whereas in HCV2, has been about 14 % and for HCV4 has been 26 %; the remaining values could not be mapped. When all three values and the existing overlaps were taken into account about 66 % are HCVFs. This new concept can be considered as an innovative element of great importance for SFM and it represents an opportunity of great interest for the monitoring of forest areas of significant value.
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P30 Dead wood diversity influence on wood-inhabiting fungi in beech forests with different management histories

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Many studies have proved that wood-inhabiting organisms have declined as a result of a reduced volume of dead wood in managed forests. Nevertheless, the spatial autocorrelation has not been considered in most studies dealt with this. In addition, as the main effect of forest management resides in coarse woody debris volume, the majority of studies have not considered the differences with thinner woody debris. In this context, the aims of the present study are: 1) To measure the effect of forest management on fungal communities of all woody debris sizes; 2) To test the impact of forest management on woody debris diversity; 3) To determine the real influence of woody debris diversity on fungal diversity correcting the effect of spatial autocorrelation. All woody debris of 10 x 10 m in 80 sampling plots were checked for fungal species during the spring and the autumn of 2010. Five plots were randomly located in 6 managed forest sites and another 5 on 6 non-managed forest sites. The effect of forest management was estimated by designing a 2-factor nested mixed model in Permanova. The overall fungal diversity was significantly higher in non-managed beech forests and fungal community structure was dissimilar, although most variability was found among forest sites. Likewise, the same trend was observed for woody debris diversity (defined with the three woody debris size classes and the three main decay stage classes). For different woody debris sizes (very fine, fine and coarse woody debris), fungal communities differed significantly in forests of different management. Spatial autocorrelation analyses have shown that both fungal diversity and woody debris diversity are highly correlated at short distances (correlograms were constructed by calculating Moran´s I coefficient). To correct this effect, Dutilleul's modified t-test was used, which has shown that there is a significant high correlation between woody debris diversity and fungal diversity.
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P31 Biological control of rhododendron using a fungal pathogen

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Humans have introduced a huge number of plant and animal species into non-native habitats and environments. In a relatively small number of cases, a combination of favourable environmental conditions and habitat modification permits a species to become invasive. Often such invasions have severe impacts on the biodiversity and integrity of the new habitats, with consequences affecting biological diversity, ecosystem process and human health and welfare. In Ireland there are a number of invasive alien species which pose threats to local biodiversity. Foremost in terms of area covered density and resulting sterilising effect is *Rhododendron ponticum* L. Rhododendron is also a known host species for the oomycete plant pathogen *Phytophthora ramorum.* This experiment investigates of the biocontrol potential of the native fungal pathogen *Chondrostereum purpureum* as a cut-stump treatment to prevent re-sprouting of rhododendron (*Rhododendron ponticum*) and birch (*Betula spp*). Previous studies have shown that *Chondrostereum purpureum* has a control level comparable to that of chemical herbicides on broadleaf scrub species. The treatments consisted of control with no applicant; control with glyphosate and the fungal inoculums itself. The fungal treatment is causing cambium degradation and blackening of the stump at a similar rate as the glyphosate treatment and noticeably more advanced than the control. The difference between the fungal treatment and the control is noticeable in approx. 70% of the population. No re-sprouting is evident on any of the samples.
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P32 The southern range expansion of invasive grey squirrels in Ireland: Determining the frontier and surveying the population

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Grey squirrels (*Sciurus carolinensis*), an invasive alien species introduced into County Longford in 1911, have since spread through the forested landscapes of Ireland to the north, east, and south. As a more successful competitor, grey squirrels have caused a decline in native red squirrel (*S. vulgaris*) populations and range on the island of Ireland. Here we identify the current southern frontier of range expansion of the grey squirrel in Munster through use of (i) public surveys and (ii) hair tube studies, an indirect method of field sampling. Public surveys were conducted through the NUIG Mammal Ecology Group website http://www.woodlandmammals.com and telephone reports. The survey was publicized by talks, posters, publications in local newspapers, and the annual NARGC publication. Fourteen woodland sites were surveyed using hair tubes. The presence of grey squirrels was confirmed in six sites through cuticular analysis of collected hairs and sightings while in the field. Hair tube surveys placed the confirmed frontier of grey squirrels behind the frontier identified by public sightings. It is suggested that public reports may track transient dispersers ahead of the established frontier while hair tube studies are better suited to the identification of newly settled populations of grey squirrels. Future work in this project will explore grey squirrel population demography through live trapping capture-mark-recapture studies in newly established populations at the frontier and compare it to that of established populations. Population modelling will examine the future predicted spread of grey squirrel populations in Ireland, identify potential corridors conducive to further expansion, and allow for the formulation of informed red squirrel conservation recommendations.
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P33 Diameters of trunks and branches, and parts and condition of trees more frequented by the longhorn beetle Rosalia in beech woodlands of Gipuzkoa (northern Spain)

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The conservation of the legally protected saproxylophagous species *Rosalia alpina* in European beech woodlands and forests involves the proper management of moribund and dead trees. The management must be based on the knowledge about the preferred habitat of *R. alpina*. However, the preference of *R. alpina* for conspicuous tree features as specific trunk and branch diameters, decay conditions (still alive, snag, log), and parts of the stem (trunk, branches) is still poorly known. The influence of these variables on habitat selection by *R. alpina* was analyzed compiling data available from six years of distributional studies of the species carried out in a wide range of heterogeneous beech woodlands of four Sites of Community Interest of the province of Gipuzkoa (northern Spain). All the trees (always beeches) that showed living individuals and emergence holes of *R. alpina* were included in the analysis. 72 living individuals and 520 holes were registered in 77 trees. The species occupied trunks Ø > 25 cm of standing beeches (either dead or still alive) more frequently than branches, logs and thinner trees. However, the same comparisons performed on the number of holes did not show differences. On the other hand, the thickest branches (Ø > 15 cm) registered higher rates of presence and number of holes. Knowing the most selected kind of trees, the making of a regional map of availability of habitat is suggested as a useful tool to plan conservation strategies.

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P34 Early colonization of arboreal lichens on planted trees in a dry Douglas-fir forests in southern British Columbia

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Arboreal lichens are excellent indicators of environmental change due to their symbiotic relationship and biology. An increasing number of studies are showing significant impact of forest harvesting on arboreal lichen diversity. Much has been learned about the key role of specific microhabitats such as deadwood, and large old trees and forest age. However there is not a lot of information about how arboreal lichens colonize planted trees in young forests. This information is critical to understand how forest plantations can contribute to biodiversity and to investigate if key processes and patterns can be identified to accelerate recovery or mitigate loss of biodiversity in patch-cut or clear-cut operations. In order to address this gap we examined the development of branches on 27 planted *Pinus ponderosa*, *Pinus contorta*, and *Pseudotsuga menziesii* trees in a patch-cut and made observations on the patterns of lichen colonization at different stages of branch development. We have examined the pattern of thalli establishment for 18 lichen taxa on over 1300 branch segments. Preliminary observations suggest that hair lichen of the genus Bryoria is unique in that it establishes by both fallen thalli from adjacent large trees (parachutes) as well as new thalli. For all new thalli establishment it appears that rougher bark substrate especially at the node of branches is a significant factor. In addition it also appears that early establishment is closely associated with an unlichenized fungus which we hypothesize is an example of facilitated succession.

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P35 Conservation priorities for a highly valuable Afromontane tree species, defined with the aid of spatial analysis of genetic data

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Prunus africana (Hook f.) Kalkman (Rosaceae) is a species of great commercial interest due to the preparation of medicinal products from its bark, to treat benign prostatic hypertrophy. The species' range spans the African continent, from South Africa to Ethiopia and west to Cameroon, but has a highly scattered distribution, limited to montane forests where it can be locally common. In addition to extensive local use and trade, bark collection and processing has created economic opportunities for rural communities, with harvest shifting from subsistence and local use to large-scale commercial use for international trade. Studies on the impacts of wild harvest on *P. africana* populations have shown that the practices adopted and the quantities extracted were not sustainable and the species was listed in 1995 in CITES Appendix II. The distribution species distribution was modelled based on the environmental envelope derived from 1,500 *P.africana* observations and the fraction of the potential range covered by protected areas was determined. Geospatial methods were then applied to chloroplast and nuclear microsatellite markers data for 32 populations from nine African countries. Priority areas for conservation of the species throughout its range, were defined, based on a combination of spatial analyses of genetic diversity data and climatic variables. The potential threats posed by climate change at the regional scale were assessed by comparing the potential distribution of *P.africana* under the current climate (based on a species' current climate preferences) with the one found under future climatic conditions for the year 2050, under the A2 emission scenario, from three Global Circulation Models. Finally, potential distribution of *P. africana* during the peak of the last glacial period was modelled, to understand how the species reacted to past climatic changes. A total of 16 tree populations were selected for priority conservation actions.

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P36 Population genetic diversity in eastern white cedar towards the northern limit of its distribution range

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Eastern white cedar (*Thuja occidentalis* L.), so called "tree of life", is one of the key tree species in boreal forest. It reaches its north distribution limit in Quebec, which allows us to address its population genetic diversity towards the northern limit of the species distribution range for the first time of its kind. In this study, we mainly focused on revealing genetic diversity and genetic structure among the populations that reside towards the north distribution limit, and testing latitudinal effects on genetic estimates by means of molecular marker. Totally, fresh foliage from 552 trees of 24 populations was sampled along north-south latitudinal gradient from marginal, discontinuous and continuous distribution zone for microsatellite genotyping analysis. Our results showed four marginal populations and three discontinuous populations had significant heterozygosity deficit. There were no significant latitudinal effects on gene diversity (Hs), allelic richness (AR), and population differentiation (Fst). While, they were significant on observed heterozygosity (Ho) (P=0.003), as well as on inbreeding coefficient (Fis) (P=0.002). Mantel tests did not detect any significant correlation between genetic and geographical distance when excluding Chibougamau samples due to their geographical locations. Bayesian analysis detected the presence of population structure. The results of analysis of Neighbour Joining Tree generally reflected the geographic origins of populations. Migrant tests identified highly probable first generation immigrants in all three distribution zones. We found a clear geographical structure and a certain level of population substructure that was similar among marginal, discontinuous, and continuous zones. The relatively high amount and structure of genetic variation in marginal populations together with their tolerance of inbreeding manifest their great potential to adapt to climate change, thus it will facilitate the northward rang expansion of eastern white cedar in the face of climate amelioration featured by warm summer and lack of extremely cold winter.

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P37 The outbreak of emperor moth in monarch birch pure stands regenerated after forest fires in northern Japan

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Background: In Hokkaido, the most northern prefecture in Japan, an outbreak of emperor moth (*Saturnia japonica*) has continued in recent years, causing the decline of monarch birch (*Betula maximowicziana*) forests regenerated after forest fires. Monarch birch is an ecologically and industrially important species because it is a typical pioneer and long life (more than 300 years) species. Aims of this study: We investigated the distribution of emperor moth and conducted the choice and non-choice feeding experiments to clarify the food selectivity of emperor moth larva among several deciduous broad-leaf tree species. Methods: A questionnaire research was done at convenience stores in four prefectures including Hokkaido in 2010 and 2011. The number of adult moths and larvae was compared among different altitude in field work. We conducted a cafeteria experiment in which leaf pieces of five deciduous broad-leaf tree species were selected by larva. We also conducted non-choice feeding experiment in which larvae were fed one kind of tree species leaf and their weights were compared among five species. Additionally, the weights of larvae feeding on four kinds of monarch birch leaves, early and late leaves of adult and sapling monarch birch were compared. Results: The questionnaire research demonstrated wide distribution of emperor moth. The density of larvae was highest at the altitude where the density of monarch birch trees was highest. The non-choice and choice experiments demonstrated higher selectivity of monarch birch than other species. The weights of larvae were highest in early leaves of adult trees, followed by late leaves of adult trees, early leaves of saplings, late leaves of saplings respectively. Conclusion: Results of this study suggest that monocultural stands of adult monarch birch trees promote the outbreak of emperor moths. To suppress it, high diversity of tree species and age is necessary.
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P38 The French National Research Program on Biodiversity, Forest Management and Public Policies: interface between managers, researchers and decision makers

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This program was launched in 1997 by the French Ministries of the Environment and of Agriculture, and managed by a national institution (the GIP ECOFOR) regrouping forest managers and scientists interested by Forest Ecosystems. The general aim was to create a dynamic mixed community, at the interface between science and management, to promote the development of new knowledge and its diffusion. Four research calls have been organized to date: they varied in emphasis from developing tools useful to managers through mixed and very applied programs to developing knowledge on the relationship between biodiversity and various ecological processes; lastly, socio-economic approaches have also been promoted. Periodic meetings are organized; they allow strengthening of the interactions between scientific teams as well as between scientists and managers. A reflection on biodiversity indicators in forests is under way. The poster presents the research topics currently addressed through the last research call and the major characteristics of this program.
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P39 The decline of grey squirrels in the midlands region of Ireland

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Following anecdotal reports on the decline of the grey squirrel (*Sciurus carolinensis*), alongside a resurgence of the native pine marten (*Martes martes*) and red squirrel (*Sciurus vulgaris*) in counties Laois and Offaly in the 2007 Irish Squirrel Survey (Carey *et al*.), an in-depth distribution survey of all three species in the region was carried out by means of hairtube and visual sightings surveys. The grey squirrel is now absent, or present at very low levels, in sites which once supported well-established grey squirrel populations. Both the red squirrel and the pine marten have been found to be widespread in the study area. Population dynamics of both species of squirrel in relation to pine marten density and habitat quality are currently being investigated in an effort to determine the cause of the regional demise of the introduced squirrel species.

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P40 Biodiversity value of sacred natural sites in developing regions

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This poster will highlight the biodiversity aspect of the project. The sacred sites were mapped to show distribution of the kayas in the landscape, and GIS techniques were used to analyse the proportion of forest that are 'sacred' compared to those which are not sacred. In addition quadrats were conducted within the Kaya forests to measure the biodiversity value of these sacred forest patches. In addition to measuring biodiversity of forest patches, uses for traditional purposes and extractive purposes were also measured. The results show that the Kaya forests are some of the only forest patches in the area, and in addition the forests contain some rare and unique species found only in East African Coastal Forests. As well as highlighting the importance of the forest patches for biodiversity conservation, the mapping also noted a number of incidences in the majority of forests of use of the sites, both for traditional and extractive purposes. This study shows that the Sacred Kaya forests of the Mijikenda people are important refuges for biodiversity in the area, and their conservation is important for the conservation of a number of species, as well as for ecosystem services that they provide the local community. In addition it was shown that the forests are important for local people due to both the tangible resources they provide, and for local cultures and traditions. The conservation of these sites is therefore a priority in light of the biological and social importance of these sites, however the conservation management must take into account the uses associated with these sites, and provide ways of working with local communities to achieve sustainable conservation of the forests.

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P41 Biodiversity and forest health monitoring in Korea

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Biodiversity conservation is an essential part to connect with the plans to maintain and enhance health of the forest ecosystem. Korea Forest Service launched 'Korea Forest Health Monitoring (KFHM)' project on 2011 to monitor the effects of natural and anthropogenic disturbances on forest ecosystems. This paper describes the analysis of monitoring results of the 1st year of KFHM. Korea has temperate climate characterized by four distinct seasons. Forest occupies 64% of the whole country. Korean government successfully has reforested disturbed forest areas since 1960's with three conifer species. However, pure planted forests are weak to global climate change, pest outbreak, and air pollution etc. Thus, forest health monitoring has been required continuously. The whole country is systematically divided into about 1,000 plots with 4 km × 4 km size. 200 plots are selected every year, and then, it is rotated every 5 years (total plots are 1,000 for 5 years). Permanent plots with 0.08 ha are set to monitor 22 variables such as tree vitality, composition and structure of vegetation, and soil characteristics. The percentage of the 1st canopy vitalities and species biodiversities are 69.2% and 1.56 for Southeastern ecoprovince, 62.7% and 1.64 for Southwestern ecoprovince, 71.6% and 1.75 for Mountainous ecoprovince, 69.7% and 1.52 for Central hilly ecoprovince, and 74.4% and 1.77 for Coastal ecoprovince. The percentage of the 1st canopy vitalities of natural forest and artificial plantation were 68.2% and 79.1% respectively. The species biodiversity based on topographic type in the side and base of a mountain is larger than that in the gradual hill areas. Soil pH of mountainous areas was more acidic than other areas in Korea. KFHM research report can be utilized by researchers as well as by policy makers to study forest ecosystems responses for long term and to monitor sustainable forest management.
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P42 Impact of cultural change on the conservation of Sacred Natural Sites

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This poster outlines the findings from the social section of the project. It demonstrates how both quantitative and qualitative methods can be used to understand how people view and use these forests. Questionnaires were used to look at the values, attitudes and belief systems and practices of local people to investigate how they differ from traditional systems and how this impacts the traditional conservation management of sacred forests.
The results show that current cultures, values and attitudes vary significantly across the different groups, and from the relatively homogenous traditional systems of the Mijikenda people. Those adhering to the traditional animistic beliefs are in the minority. However, there are a number of cases where those who have shifted to Christianity or Islam still believe in, or partake in certain traditions. The results suggest that a combined approach to conservation management which focuses both on environmental conservation as well as cultural heritage preservation would be the most effective way to engage local people in the conservation of these forest patches and succeed in creating a sustainable conservation management approach
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P43 Development of a high nature value forest area indicator for forests in Europe

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Forests cover around 40% of the European terrestrial environment and contribute to the cultural landscapes of Europe. Forests are under management for multiple functions covering both timber and non-timber production and providing ecosystem goods and services. Forests are under pressure from competing uses of land: increasing demands for future agricultural production, renewable energy from wood, urbanisation, and increased demographic pressure. Forests are also habitats for most species in Europe and provide good conditions to protect biodiversity. An emerging issue related to the sustainable management of forest ecosystems, which is not addressed within the current set of indicators of the Streamlining European Biodiversity Indicators (SEBI), is the high nature value (HNV) concept. High levels of biodiversity in forests can be supported by a combination of structural, compositional and functional characteristics. The degree of forest naturalness should be assessed to determine whether a forest can be considered an HNV forest. HNV forests can be defined as all natural forests and those semi-natural forests in Europe where forest management supports a high diversity of native species and habitats, the presence of species of European, national, and regional conservation concern. An indicator for HNV forest areas will support the identification of areas with a high biodiversity potential in forests outside the protected areas and will determine which forest management types are best suited to support and protect biodiversity in forests. Maintaining and developing HNV forest areas will be essential for protecting biodiversity in managed forests in Europe and can support the halt of loss of biodiversity. The concept of the HNV forest area indicator is presented as well as first attempts to map the distribution and conservation status of HNV forest areas in the pan-European region on the basis of in-depth analysis of existing and available data.

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P44 A chemo-ecological study on host plant selection of the invasive ALB

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A lot of different insects feed on poplar trees. In the context of the production of renewable resources and the biodiversity on short rotation plantations it is important to investigate why some poplar species are more infested than others. Therefore we analysed the chemodiversity of the volatile organic compounds (VOC) emitted by the poplar leaves during the metabolic activity. We analysed the VOCs of the intersectional poplar hybrid MAX 1 (*P. maximowiczii* x *P. nigra*). This is a crossing of the section Tacamahaca (Balsam Poplars) and Aigeiros (Black Poplars). The dangerous invasive Asian Longhorned Beetle *Anoplophora glabripennis* (ALB) seems to prefer poplar species belonging to specific sections. We tested the antennal response of ALB to selected chemical compounds of the MAX1 blend with an electrophysiological setup (EAG). First results show that there are positive reactions to the alcohols Hexanol, trans-2-Hexenol and Linalool. The Aldehydes trans-2-Hexenal, 3-Methylbuten-2-al and Benzaldehyde also induced positive antennal reactions. Methyl Salicylate also shows clear reactions. Knowledge of attractive compounds can help to find planting mixtures of preferred and nonpreferred tree species, and this practice can successfully prevent outbreaks pest species.
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P45 The influence of forestry on epiphytic lichens and bryophytes at different spatial scales in mixed temperate production forests

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Forestry influences patterns of forest dwelling organisms, controlling forest conditions as tree species composition, stand structure, microclimate, forest continuity. Comparative studies across different management regimes and regions proved that epiphytic lichens and bryophytes are among the most sensitive organisms, also representing a large amount of forest biodiversity. Despite the fact that they occupy the same physical space and are potentially limited by the same environmental conditions, only a few studies simultaneously addressed their patterns and interactions. Epiphytes are influenced by environmental factors whose importance may depend on the scale of the analysis. Hence, for providing effective conservation strategies the influence of different management-related factors should be evaluated at different spatial scales. The aim of this study was to evaluate the influence of environmental factors indicative of stand and tree level conditions on epiphyte communities in mixed temperate production forests. The study region was the Őrség National Park at the westernmost part of Hungary. Both lichens and bryophytes were strongly influenced by tree species composition (stand level), host tree species (tree level) being among the main determinants for epiphyte species richness and composition. However, the two groups differently responded to other factors, bryophytes being most sensitive to stand structure and tree size, while lichens were mainly influenced by microclimate (i.e light conditions). The influence of landscape and historical factors was not supported by our models. This result may be explained by the relatively high forest cover in the landscape, by the high habitat connectivity, and by the fact that most of our plots have a relatively long forest continuity. Our study indicates that patterns of epiphytes within mixed temperate production forests are influenced by drivers acting at different spatial scales and that management practices should be modulated accordingly.

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P46 Forest diversity at multiple scales influences the severity of native insect outbreaks in North American forests

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Native forest insect outbreaks in North American forests cause substantial socioeconomic losses that could be mitigated given a better understanding of how biological diversity, at various spatial scales, influences the amount and distribution of damage across landscapes. The objective of this study was to describe how stand and landscape-level structural and compositional forest diversity effects outbreak severity for two forest-insect systems: i) spruce budworm (*Choristoneura fumiferana*) in spruce/fir boreal forests of eastern Canada and ii) mountain pine beetle (*Dendroctonus ponderosae*) in pine forests of western Canada. I found that the incidence of spruce budworm-caused balsam fir deaths in stands was substantially lower among stands and landscapes mixed with deciduous tree species compared to those of pure conifer forests. More abundant and diverse insect parasitoid communities associated deciduous with forests likely explains these findings. While decision support tools estimating spruce budworm outbreak impacts have traditionally only included the effects of stand-level characteristics, I show how including landscape-level diversity substantially improves estimates of budworm impacts. Initial findings in mountain pine beetle systems show diverse stand and landscape structures influence the incidence of pine death but the relative influence of stand and landscape diversity depends on geographic region. Outbreaks in mature multi-aged/multi-storied pine stands and in landscapes of diverse pine forest ages and forest types were less severe than in mature even-aged, single storied pine stands and stands in landscapes of expansive pine forest. Stand-level structural diversity is more influential in regions were surface fire regimes generate multi-aged pine stands over large expanses while landscape-level diversity seems more important in regions where stand-replacing fires

generate a diversity of pine age-classes in landscapes over time. These findings suggest that preventative forest management introducing both structural and compositional forest diversity in stands and landscapes could mitigate native insect outbreak impacts and help achieve sustainable forest management goals.

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P47 Deer Impacts in Woodland Sites of Special Scientific Interest, England

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We present results of two surveys of 80 woodland SSSIs across four regions over a 5 year interval. The impacts of deer were monitored and analysed against management effort. Generally, impacts were more severe in East England and the East Midlands. Collaborative management and management implications are discussed.

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P48 Assessment of biodiversity in Ireland's National Forest Inventory

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Ireland's first statistical National Forest Inventory (NFI) was completed in 2007. The purpose of the NFI is to record and assess the current extent, state and composition of Ireland's forest resource, both public and private, in a timely, accurate and reproducible manner. In total 1,742 plots were visited nationally, each representing approximately 400 ha. The information gathered in the NFI encompasses the traditional parameters, such as the area and species composition of the national forest estate and the growing stock, as well as, information with regard to biodiversity, health status, carbon content and soil type, for the entire forest estate. Field data collection was undertaken by professional foresters. Field data collection for the second NFI cycle commenced in October 2009 and will be completed in October 2012. Changes in the forest estate between first and second assessments will facilitate the monitoring of sustainable forest management in the national forest estate. In relation to biodiversity the NFI currently records information on forest structure, plant species, soil type, deadwood, lichen cover and damage events. Following completion of the second cycle field data collection a review of the methodology will be undertaken to ensure that the NFI is recording the most relevant information. Integration of recent research work in relation to biodiversity will be a priority. During 2013, a review group will be established to examine how biodiversity is currently monitored by the NFI and more importantly establish a revised methodology to be used in subsequent NFI's. As the NFI is the only long-term monitoring project in place for the national forest estate it essential that the inventory provides relevant data for the monitoring of biodiversity in the national forest estate.

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P49 Forest restoration: a case study in the Calabria pine stands

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Studies of gap dynamics contributed significantly to our understanding of forest management in accordance with the principles of sustainable silviculture and biodiversity conservation. The creation of gap cutting system is actually a point of reference both in Italy and abroad for who try to imitate through the forest management the natural disturbances. Gap dynamics allows to increase the heterogeneity of habitats and the compositional and structural complexity of forest stands. The aim of this study was to assess: 1) the role of gap dynamics on the increasing biodiversity in the Calabria pine afforestations; 2) the effects of the environmental factors on different gap size. The experiments were launched in 2003 on 50 years-old Calabrian pine man-made stands in Southern Apennine (38° N). A randomized complete block of six circular gaps: two small (380 m^2), two medium (855 m^2) and two large (1520 m^2) were created by removing all trees. A fixed ratio (equal to 1.0, 1.5 and 2.0) between gap diameter (D) and top height (H) was adopted. Eight years after the starting of the experiment, Calabrian pine dominated in the medium and large gaps, whereas native species such as Silver fir and Beech prevailed inside the smaller gaps The results indicates that the gap cutting system in the Calabrian pine afforestations represents a practice with low environmental impact for the restoration of native stands and a good practice for increasing the biodiversity and the structural diversification.
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P50 High variability of edge effects on forest vegetation diversity

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The influence of edges on vegetation diversity in forest fragments is an important issue for biodiversity conservation because of the large part of temperate woodlands concerned. In numerous empirical studies, a general pattern has been identified; it is described as two zones: the edge where plant distribution is linked to the distance from the forest border, the core area where the variability of vegetation is not linked to this distance. We present results of a study aiming at measuring the edge effects on vegetation in forest fragments in south-western France and at identifying potential factors of their variability. Vegetation was sampled in 28 transects constituted by 20 contiguous quadrats (2x2m). Environmental conditions (soil, light) of each quadrat was measured and each transect was assigned to a type of forest border based on its orientation and adjacent land cover. Historical records on each border were also available. Multivariate ordination methods were used to analyse data to identify patterns in species distribution. Our results showed a larger variability of vegetation response to edge influence than what was expected from literature. Beta diversity between transects, and in a given transect between quadrats was high and few species appeared as associated with edge conditions. However, multitable ordination of the quadrats from the 28 transects analysed together showed a common pattern of response of vegetation, but it seemed to have several parts that had not been described before in the literature. None of the factors measured was able to explain this variability. These results underlined the variability of edge effects on forest vegetation that was often underestimated by biodiversity managers.
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SECOND INTERNATIONAL CONFERENCE ON BIODIVERSITY IN FOREST ECOSYSTEMS AND LANDSCAPES

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P51 Differences in plant species richness between ancient and post-agricultural pine forests in Central Poland ADDITION

Jan Matuszkiewicz, Anna Kowalska, Anna Kozlowska, Ewa Roo-Zielinska and Jerzy Solon
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Deforestation due to agriculture development was one of the most important indication of human pressure on the environment in the past centuries. Whereas, in the late 19th and 20th century, socio-economical or sometimes political changes resulted in the abandonment of the poorest arable lands and in their afforestations. Post-agricultural forests are characterized by a plough level in soil and a specific structure of the undergrowth layer. In Poland, like in many other European countries, post-agricultural forests established at different times are frequently observed. A representative example is the region of former German-Polish borderland (East Prussia and Kurpie), investigated in this study. The aim of the study was to indicate differences in plant species composition and richness between ancient and recent, post-agricultural forests, established at different times. 202 phytosociological releves were collected in pine forest communities of *Peucedano-Pinetum* W.MAT. (1962) 1973 habitat. The data set was divided into 4 categories: ancient forests and 3 groups of recent forests with different regeneration period. Species frequency was calculated in the categories. The origin of each wood was ascertained with the help of historical topographical maps dating from 1740. The analysis of floristic composition and richness in 4 distinguished pine forest categories determined species groups differed on frequency. The significance of the results was tested statistically. Ecological peculiarity of the species groups was investigated. There were noticed 4 species groups: (i) present in all pine forests categories, (ii) with clear preference for ancient forests and different colonisation rates in recent forests, (iii) associated with early phases of forest regeneration and heavy disturbance level, (iv) associated with late phases of forest regeneration or with former pressure on partly regenerated stands.

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