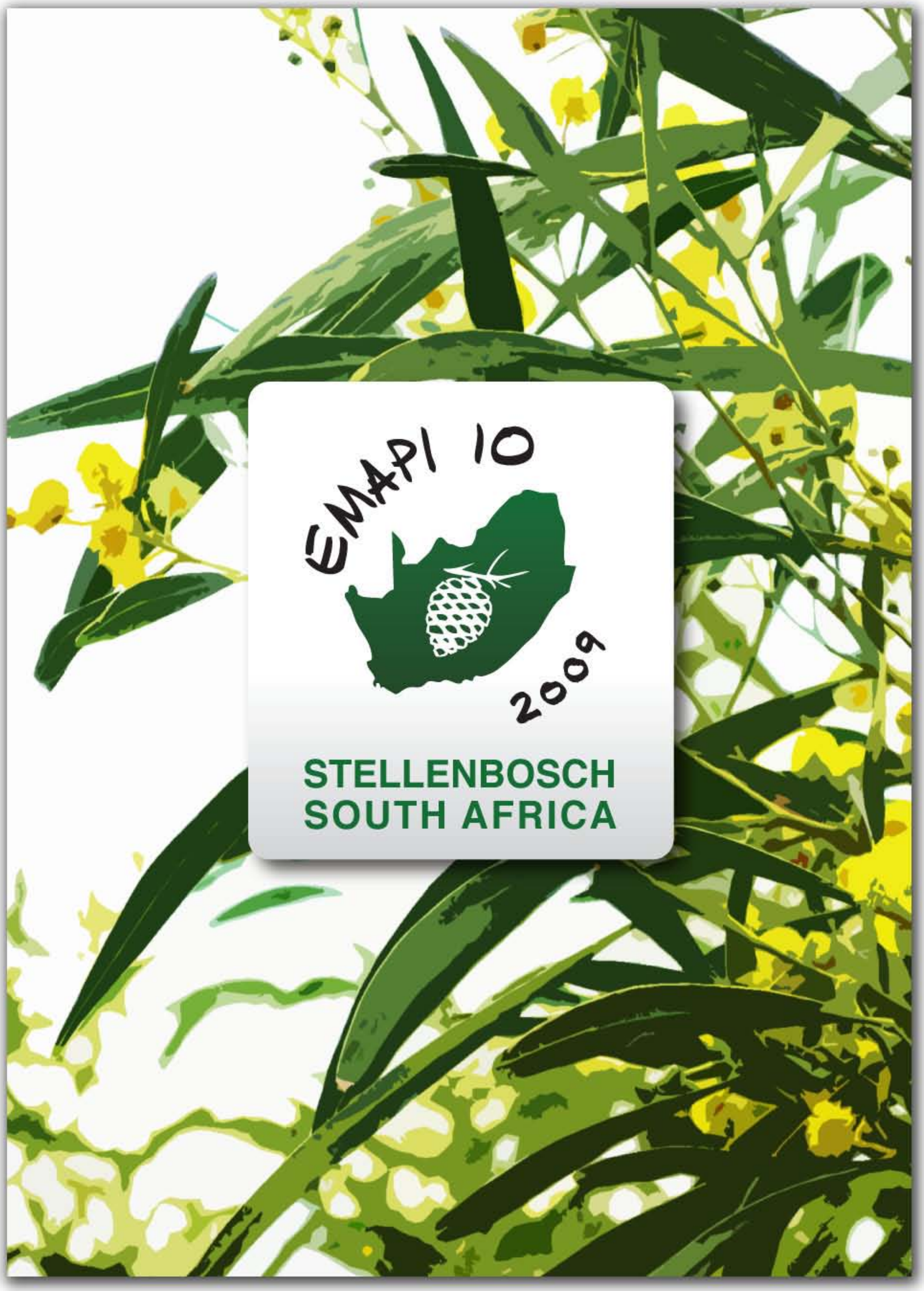
EMAPI 10
2009
STELLENBOSCH
SOUTH AFRICA

10th INTERNATIONAL CONFERENCE

Ecology and Management of Alien Plant Invasions

23-27 August 2009

STELLENBOSCH, SOUTH AFRICA

South African Organizing Committee

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Karen Esler, Stellenbosch University
Llewellyn Foxcroft, South African National Parks
Jaco le Roux, Stellenbosch University
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The DST-NRF Centre of Excellence for Invasion Biology (C•I•B) is an inter-institutional Centre of Excellence established within the Centres of Excellence Programme, and co-funded principally by the South African Department of Science and Technology (DST), through the National Research Foundation (NRF), and Stellenbosch University (SU). The C•I•B was established in 2004 with the mandate to conduct RandD and training in biodiversity science especially as it applies to understanding the impacts of, and managing and preventing biological invasions.

VISION

The *raison d'être* of the C•I•B is to provide the scientific understanding required to reduce the rate and impacts of biological invasions in a manner that will improve the quality of life of all South Africans.

MISSION

The mission of the C•I•B is to:

- undertake research and education in biodiversity and ecosystem functioning, including investigations of the changes in biological diversity that are a consequence of biological invasions, the consequences for ecosystem functioning of these invasions and their remediation, and the longer-term effects of invasions on ecosystem services under a climate of environmental and land-use change;

- remain at the forefront of research regarding biological invasions, biodiversity and ecosystem functioning by pursuing research excellence, interdisciplinarity, and by encouraging local, regional and international exchanges;

- enhance its national and international standing by means of: 1. a coordinated programme of innovative research, the products of which will be broadly disseminated in the international literature; 2. graduates who are sought after for their knowledge, creative, critical thinking, and for their expertise; 3. a well-supported core and associated staff who are respected and trusted by their peers, clients, and community;

- remain relevant to the needs of the community, focusing on South Africa in the context of trends shaping Africa and the global community.

C•I•B Partnerships

The C•I•B has a wide range of international collaborations and formal partnerships with RandD and training institutions. These span several countries and a range of organizations from government agencies to University Departments. Memoranda of Understanding have been signed with the Working for Water Programme, the University of Sheffield (U.K.), University of Tennessee (U.S.A.), Pontificia Universidad Católica de Chile, South African National Parks, South African Institute for Aquatic Biodiversity, Iziko Museums of Cape Town and the Western Cape Nature Conservation Board (CapeNature).

Additional Information and Contact Details

Further information on the C•I•B and its partners is available on the C•I•B home page at: www.sun.ac.za/cib

Greetings Colleagues

EMAPI 10 - "Effective intervention through enhanced collaboration"

The conference series on "*Ecology and Management of Alien Plant Invasions*" (*EMAPI*) has become the premier international forum for scientific research in the field of plant invasions.

The *EMAPI* story began in April 1992 with the 1st International Workshop on the Ecology and Management of Invasive Riparian and Aquatic Plants at Loughborough University in the U.K. *EMAPI 2* was held in the Czech Republic in 1993. Since then, *EMAPI* conferences have been held every 2-3 years (in Arizona, Germany, Italy, the United Kingdom, Florida, Poland, and Australia).

EMAPI conferences have been very influential in shaping the research agenda for the study of plant invasions worldwide. Most conferences have yielded an edited book, special issues of journals, or both. Probably much more important though have been the collaborations that have been forged through the personal contacts made at *EMAPI* gatherings. These were initially focussed in Europe and, to a lesser extent, North America. *EMAPI* is now truly global in its reach, as is reflected by the number (29) and geographical spread (all continents) of countries represented at this conference.

Also clearly evident from the programme for *EMAPI 10* is the wide scope of topics and disciplines besides biology and ecology that now occupy the time and research effort of those who work on invasive plants. Those wanting to stay informed of developments regarding plant invasions now need to read about communication, education and social marketing, global change biology, mapping and modelling, molecular biology, policy studies, restoration ecology and risk analysis, to name but a few fields. Plant invasions are impacting on almost every facet of resource management and there are numerous challenges facing those tasked with management.

EMAPI 10 is the first conference in the series to be held in Africa. A recent review of geographical biases in invasion ecology (Pyšek *et a*l. 2008; *Trends in Ecology and Evolution* 23: 237-244) showed a clear under-representation of published studies on invasive species from Africa (although South Africa is reasonably represented). Poor knowledge of the extent and impacts of invasions in Africa undermines current efforts to instigate far-reaching management initiatives to reduce impacts of invasive species on biodiversity and ecosystem functioning in African ecosystems. Martin Nuñez and Aníbal Pauchard (*Biological Invasions*, in press) have highlighted some crucial differences between developed and developing countries that influence the capacity to address problems relating to invasive species. These include factors that people in developing countries tend to take for granted, like the presence of a stable community of scientists, the availability of a corps of volunteers to participate in key phases of research and management, and a high level of public awareness of the problems associated with invasions. On the other hand, people in developing countries have a higher dependence on natural resources, and in some cases are the custodians of the most important biodiversity hotspots. But, access to cheaper labour can open doors for operations that are impossible in developed countries. We are only beginning to grapple with the complexities of forging sustainable management initiatives across regions that span a range of development levels. I am pleased to note that researchers and managers from at least seven African countries have registered to attend *EMAPI 10*. We very much look forward to hearing their experiences and insights and to forging productive collaborations.

Many thanks to everyone for attending, especially those who have travelled from distant parts of the world, and for the hard work that has gone into the papers and posters. Sincere thanks, too, to Retha Venter who co-ordinated the conference, Christy Momberg who handled most of the financial matters and many other things, and to all the members of the local organizing committee who moved mountains to make *EMAPI 10* happen. It was a huge pleasure to work with such a dedicated team! Finally, we are most grateful to all our sponsors (named elsewhere in this booklet) for their generous support.

Please enjoy the conference and make the most of the opportunities afforded to interact with fellow delegates.

David M. Richardson
Chair, Organizing Committee, EMAPI 2009

Sunday 23 August

17:00–20:00	Registration (daily registration also available 7:30–9:30)
18:30+	Reception

Monday 24 August

08:00–08:30	Opening Minister Anton Bredell, Department of Local Government, Environmental Affairs and Development Planning, Provincial Government of the Western Cape
08:30–09:15	**Plenary 1**: Prof. Marcel Rejmánek, University of California, Davis, USA
09:15–10:30	Climate and change; Perceptions and actions; Enemies and mutualists
10:30–11:00	Morning Tea + Posters
11:00–12:15	Restoration and rehabilitation; Developing regional strategies; Phylogeny and function
12:15–13:45	Lunch + Posters
13:45–14:30	**Plenary 2**: Prof. Mark Burgman, University of Melbourne, Australia
14:30–15:30	Risk Analysis; Impacts on Plant Species Richness; Pine Symposium 1 (Organised by Ramiro Bustamante, Aníbal Pauchard and Martin Nuñez)
15:30-16:00	Afternoon Tea + Posters
16:00–17:00	Early detection and eradication; Impacts on other trophic levels; Pine Symposium 2
18:30+	Dinner at Moyo (Spier)

Tuesday 25 August

08:30–09:15	**Plenary 3**: Prof. Spencer Barrett, University of Toronto, Canada
09:15–10:30	Policy; Mountains Symposium 1; Molecular ecology (Mountain Symposium organised by Aníbal Pauchard and José Arévalo)
10:30–11:00	Morning Tea + Posters
11:00–12:15	Inferences from mapping; Mountains Symposium 2; Evolution
12:15–13:45	Lunch, Posters, + Workshop (What do we know and what do we need to know to nip them in the bud, early detection and eradication)
13:45–14:30	**Plenary 4**: Prof. Sue Milton, University of Cape Town, South Africa
14:30–15:30	Protected Areas 1; Grasses; Soil and Water
15:30-16:00	Afternoon Tea + Posters
16:00–17:00	Protected Areas 2; Seeds: movement and control; Nurseries
17:00+	Evening Free

Wednesday 26 August

Fieldtrips depart 8am, return 5pm

Tour 1: Cape Peninsula

Tour 2: Darling Wildflowers

Tour 3: Slanghoek Biocontrol

Tour 4: Hermanus Coastal Trip

Thursday 27 August

08:30–09:15	**Plenary 5**: Dr. Peter Dye, University of the Witwatersrand, South Africa
09:15–10:30	Surveying and Sampling; Costs and Benefits; Integrated management
10:30–11:00	Morning Tea + Posters
11:00–12:15	Predicting Distributions; Practical management, the South African experience; Integrated Management
12:15–13:45	Lunch, Posters, + Workshop (Invasive alien species in Africa, the politics and funding [or lack of])
13:45–14:30	**Plenary 6**: Prof. Petr Pyšek, Institute of Botany, Czech Academy, Czech Republic
14:30–15:15	African Invaders; Invasions in Europe; Open Session
15:15-15:45	Afternoon Tea + Posters
15:45–16:30	**Plenary 7**: Mr. Arne Witt, Coordinator: Invasive Species, CABI Africa, Kenya
16:30–16:45	Planning of next meeting
16:45–17:00	Closing words
19:00	Conference Dinner (Spier Auditorium) and Close

MONDAY, BEFORE LUNCH

08:00 **Opening Ceremony, Minister Anton Bredell,** Department of Local Government, Environmental Affairs and Development Planning

08:30 **Plenary 1: Prof. Marcel Rejmánek, University of California, Davis, USA "Causes and consequences of plant invasions: our current understanding"**

	Climate and change Chair: Petr Pyšek	*Perceptions and actions* Chair: Llewellyn Foxcroft	*Enemies and mutualists* Chair: Michelle Leishman
09:15	**Rodriquez-Tunon and Osborne** Climate change impacts on a native and a non-native invader	**Esler et al** How wide is the "knowing-doing" gap in invasion biology?	**Traveset and Padrón** Impact of alien plant invaders on island pollination networks
09:30	**Wilson PD et al** Weeds in a warmer world: understanding the implications of climate change for Australia's weeds	**LaRosa and Johnson** Much ado about biocontrol: outreach to a risk averse public	**Kotanen and Hill** Escape from Enemies: the role of relatives
09:45	**Thiébaut** Global warming and range expansion of invasive aquatic species	**Schneider et al** A survey of Australian farmers on the topic of *Nassella trichotoma* prevention management	**Sheppard et al** Enemy escape may increase optimal flowering size in monocarpic invasive plants
10:00	**Michael and Mandel** Changes in weed spectrum in the southern agricultural region of Australia over the past 10 years	**Urgenson et al** Stakeholder perception and management of alien invasive plants on private land in the Western Cape, South Africa	**Den Breeÿen et al.** Role of fungal endophytes in promoting invasiveness of Acacia species in South Africa
10:15	**Coetzee** Better the devil you know than the devil you don't: submerged aquatic weed invasions in South Africa	**Spier Estate** Tackling plant invaders at Spier Wine Estate in the Western Cape	**Veldtman et al** Holding up a mirror to bio-control: emerging associations are reflected in the native range
10:30–11:00		Morning Tea + Posters	
	Restoration and rehabilitation Chair: Mirijam Gaertner	*Developing regional strategies* Chair: Arne Witt	*Phylogeny and function* Chair: John Wilson
11:00	**Khena and Fourie** Riparian restoration: developing best management practices	**Baret et al** Management strategy of invasive alien species on Réunion Island (Mascarene Archipelago, Indian Ocean)	**Winter et al** Losing uniqueness: Plant extinctions and introductions lead to phylogenetic and taxonomic homogenization of the European flora
11:15	**Geldenhuys** Rehabilitation of natural forest through invader plant stands: concepts, process and practice	**LaRosa** Pacific Invasives Partnership: a successful model for global invasive species coordination and management	**Procheş et al** Spatial relationships between alien and indigenous plants
11:30	**McAlpine and Wotton** Using native plant succession to manage weeds in New Zealand	**Roura-Pascual et al** Towards more efficient management of invasive alien plants in the Cape Floristic Region: Identifying priority areas	**Rodger et al** Does self fertilisation contribute to invasion? A case study on *Lilium formosanum* in South Africa
11:45	**Marchante et al** Ecosystem restoration after removal of the N_2–fixing invasive *Acacia longifolia*	**Krug et al** Towards more efficient management of invasive alien plants in the Cape Floristic Region: Optimising the priorities	**Shaw and Chown** Plant invasion as a driver of functional diversity: Southern Ocean islands as a case study
12:00	**Reid and Morin** Does invasive plant management aid the restoration of natural ecosystems?	**Douwes** Invasive alien plant control—interventions in Durban	**Van Kleunen et al** Do functional traits of plant species determine invasiveness?
12:15–13:45		Lunch + Posters	

MONDAY AFTER LUNCH

13:45 **Plenary 2 : Prof. Mark Burgman University of Melbourne, Australia "Trends in risk assessment for biosecurity"**

	Risk Analysis Chair: Curt Daehler	*Impacts on Plant Species Richness* Chair: Lindsey Norgrove	*Pine Symposium 1* Chair: Ramiro Bustamante, Aníbal Pauchard, and Martin Nuñez
14:30	**Wearne and Januchowski** Can we predict wetlands at risk from invasive macrophytes in Northern Australia?	**Gaertner et al** Fact or Fiction: species richness decline after alien invasions – a meta-analysis	**Richardson** Trees as invasive aliens world-wide: how do pines fit in?
14:45	**McClay et al** Evaluation and modification of the Australian weed risk assessment system for use as a preintroduction screen in Canada	**Paterson and Hill** The impact of *Pereskia aculeata* Millar (Cactaceae) on native biodiversity and measuring the success of biological control	**Raal et al** Scattered wilding conifer surveillance, control and monitoring in the Otago conservancy, New Zealand
15:00	**Sissons et al** The Canadian perspective: harmonizing risk assessment for weediness and invasiveness for plants with novel traits (living modified organisms) and plant as pests	**Hejda et al** Impact of alien plants on species diversity of invaded communities is determined by differences in vigour of the invader and native dominant	**Van Wilgen** The management of alien conifers in South Africa: three centuries of benefits, impacts and conflict resolution
15:15	**Walshe and Burgman** A pragmatic framework for assessing invasive species and emerging disease risk	**Taye et al** Parthenium weed (*Parthenium hysterophorus* L.) in Ethiopia: impacts on food production, plant biodiversity and human health	**Zenni** Patterns and prognosis of pine invasions in sub-tropical Brazilian ecosystems
15:30-16:00		Afternoon Tea + Posters	
	Early detection and eradication Chair: Andy Sheppard	*Impacts on other trophic levels* Chair: Mark van Kleunen	*Pine Symposium 2* Chair: Ramiro Bustamante, Aníbal Pauchard, and Martin Nuñez
16:00	**Darin et al** Prioritizing weed populations for eradication at a regional level	**Uys et al** Invertebrate faunal exchange in a mosaic of montane native and alien vegetation	**Nuñez** Pinaceae invasion in Argentina: General patterns and factors controlling their spread
16:15	**Mashope et al** Management of an emerging weed: *Cylindropuntia tunicate* in Graff-Reinet	**Downey and Turner** The role of birds in alien plant invasions and native plant decline: consequences for biodiversity, conservation and revegetation	**Bustamante et al** Pines Invasion in Chile: Patterns, Processes and ecological consequences
16:30	**Wilson JR et al** Assessing the eradication feasibility of emerging Acacia species	**Bedada and Tessema** Assessment of herbivorous insects associated with invasive prosopis (*Prosopis juliflora*) in Amibara District, Afar Regional State, Ethiopia	**Panel Discussion** The invasion ecology of pines in South America: patterns, processes, prognosis, and lessons
16:45	**Van Wyk et al** Early detection as a complex adaptive system: lessons from the past and implications for preparing for imminent alien plant invasions	**Norgrove and Ndzana** Impact of *Imperata cylindrica* on granivory and seedling destruction in maize fields in Cameroon	
18:30		Dinner : Moyo @ Spier	

TUESDAY BEFORE LUNCH

08:30 **Plenary 3 : Prof. Spencer Barrett, University of Toronto, Canada "Evolution and local adaptation in invasive plants"**

	Policy Chair: Tony Grice	*Mountains Symposium 1* Chair: Aníbal Pauchard and José Arévalo	*Molecular ecology* Chair: Jaco Le Roux
09:15	**Spear et al** Challenges to the development of a global indicator for invasive plant species	**Alexander et al** Global patterns of plant invasion along altitudinal gradients	**Fennel and Osborne et al** Molecular ecology of *Gunnera tinctoria* invasions
09:30	**Ziller and Dechoum** Providing capacity building for the management of invasive alien species: building public policies in Brazil	**Haider et al** Distribution patterns of mediterranean and temperate non-native species in mountain regions: comparisons between Switzerland and Tenerife	**Novak et al** Allozyme diversity in native and invasive populations of medusahead (*Taeniatherum caput-medusa*e)
09:45	**Mallett-Johnson** Implementing biosecurity awareness on declared plants and other invasive weed species: departmental training	**Pauchard et al** Consistent negative relationship between non-native plant species and elevation in south-central Chile	**Thompson et al** The Port Jackson 4 – a molecular analysis of *Acacia saligna* across its invasive range
10:00	**Sheppard et al** Weedy potential biofuel crops in Australia: Regulatory and risk assessment processes associated with cross sector risks	**Arevalo et al** Do anthropogenic corridors homogenize plant communities at a local scale? A case study in Tenerife (Canary Islands)	**Jahodova et al** Molecular ecology of invasive *Heracleum mantegazzianum* across European continent and in the native Caucasus
10:15	**Blanchard et al** Biofuels – fuelling biological invasions?	**Jakobs and Daehler et al** Naturalized and invasive plant distributions along altitudinal transects in Hawai'i	**Barnaud et al** Patterns and pathways of weed invasion: evidence from the spatial genetic structure of *Raphanus raphanistrum*
10:30–11:00		Morning Tea + Posters	
	Inferences from mapping Chair: Andrew McConnachie	*Mountains Symposium 2* Chair: Aníbal Pauchard and José Arévalo	*Evolution* Chair: Spencer Barrett
11:00	**Phiri et al** Co-occurrence: alien and indigenous plant species along rivers on Marion Island	**Wu et al** Patterns of plant invasions in the reserves and recreation areas of Shei-Pa National Park in Taiwan	**Molofsky and Collins** Evolution of range margins in invasive species
11:15	**Beukes et al** Classifying spatial distribution of woody aliens in South Africa, Swaziland and Lesotho: Quantifying the relationship between woody alien species and the environment using the SAPIA dataset	**Chiarucci et al** Spatial determinants and diversity partitioning of alien and native species along roadside elevational gradients in Tenerife, Canary Islands	**Harris and Leishman et al** Comparing the reproductive output of introduced plants in their native versus introduced ranges: do more or larger seeds contribute to invasion success?
11:30	**Santos et al.** Modelling the spatial distribution of alien plant species: the case study of *Acacia* in Portugal	**Ansari and Daehler** Life history variation of the introduced weed *Verbascum thapsus* along an elevational gradient of Mauna kea mountain in Hawaii	**Godoy et al** Phenotypic plasticity of invasive alien plant species in Spain: a broad phylogenetic comparison
11:45	**Howison O et al** Using remote sensing and GIS to map invasive alien plants and assess impacts of biodiversity: A study on *Chromolaena odorata* in KwaZulu-Natal, South Africa	**Jakobs and Daehler** Adaptive evolution and plasticity define the distribution of European weeds across elevation gradients in Hawai'i	**Cuneo and Leishman** Tackling the next generation of woody weeds: ecology and management of invasive African Olive in eastern Australia
12:00	**Carvalho et al** Hyperspectral remote sensing approach to study the biochemical properties of *Senecio inaequidens* and *Jacobaea vulgaris*	**Discussion**	**Suda et al** Applications of flow cytometry to plant invasion biology

12:15–13:45 Lunch, Posters, + Workshop (*What do we know and what do we need to know to nip them in the bud, early detection and eradication*—**Philip Ivey**)

TUESDAY AFTER LUNCH

13:45 **Plenary: Prof. Sue Milton, University of Cape Town, South Africa "Plant invasions in arid areas—special problems, special solutions"**

	Protected Areas 1 Chair: David le Maître	*Grasses* Chair: Şerban Procheş	*Soil and Water* Chair: John Hoffmann
14:30	**Foxcroft et al** Keeping unwanted neighbours out: protected area boundaries as barriers to alien plant invasions	**Brock** Invasion of *Pennisetum cilare* and its control in the deserts of southwestern North America	**Fierro et al** Exotic and native tree litter effects on soil properties in two contrasting sites in the Iberian Peninsula
14:45	**Dechoum and Ziller** Control of invasive alien plants in protected areas in Brazil	**Rahlao et al** Fountain grass (*Pennisetum setaceum*) performance along the environmental gradient in South Africa	**Ramaswami** Distribution and spread of the alien invasive plant *Lantana camara* in a dry tropical forest plot at Mudumalai, Southern India
15:00	**Downey et al** Evaluating alien plant management across protected areas in New South Wales, Australia	**Le Roux et al** Genetic diversity of the globally invasive grass *Pennisetum setaceum*	**Masfaraud et al** Competitive ability of *Solidago canadensis* L. in spontaneous successions of polluted wastelands
15:15	**Trueman et al** Galapagos National Park is on the brink of further plant invasion	**Grice and Clarkson** Ecological basis of grass invasions in Australia	**Le Maître and Wise** Current and potential invasions by *Prosopis* species in South Africa: development of a model for assessing the impacts on groundwater resources
15:30-16:00		Afternoon Tea + Posters	
	Protected Areas 2 Chair: Paul Downey	*Seeds: movement and control* Chair: Alana Den Breeÿen	*Nurseries (1st talk in Soil and Water cont.)* Chair: Marcus Byrne
16:00	**Nkya and Janse van Rensburg** A Tanzanian perspective on alien plant control: the Ikorongo Grumeti game reserves pilot alien plant control programme	**Bar Kutiel et al** Management tools for controlling the seedbank of invasive plants – the case of *Acacia saligna*	**Mwihomeke and Omara-Ojungu** Knowledge gaps on invasion potential of *Casuarina cunninghamiana* in riparian habitats of Limpopo
16:15	**Terblanche** Tackling the threat head on: invasive alien species management in Ezemvelo KZN wildlife, South Africa	**Impson and Hoffmann** Assessing the benefits of seed reducing biological control agents for perennial invasive plants	**Brunel** A code of conduct on horticulture and invasive alien plants for Europe
16:30	**Howison R et al** The effect of the invasive weed *Chromolaena odorata* on the critically endangered black rhino in Hluhluwe-iMpolozi Park, South Africa	**Skalova et al** Seed germination and seedling traits as determinants of invasion success: comparison of invasive and native *Impatiens* species	**Montgomery and Faulhammer** Jacarandas, hadedas, and floating hearts: a case study in managing social conflict through partnerships in South Africa
16:45	**Makarick** Invasive plant species management in Grand Canyon National Park: Past challenges, current efforts, and future direction	**Moravcová et al** Reproductive characteristics of naturalized plants as a tool for prediction of invasiveness	**Chrobock et al** Human-mediated selection in ornamental plant species can increase their potential invasiveness
17:00+		Evening Free	

THURSDAY BEFORE LUNCH

08:30 **Plenary: Dr. Peter Dye, University of the Witwatersrand, South Africa " Lesser of two evils—managing alien plants to enhance ecosystem services in devastated landscapes"**

	Surveying and Sampling Chair: John Brock	*Cost and benefits* Chair: Karen Esler	*Integrated management* Chair: Giuseppe Brundu
09:15	**Veldtman et al** Scale-area curves as a technique to test predicted range expansion of invasive plants	**Braack** The costs of managing *Campuloclinium macrocephalum* in the province of KwaZulu-Natal, South Africa	**Wood** Integrated weed management: comparison of two cases from South Africa
09:30	**Henderson** SAPIA and range expansion of some invasive species in South Africa	**Wise and Van Wilgen** Towards the sustainable management of a conflict of interest species: establishing the costs and benefits of Prosopis in the Northern Cape	**Ansari and Thair** Cattle grazing reduces fire hazard from invasive guinea grass on a military training area and its neighbouring residential community in Hawaii
09:45	**Kotze et al** South African invasive alien plant survey	**Ntakyo Gumisiriza et al** Economic impact of *Cymbopogon nardus* on livelihoods in pastoral systems in Uganda	**Martins and Hay** Effect of fire on reproductive behaviour of *Melinis minutiflora* (molasses grass) in the Brazilian Cerrado
10:00	**Hui et al** Identifying the optimal sampling scheme and effort for monitoring invasive alien plants	**De Lange and Van Wilgen** Assessing the costs and benefits of the biological control research programme on invasive plants in South Africa	**Gerber et al** Non-chemical management methods against invasive knotweeds (*Fallopia* spp.) – impact on target weed and recovery of native biodiversity
10:15	**Coutts et al** Do plants have common drivers of spread, and can we use them to aid management?	**Akpabey** Preliminary assessment of the social and environmental impacts of water hyacinth, *Eichhornia crassipes* (Mart.) Solms-Laubach (Pontederiaceae) in the River Oti Arm of the Volta Lake, Ghana	**Byrne et al** Management of water hyacinth in South Africa: options for biocontrol and IPM
10:30–11:00		Morning Tea + Posters	
	Predicting Distributions Chair: Mark Robertson	*Practical management the S. African experience* Chair: Justine Shaw and John Wilson	*Integrated management (continued)* Chair: Giuseppe Brundu
11:00	**Lamoureaux et al** *Nassella trichotoma*: potential global distribution under future climates		**Madamombe-Manduna and Vibrans** Does coevolution of weeds and crops predict migration success? A comparative study of maize field weeds from Mexico and Zimbabwe
11:15	**Martin and Coetzee** Distribution modelling as a tool for predicting the distributions of potentially invasive submerged aquatic weeds in South Africa	**Panel Discussion** Is our science useful? Insights from Working for Water managers in South Africa	**Session open** Book at the registration desk
11:30	**McConnachie A and Strathie** Current and potential geographical distribution of parthenium weeds in Eastern and Southern Africa		
11:45	**Moverley** Simulating weed spread and control strategies: a simulation model of *Rhamnus alaternus* on Rangitoto island		
12:00	**Saldaña et al** Can we predict the invasiveness of the Australian *Acacia* species on the basis of life-history traits and native distribution ranges?		

12:15–13:45 Lunch, Posters, + Workshop (*Invasive alien species in Africa, the politics and funding [or lack of]*—**Arne Witt**)

THURSDAY AFTER LUNCH

13:45	**Plenary: Professor Petr Pyšek, Institute of Botany, Czech Academy of Sciences, Czech Republic "There's no place like abroad: Alien plants in Europe"**		
	African Invaders Chair: Julie Coetzee	*Invasions in Europe* Chair: Marcel Rejmánek	**Session open**
14:30	**Fessehaie and Tessema** Invasive alien plant species in Ethiopia: status and management	**Brundu et al** Woody alien invaders in Italy: distribution and threats	Book at the registration desk
14:45	**Byenkya Gumisiriza et al** Evaluation of control strategies for *Cymbopogon nardus* and their impact on plant diversity in the rangelands of Uganda	**Adamowski** Ornamental non-woody plants that threaten the native flora in Białowieża Forest (NE Poland)	
15:00	**Nkandu** Coping with the invasion of the Kafue River floodplain in Southern Zambia by the invasive plant *Mimosa pigra*	**Winter et al** The European legacy of plant invasions: Why is Europe suffering less from invasions than other regions?	
15:15-15:45	Afternoon Tea		
15:45	**Plenary: Mr. Arne Witt, Coordinator Invasive Species, CABI Africa, Kenya "Alien plant invasions in sub-Saharan Africa—status, prognosis, and key challenges for management"**		
16:30	Planning for next EMAPI conference (tbc)		
16:45	Closing words, Prof. D. M. Richardson, Centre for Invasion Biology, Stellenbosch		
17:00	Close		
19:00 for 19:30	Conference Dinner (Spier)		

EVOLUTION AND LOCAL ADAPTATION IN INVASIVE PLANTS

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Recent plant invasions provide outstanding opportunities for investigating the evolution of local adaptation during contemporary time scales. Geographical range expansion following introduction requires that invading plants solve the problem of establishment and reproduction in new environments. Phenotypic plasticity can assist in this process but the most durable solution is the evolution of local adaptation. The scope of local adaptation during range expansion depends critically on the amount and kind of genetic variation within populations. In flowering plants, this variation is particularly affected by the reproductive systems of invaders, the role of founder events during colonization, and the occurrence of gene flow among invading populations. Here, I review our work on the ecology and genetics of plant migration focusing in particular on evolutionary changes to reproductive traits in Purple Loosestrife (*Lythrum*) and Water Hyacinth (*Eichhornia*), two notorious invaders of wetland habitats. Using quantitative genetic analyses, I provide evidence that in Purple Loosestrife shifts in life history and reproductive phenology have accompanied northward migration in eastern N. America. In contrast, using DNA sequence data I demonstrate that in Water Hyacinth Neotropical migrations have been facilitated by multiple independent origins of selfing, enabling colonies to establish after long-distance dispersal. Knowledge of the likelihood and tempo with which local adaptation is likely to evolve is of importance to evolutionary biologists, managers and conservation planners.

TRENDS IN BIOSECURITY RISK ANALYSIS

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Most countries employ qualitative methods to assess biosecurity risks. Exceptions occur in some high-profile and contentious cases, or in situations in which there are abundant data. The prevailing philosophy is that if direct data are unavailable to fully parameterize a quantitative model, then the development of such models is unjustified. A few steps have been made in the direction of quantitative models, notably, some recent import risk assessments by Biosecurity Australia, and a point-scoring method for assessing potential weed risks adopted by the Federal Australia government. Other structured approaches, such as the British EPPO scheme, supplement qualitative assessment with rules and guidelines. The perspectives embodied in international biosecurity risk analyses assume that uncertainties in explicit (quantitative) models should be characterized by statistical distributions. Analysts are appropriately sceptical of methods that presume more than is known about the entry, establishment and spread of pests and diseases. Avoidance of traditional quantitative analysis has benefits (tractability, accessibility) and costs (the most important being the submergence of otherwise explicit assumptions beneath unassailable expert judgement). Biosecurity risk analyses have not yet explored alternative perspectives that circumvent the need to specify unknown distributions, without making untenable

assumptions. In this presentation, I will outline some of these alternatives. It is incorrect to characterize models as either strictly quantitative or qualitative. There is a continuum between these notions. Alternative forms of semi-quantitative and qualitative uncertainty and risk analysis provide a host of alternatives that may be adapted to particular problems, providing a more comprehensive and explicit treatment of uncertainty, and resulting in more transparent and better decisions.

LESSER OF TWO EVILS – MANAGING ALIEN PLANTS TO ENHANCE ECOSYSTEM SERVICES

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Recent papers describing the concept of novel ecosystems have questioned whether there is a legitimate place for alien plant species with beneficial properties in present-day landscapes that are neither managed intensively for crops, nor conserved as relatively pristine wildlands. The case for the use of alien plants with useful ecological properties and a relatively low invasive potential seems to be a strong one, especially in rehabilitating damaged or artificially created ecosystems where serious contamination of soil and groundwater requires containment and amelioration. Many examples of such systems occur in South Africa as a result of mining and industrial activities. Attitudes in South Africa regarding alien plants are greatly affected by the widely publicised "Working for Water" activities aimed at eradicating alien invasive plants, and protecting our particularly rich and valuable indigenous flora. There is a general perception that all alien plants outside of urban areas should be eradicated where possible, and replaced by indigenous species which are reputedly less invasive, conservative water-users, with greater resilience to harsh South African environments. The aim of this paper is to demonstrate that these perceptions are sometimes simplistic and/or inaccurate, and that a more objective view of the potential use of alien plants should be taken, especially in the case of remediation of damaged ecosystems. Some recent research data are presented to illustrate differences between groups of indigenous and alien species of trees in overall water use, water use efficiency, productivity, contaminant uptake and resistance to environmental stresses.

PLANT INVASIONS IN ARID AREAS – SPECIAL PROBLEMS, SPECIAL SOLUTIONS

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Plant invasions in arid areas differ from those in other environments in that they are dominated by species introduced for utilitarian purposes, and which continue to be valued for their uses in some parts of the landscape while posing a threat to the economy or environment in others. Typically the introduced species are associated with the prevailing landuse – namely ranching, and most

are either forage, shade or barrier plants, with efficient mechanisms for directed dispersal by animals. Biotic adaptation and interactions in arid lands worldwide have tended to converge. For example, bird-dispersed, fleshy-fruited plants that colonise subcanopy sites are found in all deserts – preadaptation to ubiquitous dispersal and facilitation processes enables desert aliens to invade intact, climax vegetation. Invasive plants in arid areas are not all arid-adapted: the most problematic are phreatic, wetland or oasis specialists. This group can rapidly colonise remote wetlands and springs through a combination of wind-dispersed seeds and vegetative reproduction, and have impact on water resources and biodiversity that is disproportionately great relative to the area they cover. Management of arid region aliens could include pre-introduction biocontrol planning that makes it possible to use aliens while reducing invasion risks. An alternative is to replace the aliens with extralimital indigenous plants that can supply the rangeland services perceived to be absent from arid environments – however such interventions may carry even greater risks.

THERE'S NO PLACE LIKE ABROAD: ALIEN PLANTS IN EUROPE

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Although suffering less from the impact of invasions than some other parts of the world, biological invasions in Europe have been intensively and thoroughly documented and studied. In the last five years, this continent has made considerable progress towards synthesizing information on invaders thanks to the recently accomplished pan-European DAISIE (2005–2008; www.europe-aliens.org) and ALARM (2004–2009; www.alarmproject.net) projects. Thanks to DAISIE, which resulted in the compilation of a database comprising data about 11,000 alien species, Europe is probably the continent with the most complete information on its alien biota. Such data has provided a unique opportunity to search for general principles of biological invasions, valid across a wide range of taxonomic groups and environments, to assess the risk from invasions, and summarize the variety of impacts that invasive species exert on invaded ecosystems. The ALARM project aimed to evaluate the role of introduction pathways, habitats in plant invasion, and to assess the relative roles of species traits and other factors in determining which species will invade. The results of these analyses suggest that species biological traits are important, but that habitat characteristics are crucial in determining the level of invasion. From a practical point of view, characteristics such as the size of the native distribution area, characteristics of habitats in both the native and invaded range, and the economic situation of the recipient region are the most robust and useful predictors of plant invasions. Moreover, mapping of plant invasions in Europe and prediction of future development under various socioeconomic scenarios indicate that the level of plant invasions is unlikely to decrease in the following decades even if an environmental friendly land-use scenario was applied. This paper will provide an overview of insights from the above initiatives, and outline possible strategies of dealing with the problem of invasive species in Europe.

CAUSES AND CONSEQUENCES OF PLANT INVASIONS: OUR CURRENT UNDERSTANDING

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Historically, there have always been spreading and migrating plant taxa. Colonization of deglaciated areas has been very well illustrated by many examples and we know that floras and faunas of oceanic islands would not be here without occasional long-distance dispersal events. Now, however, the rate of human-assisted migrations (invasions) of plants and animals is several orders of magnitude higher. Biological invasions are a widespread and significant component of human-caused global environmental change. There are three reoccurring major questions of invasion biology: (1) Are there any inherent differences in invasiveness among biological taxa? (2) Are some ecosystems more or less resistant to invasions? (3) What are the consequences of biological invasions? An emerging theory of plant invasiveness based on biological attributes has resulted in several rather robust predictions, namely for woody seed plants. However, in spite of the exponentially growing number of publications, there are still serious gaps in our understanding of invasion causes and consequences. Operational criteria for impact assessment of alien taxa are one of them. Invasive species are often blamed for extinction of rare species. Invasive predators, pathogens, and herbivores provide several conclusive examples. As for plants, however, we have yet to reach a more balanced view of what the situation is. Plant invasions are very often just symptoms of human-created changes in our environment rather than their causes. Space for time substitution, i.e. comparison of species diversity within invaded and reference, non-invaded, plots represents the common approach to the evaluation of non-native species impacts. However, it is usually impossible to derive conclusive cause-effect relationships from such studies. Reconciliation of available results from experimental and observational studies conducted at different temporal and spatial scales is one of the most pressing current tasks of invasion biology.

ALIEN PLANT INVASIONS IN SUB-SAHARAN AFRICA – STATUS, PROGNOSIS AND KEY CHALLENGES FOR MANAGEMENT

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The majority of people in sub-Saharan Africa (SSA) are subsistence farmers who rely very heavily on natural resources to sustain their livelihoods and are therefore very exposed to the risks associated with Invasive Alien Species (IAS). Despite this most countries in SSA have done little to address the issue of IAS, especially that of Invasive Alien Plants (IAP's). In most sub-Saharan countries there are gaps, overlaps and inconsistencies in existing policies, regulations, strategies and institutional arrangements concerning IAS with virtually no country having a body with the responsibility and the means of coordinating IAS activities. This weak policy and institutional environment results in critical information for informed decision making being unavailable. There is inadequate sharing and exchange of information between the different stakeholders within country and between countries; there is a shortage of information regarding the biodiversity of a

country, and the status of alien species present; and little effort is made to access globally relevant information on IAS and contribute to it. Although there are some mechanisms in place to prevent the introduction of IAS the focus is mainly on agricultural and forestry pests with virtually no mechanisms in place for early detection and rapid response, especially of invasive plants. There have been some successful programs to control aquatic weeds through the introduction of host-specific biological control agents, but the introduction of agents for terrestrial invasive plants has generally been hampered by “conflicts of interest”. This is mainly because of the absence of a regulatory framework and scientific methods for evaluating costs and benefits. The capacity to address IAS issues in SSA is also woefully inadequate. These issues can be addressed if governments can be convinced of the threats posed by invasive species, not only to biodiversity but also water resources, food security, human health and economic development. To this end it is imperative that more research be undertaken to assess impacts, especially cost-benefit analysis, in order to resolve conflicts over management and use of invasive species. Resources also need to be found to build capacity, create awareness and implement control strategies. Most governments in SSA do not have the financial resources to do so alone but collaborative projects between government institutions and local/international NGO’s funded by donor organizations with co-funding from governments may be the way forward. A good example of such a project is the GEF/UNEP project, “Removing Barriers to Invasive Plant Management in Africa” which has gone a long way in addressing many of the issues raised above.

ORNAMENTAL NON-WOODY PLANTS THAT THREATEN THE NATIVE FLORA IN BIAŁOWIEŻA FOREST (NE POLAND)

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Ornamental plants are one of most important sources of invaders. In Białowieża Forest, 115 taxa of non-woody ornamental plants were found growing spontaneously, 53 as ephemerals only and 33 established at least in disturbed habitats. For 29 taxa we have incomplete information. At least fifteen ornamental species are spreading into natural communities and could be a threat to the native vegetation of Białowieża Forest in the future. Ten of them come from North America, two from Asia and three from Europe. Most dangerous are plants well known as invaders in other parts of the world: *Aster novae-angliae*, *A. novi-belgii*, *Echinocystis lobata*, *Elodea canadensis*, *Erigeron annuus*, *E. ramosus*, *Impatiens glandulifera*, *Lupinus polyphyllus*, *Reynoutria japonica*, *Rudbeckia laciniata*, *Solidago canadensis*, *S. gigantea*. Interestingly the protected fern *Matteucia struthiopteris*, often cultivated in the region, is also spreading spontaneously. Other European species spreading are *Myosotis sylvatica* and *Viola odorata*.

PRELIMINARY ASSESSMENT OF THE SOCIAL, ECONOMIC AND ENVIRONMENTAL IMPACTS OF WATER HYACINTH, *EICHHORNIA CRASSIPES* (MART) SOLMS-LAUBACH (PONTEDERIACEAE) IN THE RIVER OTI ARM OF THE VOLTA LAKE, GHANA

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The paper presents preliminary results on the assessment of the social, economic and environmental impacts of Water hyacinth in the River Oti Arm of the Volta Lake. The River Oti Arm is a repository for mainly human and agricultural (fishery, crops, livestock) activities as well as source of water for energy generation, transport and domestic use for over 700,000 people. In 2002, over 100km^2 of the water surface was covered by water hyacinth. Impact assessment of Water hyacinth on the socio-economic, health and lake resources have mostly been subjective due to the unavailability of scientific data. These assessments have shown a negative socio-economic and health impacts through the pollution of water, increased water borne and related diseases and reduction in fish landings. Water hyacinth did not replace other plant communities or impede their growth during the study. All nine-lakeshore communities interviewed wanted the Water hyacinth eradicated. The control strategies already in place, if continued, could help reduce the deleterious impacts and allow for sustained development of lake resources and the communities. Research to quantify and cost the levels of negative impacts (loss of livelihood, disease and disruption of normal operations) caused by the Water hyacinth and that of its control is imperative for any meaningful socio-economic planning and development in the basin.

GLOBAL PATTERNS OF PLANT INVASION ALONG ALTITUDINAL GRADIENTS

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Mountain regions are increasingly invaded by non-native plant species. As well as posing a potential threat to these fragile ecosystems, invasions along altitudinal gradients are ideal model systems to address fundamental ecological and evolutionary questions. They can provide insight not only into the drivers of invasion along environmental gradients, but also the establishment of large-scale species richness patterns. We present the results of a global survey of invasive plant species in eight mountain regions conducted by the Mountain Invasion Research Network (MIREN). Our approach allows an hierarchical assessment of the drivers of alien plant richness at different spatial scales including: between bioclimatic zones, between regions within bioclimatic zones, along altitudinal gradients within regions, and between habitat and land-use types along gradients. Alien plant richness decreases with altitude consistently across regions, irrespective of bioclimatic zone or the range of the gradient studied. Dispersal from the lower elevations seems to be more important than climate matching for the establishment of these altitudinal richness patterns. However, at a local scale the correlates of species richness (e.g. disturbance patterns, habitat) are largely idiosyncratic. We discuss how plant invasions along altitudinal gradients are shaped by the interaction of species traits, dispersal processes and habitat factors at multiple spatial scales.

LIFE HISTORY VARIATION OF THE INTRODUCED WEED *VERBASCUM THAPSUS* ALONG AN ELEVATIONAL GRADIENT OF MAUNA KEA MOUNTAIN IN HAWAII

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Verbascum thapsus is an invasive weed of montane and subalpine habitats in Hawaii. The aim of this study was to determine if there is variation in the life history strategy and demography among *V. thapsus* populations in Hawaii. Seven study sites were established along an elevational gradient spanning 1030 m from 1690 m to 2720 m a.s.l. on the east-facing slope of Mauna Kea Mountain on the Island of Hawaii. Belt transects were set up at each site, and the fate of over 7000 seedlings was followed over a period of three years. Seedling germination, plant growth, survival and flowering were recorded periodically over the course of the study. Results indicate that germination, survival, growth and reproduction in *V. thapsus* vary along the elevational gradient. Compared to plants at lower elevations (2000 m and below) those at higher elevations (above 2000 m) had lower juvenile survival, higher adult survival, higher vegetative growth rates, higher threshold sizes for flowering and longer time to maturity. Abundance of neighboring vegetation was instrumental in driving the variation in survival and growth. This size-dependent survival appears to play a major role in the selection for smaller rosette sizes for flowering and shorter generation time at lower elevations.

CATTLE GRAZING REDUCES FIRE HAZARD FROM INVASIVE GUINEA GRASS ON A MILITARY TRAINING AREA AND ITS NEIGHBORING RESIDENTIAL COMMUNITY IN HAWAII

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Invasive guinea grass (*Panicum maximum*) can carry high intensity, fast moving fires. Dense stands of fire-prone guinea grass are a major fire hazard on military lands of Marine Corps Training Area Bellow (MCTAB) and consequently to a neighboring residential community on Oahu, Hawaii. The aim of this study was to investigate alternative control methods for reducing guinea grass fuel loads on MCTAB. Twelve 50 m^2 plots were established to which the following four guinea grass removal treatments were applied in replicates of three: mechanical, herbicide, cattle grazing and control. Live herbaceous fuel loads were measured immediately following application of treatments and five months post treatment application. Results indicate that mechanical treatment was the most effective in reduction of live herbaceous fuels immediately following treatment application, but cattle grazing was the most effective in maintaining low herbaceous fuels five months post application of treatment. A cost analysis of applying the control treatments over entire MCTAB over a ten year period also revealed grazing of guinea grass to be the most cost effective. Adopting a long term grazing program is likely to reduce the fire hazard on MCTAB, maximize their training capacity and maintain good military public relations with the neighboring community.

DO ANTHROPOGENIC CORRIDORS HOMOGENIZE PLANT COMMUNITIES AT A LOCAL SCALE? A CASE STUDY IN TENERIFE (CANARY ISLANDS)

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Biological homogenization of plant communities due to introduced species is a process that can be faster and more intense on islands. The aim of this study is to analyze vascular plant species composition in roadside communities along a steep altitudinal gradient in order to test a process of biological homogenization in the island of Tenerife. We located plots at the roadside, at an intermediate distance (0-50 m) and at the interior of the traversed habitat (50-100 m from the road). We analyzed the results separately for each group of plots with a Detrended Correspondence Analysis including and excluding exotic species. The results revealed that where exotic species were most abundant, i.e. at the road edge, they can create the effect of floristic homogenization comparing three similar roads. At a distance of >50 m from the road, this effect disappears, indicating that it is a local phenomenon, closely related to the highly disturbed roadside environment. Floristic homogenization seems to be more important at higher altitudes (>1000 m), related to higher diversity in native plant communities and lower degrees of human disturbances. Roads facilitate the spread of exotic plants which can result in floristic homogenization of roadside communities.

MANAGEMENT TOOLS FOR CONTROLLING THE SEEDBANK OF INVASIVE PLANTS –THE CASE OF *ACACIA SALIGNA*

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Acacia saligna is the most invasive tree in the Israeli ecosystems as well as along the Mediterranean Basin. The tree spreads either by sprouts or seeds, which can remain viable for tens of years due to their physical dormancy mechanism. We examined the effect of various treatments on the re-establishment potential of *A. saligna* from its seedbank in order to be able to control it. The study was conducted in the coastal dunes of Israel (500 mm/year). The experiment was based on a random block design in which each block was subjected to several treatments with various combinations (cutting and removal, uprooting, fire, soil solarization, chemical disinfestations, and one-time irrigation during the summer). Soil solarization treatment completely eradicated the *Acacia* seedbank. Fire reduced seed viability by 50%. However, the dormancy rate of the remaining seeds was not affected directly by the fire. The post-fire conditions, i.e. the direct exposure of the soil surface to the solar radiation, significantly reduced the dormancy rate of seeds, leading to re-establishment of seedlings after the fire. All possible result variations (success, failure, or stimulated) were simply presented in a 'seedbank transition matrix', which explains the effect of different treatments on weed control, focusing on physically dormant seedbanks.

MANAGEMENT STRATEGY OF INVASIVE ALIEN SPECIES ON RÉUNION ISLAND (MASCARENE ARCHIPELAGO, INDIAN OCEAN)

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Many actions have been initiated to tackle biological invasions on Réunion Island over the last three decades. Unfortunately, these actions have not been well coordinated. A national park, covering 42% of the island has been proclaimed in 2007. The national park scientific committee has highlighted the lack of guidelines and a strategy to control alien species invasions at the island scale. At the national scale, authorities and NGOs have also recently considered the importance of biological invasions in French and European overseas territories. At the local scale, a first biological invasion management strategy for Réunion has been written with strong stakeholder involvement. The main issues concern the control at border, invasive alien species impacts, native habitat management, an invasive species monitoring programme and public awareness. Prioritisation and implementation of the strategy are outlined as the main challenges.

PATTERNS AND PATHWAYS OF WEED INVASION: EVIDENCE FROM THE SPATIAL GENETIC STRUCTURE OF *RAPHANUS RAPHANISTRUM*

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Agricultural weeds are a major cost to economy worldwide. Knowledge of the likelihood and speed at which gene dispersal occurs in weedy plants is of particular importance for management practices. Furthermore, weedy species constitute good model organisms as they offer examples of evolutionary and ecological change over relatively short time intervals. *Raphanus raphanistrum* is arguably one of the most difficult weedy species to manage both in agricultural system and road-side verges and has a cosmopolitan distribution. The fynbos biome in South Africa is recognized as a biodiversity hotspot because of high levels of species endemism. We have chosen this biome to investigate the impact that various habitats have on, as well as the evolutionary processes that drive, range expansion in *Raphanus raphanistrum*. We collected leaves from 595 plants at 14 different sites in the Fynbos. We assessed the spatial genetic structure using 12 nuclear microsatellites and the *trnL-rpl32* intergenic region of the chloroplast DNA. In this study we focus on (1) the distribution of genetic diversity, (2) the phylogeographic patterns of *R. raphanistrum* and (3) the effect of landscape and environmental features on the spatial genetic patterns

ASSESSMENT OF HERBIVOROUS INSECTS ASSOCIATED WITH INVASIVE PROSOPIS (*PROSOPIS JULIFLORA*) IN AMIBARA DISTRICT, AFAR REGIONAL STATE, ETHIOPIA

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Assessment of herbivorous insects associated with *Prosopis juliflora*, was conducted in Amibara District, Afar Regional State, Ethiopia in order to ascertain their biology and impact. An unidentified lepidopterous larvae was found feeding on seeds within pods. A curculionid beetle, *Cosmogaster lateralis*, a bostrychid, *Xyloperthela* sp. and a cerambycid, *Oncideres* sp. were found tunnelling in stems often leading to wilting and in some cases death of large stems and even trees. However, there were no significant differences in the height and diameter, at breast height of plants, in which any one of the three insect species were present, because they appeared to attack the plants at different developmental stages. However, there were significantly more dried stems on trees in which *C. lateralis* was present. Ninety-two, 88 and 56% of 25 trees with dried branches were as a result of curculionid, cerambycid and bostrychid damage, respectively. However, it is unlikely that any of the insects associated with *P. juliflora* in Ethiopia will have any significant impact on the population. Thus, importation of host specific biocontrol agents will have to be considered.

CLASSIFYING SPATIAL DISTRIBUTION OF WOODY ALIENS IN SOUTH AFRICA, SWAZILAND AND LESOTHO: QUANTIFYING THE RELATIONSHIP BETWEEN WOODY ALIEN SPECIES AND THE ENVIRONMENT USING THE SAPIA DATASET

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The bioclimatic requirements of a wide variety of woody alien species were investigated using the SAPIA dataset. The assumption is that the association of the species with the combination of long-term climate data and the Land Type Database (a factorial design of the classified variables from both themes) will serve as an indicator of the potential occurrence of alien species or groups of species. The spatial distribution of the species, as published within SAPIA, has a many-to-many relation to the environment and was enhanced to fit the association model (groups of many-to-one relationships). Neural network models (step wise) were designed which clearly identified groups of species and their sensitivity to the mentioned environmental variables.

BIOFUELS - FUELLING BIOLOGICAL INVASIONS?

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Biofuels have been identified as a priority issue in South Africa – to reduce the country's reliance on imported fossils fuel, and for social development. Many potential plant species could be used for this purpose, including food crops such as maize, sugar cane for ethanol production or sunflower, canola for biodiesel production. As a non-food feedstock for biodiesel, much has been focused on *Jatropha curcus* which is already being widely planted throughout the tropics. This paper considers the potential biodiversity impacts of several scenarios for biofuel production in South Africa, focussing primarily on *J. curcas*. We discuss concerns regarding the potential invasiveness of this species. Many non-native plant species are widely planted in South Africa, for example for commercial forestry, and horticulture. In all cases, widescale plantings have had important impacts on biodiversity, and have escaped from plantings to become invasive. Insights from invasive ecology suggest that the traits of the species, features of the recipient environment, and the extent and configuration of plantings relative to areas with high conservation value must all be considered. The paper highlights some key aspects confronting managers, planners and invasion ecologists in relation to biofuels, using the South African situation as a test case.

THE COSTS OF MANAGING *CAMPULOCLINIUM MACROCEPHALUM* IN THE PROVINCE OF KWAZULU NATAL, SOUTH AFRICA

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Campuloclinium macrocephalum (Pompom weed) is a category 1 weed and has been in South Africa since the early 1960's. In 2006 the KZN Invasive Alien Species Programme initiated the management of pompom in the province using the South African Plant Invader Atlas (SAPIA) database as reference with which to start work. The national pompom weed distribution according to SAPIA falls within 14 quarter degree squares. We hypothesize that invasive plant management authorities will be able to use a 15 quarter degree distribution at a national level as a cut off to deal with most emerging weeds at a provincial level, proving the national distribution is not concentrated in one province. Above this the costs per hectare exceeds the benefit of working on a species based approach rather than a geographic based approach. Our clearing operations on pompom weed in KZN provide data that backs up this hypothesis. In 2006/07 17 sites were treated with a total area of 11.15 hectares at a cost of R 3784 ha^{-1}. In 2007/08 43 sites were treated with a total area of 80,64 hectares at a cost of R2159.75 ha^{-1}. All the plants in the known sites were treated with a registered foliar-applied herbicide.

INVASION OF *PENNISETUM CILARE* AND ITS CONTROL IN THE DESERTS OF SOUTHWESTERN NORTH AMERICA

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Buffelgrass (*Pennisetum cilare* L. Link) is an invasive subtropical grass to desert vegetation of the southwestern United States of America and northern Mexico. *Pennisetum cilare* is native to the flora of the southern African continent. Introduction of this grass for livestock forage to North America began in the 1940s and the grass is rapidly spreading in its new habitat. *Pennisetum cilare* is a great risk to native flora, not only because of its competitive nature, but because it provides a perennial fine fuel, where fire is a rare event. *Pennisetum cilare* is a fire adapted species. Biological control agents have not been developed. Pulling and removal of with hand tools is effective in small areas. Except for glyphosate, little information exists concerning chemical control of this plant. In the summer of 2008 herbicides were applied to at two Arizona locations. Ten herbicide treatments were applied to an old field of *P. cilare* in the Avra Valley approximately 20 km west of Tucson. Twelve herbicide treatments were applied in another test on the northern edge of the Arizona State University (ASU) campus at Tempe. Results of these herbicide tests will be discussed as potential control options for this invasive grass.

WOODY ALIEN INVADERS IN ITALY: DISTRIBUTION AND THREATS

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Woody species are generally regarded as a specific group of aliens, and they make up a substantial proportion of the most noxious alien species worldwide. The dataset collected during the first inventory of the alien flora of Italy (1023 taxa, invasive, naturalized, casuals, neophytes and archeophytes) is used to perform a comparative statistical analysis of the woody aliens between three different regions (northern, central and southern Italy) to address the main drivers of allodiversity, distribution and threats in relation to a set of regional predictors. The three selected study regions have a total of 553 alien taxa with 144 woody aliens (trees, vines, and shrubs). There are significant differences between the investigated regions, considering, e.g., that only thirty-one taxa are present in all the three, while 64 are present in at least two regions and 49 are found only in one region. Invasive status also differs greatly. The total number of alien woody species introduced over time in Italy is unknown, as well as the number of those taxa present only under cultivation and not yet escaped in the wild. Nevertheless, the studied data set represent a significant sample of the woody allodiversity of the Italian territory and gives useful ecological and management-oriented indications.

A CODE OF CONDUCT ON HORTICULTURE AND INVASIVE ALIEN PLANTS FOR EUROPE

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The European and Mediterranean Plant Organization (EPPO) and the Council of Europe have conjointly drafted a code of conduct on horticulture and invasive alien plants for European and Mediterranean countries, to be published in 2009. In Europe, it is estimated that 80% of the invasive alien plants are voluntarily introduced for ornamental purposes, and international trade is increasing yearly. This major pathway must be addressed urgently to prevent entry and spread of invasive alien plants, as at present, few legislation and management programmes are in place. Voluntary measures to tackle the problem and raise awareness among the horticultural sector and the public are therefore considered a priority. This code of conduct provides essential information for Governments and the horticultural and landscape sectors on regulation concerning invasive alien plants, plant wastes disposal, labelling of plants, proposing alternative plants, publicity, etc. This new and promising initiative now requires promotion and implementation within countries. Discussions are currently in progress with members of the International Association Trade Association of Horticultural Producers (AIPH), which members appreciated to be associated to the project. The Belgian Government plans to implement EPPO's code of conduct given European funding, and other countries are expected to follow.

PINES INVASION IN CHILE: PATTERNS, PROCESSES AND ECOLOGICAL CONSEQUENCES

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Pines are regarded as invasive species worldwide. Vast areas across different countries of the South hemisphere have been used for pine plantations, thus significantly increasing the potential for invasion. In this presentation, we review evidence of invasion for two pine species in central and southern Chile, *Pinus radiata* and *P.contorta*. We detected evidence of naturalization and invasion of the two pine species. In the case of *P. radiata* in Central Chile, planted individuals produced a massive seed rain across the landscape with the capacity to germinate and recruit in open habitats, gaps and at the edge of native forests. In southern Chile, dense patches of new recruits of *P. contorta* (ca. 16,000 ind/h) were detected more than 125 m from plantations. We show unequivocal evidence of pine invasion in Chile. Currently, these two invasive species and other conifers (e.g. *Pseudotsuga mensiezii*) are creating new patches across landscapes as well as modifying the structure of native vegetation. More studies are necessary to assess the ecological and economical consequences of this global process.

EVALUATION OF CONTROL STRATEGIES FOR *CYMBOPOGON NARDUS* AND THEIR IMPACT ON PLANT DIVERSITY IN THE RANGELANDS OF UGANDA

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Cymbopogon nardus, a grass species introduced from south east Asia, has become invasive in Uganda where it impacts negatively on biodiversity and pasture production. Its dense tussocks, out competes native plant species, and impedes the movement of livestock. In order to improve the grazing potential of invaded land, some farmers manually remove *C. nardus* using hand hoes. However, due to high labour costs of manual removal many landowners are unable to clear their land, inadvertently providing a source of seed for re-infestation of cleared lands. Studies were undertaken to evaluate the potential of other control strategies including the use of fire in conjunction with mechanical and chemical control. The costs of these control methodologies were also evaluated and their impact on plant diversity monitored. Preliminary results indicate that burning followed by manual removal or foliar applications of glyphosate were equally effective in controlling *C. nardus*. Indigenous plant species recovery was slower in plots sprayed with glyphosate, but after three seasons there was no significant difference in plant species diversity between plots that had been cleared manually and by herbicides. Fire alone was ineffective as a control strategy but increased the growth rates and flowering and hence seed set of *C. nardus*.

MANAGEMENT OF WATER HYACINTH IN SOUTH AFRICA: OPTIONS FOR BIOCONTROL AND IPM

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Despite thirty years of biological control efforts which have significantly impacted water hyacinth infestations, it remains an important aquatic weed in South Africa. Five arthropod agents provide varied control of the weed dependent on local conditions. Long term monitoring of 14 sites around the country indicate that low temperatures do not hinder agent development, but elevated nutrient levels are still implicated as an impediment to biocontrol. Sublethal doses of herbicide, while freezing the plant's growth and allowing the agents to inflict heavy damage on it, were shown in the laboratory to be either neutral, or beneficial to the biocontrol agents. However, in the field these herbicide applications were not always successful in containing the weed's growth and resulted in a reduction of the nitrogen content of the plant. Difficulties in applying carefully adjusted dosages of herbicide may preclude use of this technique in most management situations. Instead, increased release-effort of existing biocontrol agents is recommended, with the option of once-off strip-spraying, which creates refuges for biocontrol agents, as a last resort in the face of occasional weed outbreaks. Reduction of nutrient inflows remains a critical objective for aquatic weed control in South Africa.

A HYPERSPECTRAL REMOTE SENSING APPROACH TO STUDY THE BIOCHEMICAL PROPERTIES OF *SENECIO INAEQUIDENS* AND *JACOBAEA VULGARIS*

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Understanding the mechanisms behind invasive species qualitative and quantitative success over time is a worldwide challenge. Ideally it should be possible to study plant gradients more thoroughly, taking specific component properties into account. Here we present how a considerably new technique "Hyperspectral Remote Sensing" offers the possibility for estimating foliar chemical concentrations over large geographic areas by using many subtle reflectance features (or absorption features) of the plant. Because soil-plant interactions cause variation in the chemistry of the plants this should be evident in the spectral signature of the plants when measured with spectroscopic tools and allow inferences over the influence of natural soil enemies in the plants. The project will implement field spectroscopy and spatial imagery to map several biochemicals of *Senecio inaequidens*, an invasive species, and *Jacobaea vulgaris*, a native species in the Netherlands. We will compare whether *Senecio inaequidens* is experiencing negative soil feedback of soil biota in the different successional stages or if the lack of pathogens in the new environment confers immunity. The knowledge gathered will improve our understanding of the plants-soil interactions in each of these groups and potentially allow us to successfully predict which variations may identify a species becoming invasive.

SPATIAL DETERMINANTS AND DIVERSITY PARTITIONING OF ALIEN AND NATIVE SPECIES ALONG ROADSIDE ELEVATIONAL GRADIENTS IN TENERIFE, CANARY ISLANDS

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Data about plant species richness and composition were gathered in 55 transects, sampled along three roads in Tenerife from 5 m up to 2250 m above sea level. A total of 239 species were recorded in the data set; 32 of these species were alien species. These data were used to investigate the role of the different spatial scales in controlling the proportion of alien species within plant communities and the partitioning of species diversity at different spatial scales (plot, transect and road). The partitioning of species diversity of alien species versus native species at different spatial scales was used to understand the patterns and processes connected to the invasion of alien species. In relative terms, alien species showed a lower alpha diversity and a higher beta diversity than native species. Species richness decreased with elevation for both alien and native species, with the former decreasing in a more marked way. In addition, the relative importance of alien species was higher in the roadside plots than in the plots located few meters away from the road, showing clear effects of the disturbance connected with the road.

HUMAN-MEDIATED SELECTION IN ORNAMENTAL PLANT SPECIES CAN INCREASE THEIR POTENTIAL INVASIVENESS

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Plant species introduced as ornamentals are the largest group among alien invasive plants. This might be a consequence of the high propagule pressure of these species due to frequent horticultural usage. However, another reason could be that ornamental species have been selected for traits, such as high germinability, that promote invasiveness. In a multi-species greenhouse experiment, we compared seed and germination characteristics, i.e. seed mass, speed and proportion of germination, among 44 Swiss native plant species and 47 related non-native species (26 cultivars and 21 non-cultivars) in two different light regimes. Averaged over all 91 species, both speed and proportion of germination were higher in shaded conditions than in unshaded conditions. Non-native plant species had heavier seeds, germinated faster and with higher proportions than related native plant species. Among non-native species, cultivars germinated faster and with higher proportions than non-cultivars. Our results indicate that ornamental non-native species, and particularly cultivars, have been selected for high germinabilities. Because germinability is frequently positively associated with invasiveness, these results suggest that human-mediated selection for high germinability in ornamental plants increases the risk that these species can become invasive.

BETTER THE DEVIL YOU KNOW THAN THE DEVIL YOU DON'T: SUBMERGED AQUATIC WEED INVASIONS IN SOUTH AFRICA

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South Africa (SA) has a long history of aquatic weed invasions, the majority of which are free-floating weeds that are largely under successful integrated control. There are few cases, however, of submerged plant invasions in comparison to countries such as the U.S.A., New Zealand and Australia that have very high incidences of submerged plant invasions. This is due to the presence of a rich indigenous submerged aquatic flora in uninvaded systems and competitive exclusion by floating aquatic weeds in disturbed systems. However, the successful control of floating weeds that has resulted in denuded habitats and the continued creation of impoundments open the door to invasion by submerged aquatic species. A countrywide survey has revealed very few submerged plant invasions in SA, e.g. *Hydrilla verticillata*, *Myriophyllum spicatum* and *Egeria densa*, but the potential for these species to spread, and for others, such as *Cabomba caroliniana* to invade is great due to the nature of SA's aquatic systems. Evidence for this is provided on the Vaal River, where water hyacinth (*Eichhornia crassipes*) has been controlled biologically, and *M. spicatum* is now present in large mats. These invasions afford us the opportunity to gain a better understanding of invasion succession in aquatic plant communities.

DO PLANTS HAVE COMMON DRIVERS OF SPREAD, AND CAN WE USE THEM TO AID MANAGEMENT?

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Invasive plants disrupt ecosystem processes from local to landscape scales and controlling spread can be a cost effective alternative to managing established invasions. Adequate management strategies to control spread at the landscape scale however, have not been well explored. To address this problem we carry out sensitivity analysis on a simulation of plant spread that incorporates dispersal ability, demography and landscape structure. To do this we use Boosted Regression Trees, which deal well with the high level interactions and non-linear responses which commonly prevent adequate analysis of simulation model outputs. Our results suggest that efforts to manage spread will have variable outcomes both spatially and temporally. This is due to complex interactions between demographic, dispersal and landscape components of spread, and the non-linear response of spread to several of its most important drivers. However, there are two parameters that are important under many conditions: mean dispersal distance and fecundity. Three other parameters are important when certain dispersal and landscape conditions are met: age of maturity, survivorship and germination rate. These five parameters are useful initial targets for management aimed at slowing spread in a variety of different plant-landscape combinations, particularly when information about the main drivers of spread are lacking.

TACKLING THE NEXT GENERATION OF WOODY WEEDS: ECOLOGY AND MANAGEMENT OF INVASIVE AFRICAN OLIVE IN EASTERN AUSTRALIA

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Olives (*Olea* spp.) are beginning to attract attention as the 'next generation' of woody weeds. In the western Sydney and Hunter Valley regions of New South Wales, Australia, African Olive (*Olea europaea* ssp *cuspidata*) has established as an aggressive invasive species at a landscape scale. The abundant small black fruits are dispersed by birds into native eucalypt woodlands, resulting in a dense African Olive mid-canopy excluding the regeneration of native plants. Successful broad scale African Olive control has been achieved with a number of strategies including herbicide injection and mechanical removal. Although seed production is high, in-field germination determined from a field seed burial trial was found to be low (3.3%). Seed viability declined to 14.7% at the end of the second year, suggesting that African Olive does not form a persistent soil seedbank. A two year ecological restoration trial in cleared African Olive forest has used burning to stimulate native species germination from the soil seedbank, after 15 years of olive infestation. Native grasses were readily established by supplementary direct seeding. The use of burning and direct seeding to establish early successional stage native vegetation on degraded African Olive sites, will form the basis of an ecological restoration model and subsequent olive control.

PRIORITIZING WEED POPULATIONS FOR ERADICATION AT A REGIONAL LEVEL

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California has many pioneer weed infestations worthy of eradication, but too few resources to respond to all. Traditionally, weed lists guide eradication efforts in the state. However, species evaluation systems have limitations when applied to prioritizing individual populations for eradication. Therefore, the California Department of Food and Agriculture's Integrated Pest Control Branch developed a science-based, transparent, decision-making tool to help prioritize weed populations for eradication using the Analytical Hierarchy Process. This ranking tool assesses the relative impact, potential spread, and the cost and feasibility of eradication. This tool will help land managers systematically target weed infestations by putting their limited resources into populations known to cause the highest impacts and are most feasible to eradicate.

ASSESSING THE COSTS AND BENEFITS OF THE BIOLOGICAL CONTROL RESEARCH PROGRAMME ON INVASIVE PLANTS IN SOUTH AFRICA

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The justification of investments in biological control research programmes on invasive plants is partly based on comparisons of the costs and benefits realised by such programmes. Such comparisons are typified by significant positive benefit-cost ratios for such programmes. Consequently, biological control investments are mostly seen as 'money well spent'. However, such benefit-cost comparisons are done on a species level and often do not account for weed substitution effects. Although control of the target species may be effective, further negative impacts arise as a result of species substitution. Positive ratios based on species-level are therefore unsuitable when arguing the merits of a biological-control programme. This study followed a functional grouping approach to argue the benefits of biological control programme. This approach has significant impacts on the relative merit of biological control projects as measured by benefit-cost ratios, because it accounts for species substitution effects on the benefit side of the ratio. In some cases, significant decreases in benefits relative to costs were observed, reflecting only marginal benefits on a functional group level. The study suggests the need for an integrated approach when dealing with invasive alien plants by means of biological control.

CONTROL OF INVASIVE ALIEN PLANTS IN PROTECTED AREAS IN BRAZIL

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Controlling invasive alien species is a relatively new activity in South America. Surveys carried out in protected areas in Brazil showed that all had invasion problems in the states of Espirito Santo, Paraná and Santa Catarina. The main species in Espirito Santo were Furcraea gigantea*, Acacia mangium, Mimosa caesalpiniifolia, Leucaena leucocephala, Elaeis guineensis* and *Terminalia cattappa*, and African grasses in the genus Urochloa. In the South of Brazil, the main species were *Pinus elliottii, Pinus taeda, Ulex europaeus, Hovenia dulcis, Ligustrum* spp., *Melia azedarach* and African grasses in the genus *Urochloa* and *Melinis minutiflora*. More detail is available at http://www.institutohorus.org.br. Mechanical and chemical control was undertaken in different areas and the methods are further explained in this paper. Although Garlon (triclopyr) generates good results for woody species, other active ingredients such as imazapyr and glyphosate are also efficient and need to be used at times due to current legislation. Grasses have been managed using chemical control as well as choking, by placing transparent plastic sheets on top of invaded areas to kill off the plants and seed bank.

ROLE OF FUNGAL ENDOPHYTES IN PROMOTING INVASIVENESS OF *ACACIA* SPECIES IN SOUTH AFRICA

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Fungal endophytes, as mutualists, are thought to contribute to the overall competitiveness of alien plants in the invaded ranges by conferring the required functionality of adaptation to habitat and microhabitat stresses. Could it be possible that mutualistic interactions with endophytes are contributing to the range expansion of alien plant species by increasing stress tolerance and resistant mechanisms? The research project's objective is to determine whether fungal endophytes are contributing to the invasiveness of alien *Acacia* species in South Africa. Specifically, we test the hypotheses that alien plant species will have a less diverse endophyte community than native plant species as native species would show evidence of coevolution with local fungal flora; having greater diversity and more host-specific species. The project is assessing the endophyte community and fungal diversity within alien *Acacia* species (*A. paradoxa* and *A. saligna*) compared to native *Acacia* species (*A. karroo*) in South Africa focusing on key species within the Family Botryosphaeriaceae. Cultures will be classified morphologically, using microscopic and culture characteristics. Phylogenetically relevant comparisons, using multiple genes, will be drawn between the endophyte diversity in alien and native plants.

INVASIVE ALIEN PLANT CONTROL - INTERVENTIONS IN DURBAN, SOUTH AFRICA

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One of the greatest threats to biodiversity in Durban, South Africa, is the proliferation of invasive alien plants. This is of high concern to the eThekwini Municipality given the significant goods and services that local biodiversity is known to deliver to the City and its 3.5 million residents. In addition, invasive alien plants utilise large quantities of water which would otherwise be available for natural ecosystems, or for human use. The municipality has initiated a broad range of interventions which form part of a broad strategy aimed at controlling alien plants. Such interventions include: development of an Invasive Alien Species Strategy and an accompanying Strategic Action Plan; compilation of a municipal State of Invasive Alien Species document; various management projects in nature reserves and parks; appointment of a dedicated Working on Fire team for alien plant control; initiation of a sustainable livelihoods programme called 'Working for Ecosystems' for alien plant control; establishment of three Emerging Weeds Control Teams; development of a three-tiered staff training document; publication of various education/awareness resources; roll-out of various Environmental Education and Outreach programmes; implementation of a municipal Nurseries and Parks Alien Plant Audit; a Nature Reserve Prioritisation Programme with regards to invasive alien plant control, and various other initiatives.

THE ROLE OF BIRDS IN ALIEN PLANT INVASIONS AND NATIVE PLANT DECLINE: CONSEQUENCES FOR BIODIVERSITY, CONSERVATION AND REVEGETATION

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Alien plants contribute to native species decline, however there is limited information on the mechanisms that drive such declines. Thus, management strategies tend to focus on one aspect of the interaction between alien plants and their invaded ecosystems. Here we piece together various ecological interactions associated with *Lantana camara* invasions and its avian dispersal vectors to illustrate how we might need to re-examine alien plant management strategies. The first piece identified 28 bird species that consume the fruits/seeds of lantana in Australia. The second identified 202 native plant species from 1400+ species at risk from lantana, whose fruits/seeds are consumed by these bird species. The last piece determined another 36 alien plant species that also have fruits/seeds consumed by these birds, and are known to invade following lantana control. This three-way interaction demonstrates that the dispersal of lantana by birds can indirectly lead to native species declines during foraging activities on natives. It also illustrates the need to consider bird dispersal in revegetation activities and the associated implications for reinvasion and long-term control of lantana, as it is difficult to stop further dispersal of such alien species or foraging on natives. The outcomes of the investigation have broader management implications for other alien plants species.

EVALUATING ALIEN PLANT MANGEMENT ACROSS PROTECTED AREAS IN NEW SOUTH WALES, AUSTRALIA

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In New South Wales protected areas exceed 6.7 million hectares (8.3% of the state) across ~800 parks, encompassing coastal, temperate, rainforest, arid and alpine ecosystems, as well as the urban interface. Alien plants pose a significant management issue. Using a state-wide evaluation tool (State of the Parks), we examined the effectiveness of weed management activities across all parks. Analysis showed that, where robust planning processes were in place, alien plant management was either effective in diminishing threats to park values or preventing their decline. We also examined the relationship between the effectiveness of alien plant management and the number of park neighbours and park size. The results showed that small parks with a large numbers of neighbours (i.e. urban parks) were more likely to have an alien plant problem and a reduced capacity to protect park values compared to larger parks with fewer neighbours. Alien plant management actions however, are not always specifically aimed at achieving biodiversity conservation outcomes. To overcome this, a new Threat Abatement Planning (TAP) process has recently been implemented. Initial results demonstrate greater biodiversity conservation outcomes and a wider roll out is planned. These results provide insights into how protected area management can better deliver alien plant management and conservation outcomes.

HOW WIDE IS THE "KNOWING-DOING" GAP IN INVASION BIOLOGY?

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To leverage funds and to justify research, academics writing in the field of invasion biology often cite the ecological, social and economic consequences, the basis for which is the need for policy and implementation action. We ask the question – to what extent does a "knowing-doing" gap exist in the voluminous literature on invasion ecology? Our specific objectives are: (1) to determine the extent to which the literature on invasion biology contributes to implementation of knowledge generated, by addressing management, policy, and/or social issues; and (2) to ascertain the scale of focus (global, regional, or local) of invasion ecology papers, particularly those that attempt to bridge the knowing-doing gap. We conducted analysis at two scales – a global one looking at popular search engines of four well-known publishers, and the ISI Web of Science SCI database. At the second scale we narrowed our focus to South Africa – one of three regions outside USA where researchers producing highly cited papers in invasion ecology are well represented. Here, we conducted a content analysis of South African-authored invasion ecology-related papers listed in ISI Web of Science. We interrogate these data with our questions in mind, and suggest ways to bridge the gap (if it exists).

MOLECULAR ECOLOGY OF *GUNNERA TINCTORIA* INVASIONS

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There are two primary hypotheses to explain why some plant species become invasive when introduced into new environments, (a) the plant takes advantage of favourable environmental conditions or (b) a new invasive population rapidly evolves and becomes 'adapted' to the local environmental conditions. Although the rapid evolution of populations with invasive traits is an attractive proposition, the evidence is conflicting. *Gunnera tinctoria* is an increasingly significant invader in Ireland and elsewhere. In order to assess whether its success is due to the evolution of invasive populations, we have conducted an AFLP analysis of ~800 individual plants from ~40 different locations in Ireland, the Azores, the UK, New Zealand, where it is invasive, and Chile, where it is native. Native populations differed from the invasive populations, but there was also significant diversity within the invasive populations. Even at a local level on Achill Island, Co Mayo, Ireland, where invasive populations have been present for >80 years there was also significant genetic variation. Individuals associated with more recent colonization, such as those sampled on the neighbouring Island, Clare Island, displays less variation. These results indicate that genetic differentiation has occurred at both local and global scales and that this may be related to the success of this invader. A major challenge, however, is to elucidate how these genetic differences contribute to plant fitness and ecological success.

INVASIVE ALIEN PLANT SPECIES IN ETHIOPIA: STATUS AND MANAGEMENT

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Ethiopia has had several invasions of alien plant species that have had negative impacts on biodiversity, agriculture and human development. Foremost among these is parthenium weed (*Parthenium hysterophorus*), although major problems are also being caused by water hyacinth (*Eichhornia crassipes*), mesquites (*Prosopis juliflora), Lantana camara,* and the parasitic weeds of *Striga, Orobanche* and *Cuscuta* species. There are some quantified studies on biological and socioeconomic impacts of invasive alien plants in Ethiopia. Various management strategies and activities have also been used to address the problem of major plant invaders. This paper presents an update on the spread and distribution status of invasive alien plant species in Ethiopia and provides a summary of the initiatives, achievements and research opportunities in order to explore the options available for their management.

EXOTIC AND NATIVE TREE LITTER EFFECTS ON SOIL PROPERTIES IN TWO CONTRASTING SITES IN THE IBERIAN PENINSULA

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We assessed the effects of native and exotic tree litter on soil properties in two contrasting scenarios. First, native *Quercus robur* and *Pinus pinaster* coexist with alien *Eucalyptus globulus* and *Acacia dealbata* in oligotrophic acid soils of NW Spain. Second, native *Fraxinus angustifolia* and *Ulmus minor* coexist with alien *Ailanthus altissima*, *Robinia pseudoacacia* and *Ulmus pumila* in eutrophic basic riparian soils in Central Spain. For each species four plastic trays were filled with homogenized top-soil of the site and covered with litter. Before and after nine months in a growth chamber, soil pH, organic matter, mineral and total N was measured. Soil pH tended to increase in the oligotrophic soil, but to decrease in the eutrophic soil. Although total N remained constant, mineral N increased in both soils, but the main chemical form was NO_3^--N in the eutrophic and NH_4^+-N in the oligotrophic soil. The type of litter did not affect soil properties in the eutrophic soil. In the oligotrophic soil, organic matter decline more, NO_3^--N increased less, and NH_4^+-N increased more under the exotic than under the native litter. We conclude that, upon invasion by exotic trees, eutrophic basic soils were more resistant to changes than oligotrophic acid soils.

KEEPING UNWANTED NEIGHBOURS OUT: PROTECTED AREA BOUNDARIES AS BARRIERS TO ALIEN PLANT INVASIONS

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Protected areas are often established with the aim of conserving examples of functioning ecosystems, species, or significant cultural landscapes. Although protected areas are usually removed from anthropogenic factors that drive habitat loss, etc, many landscape-level processes continue across boundaries. Little is known about how reserve boundaries function as barriers to biological invasions. We used an extraordinary dataset, to explore the role of the western and southern boundaries of a large protected area, South Africa's Kruger National Park, as a barrier to alien plant invasions. We divided the boundary of the KNP into 1 x 1.5 km segments. Within these segments we assessed the abundance of alien plants, land use, proximity to rivers, and landscape type. Outside the KNP we assessed environmental and anthropogenic disturbance factors. Our results show a marked reduction in the abundance of alien plant records from the KNP boundary to the interior of the park, with a clear break point at about 1.5 km. This indicates that the boundary plays a filtering role in preventing mass invasion from neighbouring areas. Implications of these findings for management are discussed.

FACT OR FICTION: SPECIES RICHNESS DECLINE AFTER ALIEN INVASIONS - A META-ANALYSIS

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Invasive alien species are seen as a serious threat to biodiversity in many parts of the world. Recently, the broadly accepted connection between invasive species and diversity declines has been subjected to rigorous scrutiny. We conducted a meta-analysis for studies of the Mediterranean-type ecosystems (MTE) to examine: (1) whether the invasion of alien plants indeed causes declines of native plant species richness at different spatial and temporal scales; and (2) which growth forms, habitat types and areas are mostly affected by the alien plant invasion. Our results confirmed a significant decline of species richness due to the alien plant invasion. Studies conducted at small scales or sampled during long periods show a stronger impact than studies from large scales or short periods. Alien species from similar climate regions have a much stronger impact on the local MTE. Annual herbs, trees and creepers had the highest impact, whereas graminoids caused insignificant damage. Native species richness of shrub land, old fields and dune vegetation, showed a significant decline due to alien invasion, in contrast to the insignificant declines of the forest habitat. We further suggest that factors, such as competition, shading, allelopathy, soil nutrients and micro-organisms, could be responsible for the various responses of native plant communities to alien plant invasion.

REHABILITATION OF NATURAL FOREST THROUGH INVADER PLANT STANDS: CONCEPTS, PROCESS AND PRACTICE

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Most alien invader tree, shrub and other species do not compete with natural forest as in shrublands and grasslands, but rather facilitate forest recovery. Changes in the natural disturbance regimes affecting forests, particularly fire, affect the invasion potential of alien species. Fires in the landscape are directly or indirectly controlled through different land uses. Trees grow back into the landscape and alien invader plant species, as typical pioneers in their natural environment, are the first to become established. The pioneering invaders are intolerant of shade, but nurse the establishment of shade-tolerant forest species – a typical forest succession process that can be managed through manipulative thinning, not clearing. Four stages have been identified in this process as a basis for cost-effective and successful conversion of alien invader plant stands towards regrowth natural forest, with benefits to participants over a longer period. This approach can also be applied within areas where natural forest species can grow with fire control, such as along streams and rivers within areas of commercial plantations, or intensive agriculture, or urban development. The practice will be discussed for forest recovery along the Berg River (from eucalypt stands), Buffeljags River (from wattle and bugweed) and after mining rehabilitation in Tropical Africa (through *Chromolaena odorata*).

NON-CHEMICAL MANAGEMENT METHODS AGAINST INVASIVE KNOTWEEDS (*FALLOPIA* SPP.) – IMPACT ON TARGET WEED AND RECOVERY OF NATIVE BIODIVERSITY

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Exotic knotweeds (*Fallopia japonica, F. sachalinensis, F.* x *bohemica*) are among the most serious invasive exotic weeds in Europe and North America. Several methods are used to manage *Fallopia* in natural areas. However, their effect on the target weed and on native biodiversity is poorly supported by experimental studies. In 2005, we started an experiment comparing three management methods: two cutting regimes (1x cut or 6x cuts / growing season) and covering ground with "géotextil". Within each *Fallopia* invaded surface, *Fallopia* density and biomass, and richness and cover of native vegetation were regularly recorded. Invertebrates were collected using pitfall traps. *Fallopia* above-ground biomass was reduced by all three management methods. Native vegetation responded positively to decreased *Fallopia* biomass, with cover and plant species richness being highest in plots where *Fallopia* was regularly cut. Previous studies indicated a positive correlation between native plant species richness and abundance and diversity of invertebrate assemblages within *Fallopia*-invaded habitats (Gerber et al 2008). In line with this, morphospecies richness and abundance tended to be highest in plots where *Fallopia* was monthly cut. Our results suggest a rapid and positive response of native vegetation and fauna to *Fallopia* removal; hence even a low-input management scheme helps to mitigate the negative impact of *Fallopia* on native biodiversity.

PHENOTYPIC PLASTICITY OF INVASIVE ALIEN PLANT SPECIES IN SPAIN: A BROAD PHYLOGENETIC COMPARISON

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Phenotypic plasticity has often been suggested as an important mechanism of plant invasion. Despite their importance, no general conclusion can be found because there are no studies that have experimentally tested the assumption by comparing a large set of invasive-native phylogenetically related pairs in several taxonomic families between different growth forms and under the same ecological context. We investigated phenotypic plastic responses to variation in light and nutrients in 20 invasive-native cofamilial pairs occurring in Spain. Ecophysiological traits, phenological growth patterns, and fitness estimators (total biomass, survival and flower production) were measured to analyse the potential for invasion of trait plasticity. Within pairs, not all the invasive alien species showed higher phenotypic plasticity compared to natives. However in general, invaders were able to maintain higher fitness across treatments. Both previous results and the current study support the success of different invasive strategies i.e. Jack of all trades-Master of some. Differences were more noticeable under limiting conditions. Overall, invasive alien plant species showed higher plastic responses than natives, but the trend had exceptions. To our knowledge this is the first study that provides robust experimental support to the role of phenotypic plasticity as an important mechanism promoting biological plant invasion.

ECOLOGICAL BASIS OF GRASS INVASIONS IN AUSTRALIA

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Thousands of plant species have been introduced to Australia, many of them Poaceae. However, the grasses have a higher than average tendency to naturalise and several are transformer species. In northern Australia, transformer grasses include both terrestrial and aquatic or semi-aquatic species and, in some systems, there are few, if any, native ecological analogues. We will (i) explore the ecological characteristics of the invasive species and the invaded ecosystems to analyse the phenomenon; (ii) review the mechanisms by which invasive grasses influence Australian ecosystems and draw comparisons with other parts of the world; (iii) illustrate the process of ecological transformation by an invasive grass with a landscape-scale study of the ecology and management of *Urochloa mutica*. Removal of livestock from a wetland that had been grazed since the species was introduced resulted in a proliferation of this stoloniferous grass. Our experiments have demonstrated the efficacy of burning and dry season grazing to regulate the abundance of *U. mutica* and create windows in time and space that can be exploited by other wetland species. Extreme spatial heterogeneity characterises the responses of this invaded ecosystem to grazing and burning, reflecting an important interaction between fire and patterns of inundation of seasonal wetlands.

DISTRIBUTION PATTERNS OF MEDITERRANEAN AND TEMPERATE NON-NATIVE SPECIES IN MOUNTAIN REGIONS: COMPARISONS BETWEEN SWITZERLAND AND TENERIFE

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Mountain systems provide ideal conditions for analysing plant invasions along environmental gradients over short distances. In particular, mountains are suitable to study climatic limitations of plant invasions. The distribution patterns of non-native species along climatic gradients strongly depend on the bioclimatic origin of species and climatic conditions in the new area. To analyse the role of climate matching, i.e. the significance for invasion success if climatic conditions of native and invaded area are corresponding, we used a reciprocal approach: presence and abundance of non-native species with mediterranean and temperate origin were studied in a mediterranean and a temperate regions. We hypothesize that (1) altitudinal distribution patterns of non-native species differ between the regions, and that (2) species of the same bioclimatic origin show similar distribution patterns in both regions. Further, we suppose that (3) non-native species with climate matching colonise a larger altitudinal gradient, and that (4) climate change will especially promote mediterranean species in a temperate climate. The study was conducted during two growing seasons. We investigated the distribution of non-native plants up to 2000m a.s.l. along mountain pass roads as they are the main dispersal corridors to higher elevations. We discuss factors that interact with climatic constraints in shaping the distribution patterns of non-native plant species at high altitude.

COMPARING THE REPRODUCTIVE OUTPUT OF INTRODUCED PLANTS IN THEIR NATIVE VERSUS INTRODUCED RANGES: DO MORE OR LARGER SEEDS CONTRIBUTE TO INVASION SUCCESS?

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We tested whether plants introduced into a novel range have reduced seed predation and increased allocation to reproduction (seed size and/or number). Population level data were collected for five closely-related plant species that were either native to the east (*Acacia longifolia, Acacia melanoxylon*) or west (*Acacia cyclops, Acacia saligna, Paraserianthes lophantha*) coast of Australia that have become naturalized and invasive on the other side of the continent. We predicted that populations in the novel range would have significantly less seed predation and greater reproductive output, assisting their invasion success by enabling them to have a greater propagule pressure in their introduced range. Data were collected in Western Australia (Perth to Esperance) and Eastern Australia (Sydney to Yorke Peninsula) throughout the summer of 2008-09 during the peak seeding period. Five individual plants per population and 8-10 populations per species were sampled across both the native and introduced ranges. We then compared seed predation, total seed production, seed number per unit biomass and seed mass in the native and introduced ranges of each species.

IMPACT OF ALIEN PLANTS ON SPECIES DIVERSITY OF INVADED COMMUNITIES IS DETERMINED BY DIFFERENCES IN VIGOUR OF THE INVADER AND NATIVE DOMINANT

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Data on impact of alien plants, systematically collected for a number of invading species are still missing. We studied the effects of 13 naturalized neophytes (species introduced after 1500 A.D.) on species diversity and composition of invaded communities in the Czech Republic. Invaded plots were compared with neighbouring uninvaded plots, as similar as possible in terms of ecological conditions. The neophytes studied strongly differed in their impacts: some invaders (*Fallopia*, *Heracleum mantegazzianum*) reduced species richness of invaded communities by almost 90%, but others exert negligible impact. A strong impact recorded at the plot scale resulted in marked differences in numbers of species recorded in invaded and non-invaded vegetation at the landscape scale. The invaded community is an important co-determinant of impact, severity of which increases with increasing difference between the vigour of the invading species and that of the native species dominating the community prior to invasion. While changes in species numbers are determined by the identity of the invader, those in species diversity depend on the difference in height and cover of the invader and the native dominant. Communities with competitive native dominants (e.g. riparian and other nitrophilous) therefore tend to be less impacted than communities without such dominants.

SAPIA AND RANGE EXPANSION OF SOME INVASIVE SPECIES IN SOUTH AFRICA

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The Southern African Plant Invaders Atlas (SAPIA) is a mapping project, launched in 1994, to collate information on the distribution, abundance and habitat types of invasive and naturalized plants in southern Africa. The SAPIA database is a computerized catalogue of ± 65 000 locality records of more than 500 species. The database incorporates records gathered by SAPIA participants and from roadside surveys conducted by the author since 1979. Among its many uses, SAPIA can provide an historical record of the spread of invasive species. A few species that have shown an impressive range expansion over the past 30 years are discussed here. They are: *Azolla filiculoides*, *Campuloclinium macrocephalum*, *Chromolaena odorata*, *Echinopsis spachiana* and *Tecoma stans*. *A. filiculoides* expanded rapidly from the 1980s until the late 1990s when a biocontrol programme was initiated. It is now under biocontrol and its distribution range is more or less static. *C. macrocephalum* is currently in an exponential expansion phase which started in the mid 1990s. *C. odorata* started its expansion in the 1960s and by the 2000s had almost reached its predicted range. Both *E. spachiana* and *T. stans* are currently in an expansion phase and without control efforts could vastly increase their range.

USING REMOTE SENSING AND GIS TO MAP INVASIVE ALIEN PLANTS AND ASSESS IMPACTS ON BIODIVERSITY: A STUDY ON *CHROMOLAENA ODORATA* IN KWAZULU-NATAL, SOUTH AFRICA

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Since 1972, Geographic Information Systems (GIS) and remote sensing have been increasingly used to map and assess invasive alien species. Supervised classification of remotely sensed images has been used to map invasive plants whose canopy is dominant, but has been less successful with cryptic species, who dominate the IUCN's Invasive Species Specialist Group's list of 100 of the world's worst invaders. A variety of alternative methods have been developed to predict occurrence. In this paper we assess the use of remote sensing to perform a supervised classification to detect *C. odorata* in KwaZulu-Natal, South Africa. In addition, we developed a probability map of *C. odorata* using a multiple regression model with GIS layers of environmental factors that influence *C. odorata* distribution. We then combined these to produce one distribution map, and tested it's accuracy with ground-truthing data. Once the distribution was established, we used additional GIS datasets to assess the impact of *C. odorata* invasion on biodiversity conservation. Some of the most endangered vegetation types rely on proclaimed conservation areas for their protection, but our results show that formally protected areas are also invaded. Clearing costs are also very high to be practicable at a regional level.

THE EFFECT OF THE INVASIVE WEED *CHROMOLAENA ODORATA* ON THE CRITICALLY ENDANGERED BLACK RHINO IN HLUHLUWE-IMFOLOZI PARK, SOUTH AFRICA

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African savannas are fragmented by agriculture, urbanisation, and threatened by invasion of alien species. Black rhino *(Diceros bicornis minor)* is a critically endangered species (< 2500 individuals) whose population in Hluhluwe-iMfolozi Park (HiP), South Africa, has declined since 1993, possibly due to the invasion of an alien plant *Chromolaena odorata.* Despite the decrease in population density, home range sizes in the north of HiP decreased, where *C. odorata* expanded most, however, in the south, ranges increased in size, where *C. odorata* only occurs sparsely. Temporal analyses show a shift in distribution of rhino throughout the Park toward the south and that invaded indigenous vegetation types were significantly less used. We assessed woody species utilisation by black rhino along random vegetation transects. *Spirostachys africana* contributed a large proportion of the diet and was highly preferred, but the local presence of *C. odorata* significantly reduced utilization of this resource. We conclude that the invasion of *C. odorata* has negatively impacted forage utilization and

has led to a spatial reorganization of the population of black rhino, and this may explain the recent decline in the population. Therefore, biotic homogenization through the introduction of invasive species can promote the local extirpation of endangered species.

IDENTIFYING THE OPTIMAL SAMPLING SCHEME AND EFFORT FOR MONITORING INVASIVE ALIEN PLANTS

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Large-scale monitoring methods that can estimate the abundance and spatial structure of invasive alien plants (IAPs) with satisfactory accuracy are crucial for planning effective management actions. An optimal sampling scheme that costs only a reasonable sampling effort but which derives adequate monitoring results is of practical value and is urgently needed. Here, we present such a monitoring method and sampling scheme using ad hoc presence-absence records that are commonly adopted for reporting data in South Africa's Kruger National Park (KNP). The total and local abundance of IAPs were estimated using the Area-of-Occupancy (AOO) and a detection-rate-based Poisson model, respectively. Results from these two models were consistent in predicting a total of ~1 million IAPs in the KNP. Five sampling schemes (namely random, systematic, addictive, elusive and random-walk) were then examined to compare the performance in estimating total abundance and distributional structure of IAPs. A general relationship between sampling effort and abundance estimate was unveiled. Abundance estimation was shown to be much more difficult than detecting the spatial structure of the IAPs. We therefore recommend this method of using the scaling pattern of species distribution and appropriate sampling schemes in the large-scale IAP monitoring in other protected areas.

ASSESSING THE BENEFITS OF SEED REDUCING BIOLOGICAL CONTROL AGENTS FOR PERENNIAL INVASIVE PLANTS

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A considerable proportion of the species of biological control agents that have been introduced onto perennial invasive plants in South Africa primarily damage the reproductive parts of their hosts and thereby reduce seed production. Conventionally, the use of these types of agents has been considered to be an ineffective approach because there is a low probability that the insects will reduce the density of their host plants which are predominantly site limited rather than seed limited. With particular reference to Australian acacias, ongoing studies are investigating the validity of this supposition and are determining how a reduction in seeding capacity may facilitate control of the invasive species. In particular, the role of integrated control methods such as mechanical clearing and fire, in conjunction with seed longevity in the soil, is showing that the invasiveness of some perennial species is being curtailed substantially by the biological control agents.

MOLECULAR ECOLOGY OF INVASIVE *HERACLEUM MANTEGAZZIANUM* ACROSS EUROPEAN CONTINENT AND IN THE NATIVE CAUCASUS

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Heracleum mantegazzianum (giant hogweed) is one of three invasive species of *Heracleum* in Europe. It was introduced as a garden ornamental in the 19th century from the Caucasus and since then the plant has spread rapidly across Europe. To study population genetic structure and variation we used AFLP fingerprinting and employed a biogeographical sampling approach - collecting in both native and introduced ranges. In Europe, we sampled in 15 out of 19 countries in which *H. mantegazzianum* is reported. In the Caucasus, we sampled in Russia and Georgia (Abkhazia), covering approximately a third to a half of its distribution area. In total we analysed over 1000 individuals from 75 invaded and 35 native populations. Preliminary results revealed higher within-population variation and isolation by distance in native compared to invaded populations. Such pattern suggests founder events, multiple introductions, strong genetic drift and occasional gene-flow in invaded populations. On the local scale, weak population genetic structure was detected within rivers, but stronger differentiation among rivers of the same catchment. Opposing processes such as limited gene flow/migration and long distance dispersal were revealed. Implications for introduction history, migration and processes shaping population/metapopulation structure on different geographical scales will be discussed in the presentation.

NATURALIZED AND INVASIVE PLANT DISTRIBUTIONS ALONG ALTITUDINAL TRANSECTS IN HAWAII

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If anthropogenic disturbance and human-mediated dispersal are the major facilitators of plant invasions, then the species richness of invaders is expected to decline with elevation, due to decreasing anthropogenic influences at higher elevations. We surveyed roadside altitudinal transects (50-4100 m) on the islands of Hawai'i and Maui to examine patterns of invasive plant species richness as well as taxonomic patterns and patterns in the geographic origin of invaders. A total of 229 naturalized species were recorded. Most of these where short-lived herbaceous species (often Poaceae or Asteraceae) corresponding to our expectations for disturbed roadside vegetation. Tropical species dominated at low elevations whereas temperate species dominated at high elevations. Species richness of invaders appeared to be highest at middle elevations. A peak in richness at mid-elevation may be due to a convergence of tropical and temperate species. At the same time, the hump-backed pattern may be caused by opposing limiting factors at each end of the gradient: stresses from cold temperature, high irradiance and drought at high elevations, and stricter control of weeds and roadside landscaping around denser human habitation at the lowest elevations. Elevational

ranges of most weed species were similar between islands, suggesting that distributions are predicable.

ADAPTIVE EVOLUTION AND PLASTICITY DEFINE THE DISTRIBUTION OF EUROPEAN WEEDS ACROSS ELEVATION GRADIENTS IN HAWAI'I

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Climate matching between the site of origin and site of introduction is one approach to predicting the likely range of an introduced species, but invasive species may also expand their ranges into novel environments through adaptation. To investigate the role of evolutionary adaptation in determining invasive species ranges, we studied six European plant species that have invaded along steep environmental gradients of two Hawaiian volcanoes. These European species were introduced to Hawai'i about one hundred years ago. Field surveys suggested the occurrence of different ecotypes adapted to differing temperatures. Seeds were collected across elevation gradients from both volcanoes and grown in a greenhouse at cold and warm temperatures over two generations. Populations of some species, especially *Hypochaeris radicata, Plantago lanceolata, Rumex acetosella* and *Holcus lanatus*, had a clear home site advantage in germination and growth, indicating a genetic basis for the observed ecotypes, rather than phenotypic plasticity. This pattern was more pronounced in outbreeding than in inbreeding species, suggesting that the genetic diversity and recombination is a key factor that has promoted ecotypic differentiation. These results demonstrate the potential for rapid genetic differentiation during invasion across environmental gradients, resulting in patterns of ecotypic differentiation similar to those often reported for native species.

RIPARIAN RESTORATION: DEVELOPING BEST MANAGEMENT PRACTICES

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Woody alien invasive plants pose a major threat to freshwater ecosystems worldwide. In South Africa plant invasions have a severe impact on water resources and it is estimated that 7% of the Mean Annual Runoff (MAR) per year is lost to invasive plants. Invasive plants also reduce biodiversity by replacing indigenous vegetation, cause more intensive flooding and fires, increase erosion and siltation of dams and estuaries and alter ecosystem functioning. In response to this threat, "Working for Water", a government funded poverty relief programme, was initiated in 1995 to clear alien invasive plants. However, natural recovery of riparian systems after clearing is often limited, and without active intervention in the form of restoration these riparian zones are prone to reinvasion and/or further degradation. Since 2004, research to develop best management practices for restoration after clearing has been undertaken in the Albany and Kouga catchments of South Africa. This presentation will give an overview of results to date, including the impacts of invasion, clearing and restoration on soil seed banks, alien regrowth and the recovery of biodiversity. This information will be used to provide guidelines for clearing and restoration to facilitate recovery towards functional riparian ecosystems.

ESCAPE FROM ENEMIES: THE ROLE OF RELATIVES

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Invading plants may benefit by escaping their native-range natural enemies, as predicted by the Enemy Release Hypothesis. However, new host-enemy interactions can develop in the invaded community, reducing this advantage. One possible source of these enemies is transfer from closely related plants, if insects adapted to indigenous relatives can shift rapidly to related exotics. We evaluated the influence of related species on escape from enemies at three taxonomic levels. First, in common garden experiments, we found that the risk of attack by invertebrate herbivores is influenced by an invader's phylogenetic isolation from the native community: herbivory is greater for species with closer familial relatives in the local flora. Nonetheless, within the Asteraceae, exotics still experience lower levels of damage than related natives, even after compensating for correlations with phylogenetic relationship. Finally, in the case of an indigenous weed within this family, insect damage to *Ambrosia artemisiifolia* was significantly greater in artificial populations located closer to conspecifics. These results indicate that damage by natural enemies is influenced by native members of the invaded community, and suggest that considering the local occurrence of close relatives can improve studies of enemy release.

SOUTH AFRICAN INVASIVE ALIEN PLANT SURVEY

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An in-depth local knowledge and understanding of invasive alien plant (IAP) species in South Africa exists. However, the study by Versfeld *et al.* (1998) was the first assessment of the full extent of woody IAP invasions and primarily used expert knowledge across South Africa to determine the range and abundance of IAPS at a 1:250 000 scale. With the current update of the Versfeld *et al.* (1998) IAP map, the objective was to develop a cost-effective, objective, statistically-sound and therefore repeatable, monitoring system of woody IAP at the quaternary catchment level. The relationships between environmental variables (climate, soil and terrain) and species distribution and abundance were determined. The study area was stratified according to the environmental classes contributing the most to IAP occurrence and different sampling options (sampling design and number of field sample points) for a field survey was simulated in order to select the optimal sampling approach. A total of 74 187 sample points were allocated on a stratified random basis to the study area (127 million hectares). The modeling phase and field survey of the project has been completed and data interpretation is currently underway. Project progress to date will be presented.

TOWARDS MORE EFFICIENT MANAGEMENT OF INVASIVE ALIEN PLANTS IN THE CAPE FLORISTIC REGION: OPTIMISING THE PRIORITIES

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Managing invasive alien plants (IAPs) is usually a triage, constrained by human and financial resources. Limited resources do not allow for the complete eradication of all IAPs in the whole managed area. It is thus essential to use an objective and transparent prioritisation approach (as described in the presentation in this conference by Roura-Pascual et al.). Even the most objective and transparent prioritisation does not guarantee effectiveness, as success, measured in time required until an AIP is eradicated or decimated to a given level, can only be assessed over time. To be able to compare the effectiveness of different prioritisation strategies and to select the most effective one, we developed a spatio-temporal simulation model (SPREADSIM) to simulate the spread of IAPs over time. Simulations were run over 100 years, during which one prioritisation strategy was used, and the amount of area cleared was constrained by financial resources. SPREADSIM incorporates spatial as well as non-spatial information, includes fire spread simulation, the spread of the IAPs and costs of clearing. This presentation will show some results from these simulations and discuss the implications for the identification of priority areas for clearing.

NASSELLA TRICHOTOMA: POTENTIAL GLOBAL DISTRIBUTION UNDER FUTURE CLIMATES

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Nassella trichotoma is a drought-tolerant invasive grass of South American origin that has invaded pastures in Australia, New Zealand and South Africa with resulting large animal production losses and control costs. In the absence of climate change its potential ranges, as projected using the process-oriented niche model, CLIMEX, extend well beyond the currently invaded ranges in these countries. Areas not yet invaded, but also at risk, are Western Europe, eastern Africa, the north-west coast and central-eastern USA, western South America, and parts of Nepal, India and south-west China. Here we use CLIMEX to consider the potential distribution of this weed under three future climate scenarios. Regardless of future climate scenario, the model revealed marked contractions in the areas of suitable climate, with the greatest reduction in the species' native range in Argentina. These range contractions were due to increases in heat stress that excluded the species from many areas that currently experience a sub-tropical climate. By contrast, in Europe there is a projected eastward expansion in range as increasing temperatures reduce cold stress limitations. Under these future climate scenarios, the countries under greatest threat from *N. trichotoma* occur in Western Europe.

PACIFIC INVASIVES PARTNERSHIP: A SUCCESSFUL MODEL FOR GLOBAL INVASIVE SPECIES COORDINATION AND MANAGEMENT

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Invasive species are one of the greatest threats to biodiversity in island ecosystems. In recognition, Pacific island nations called for more effective means to manage invasive species threats to island biodiversity, as identified in their regional strategy, and the Pacific Invasives Initiative (PII) was born. In 2008, the partner organizations of PII joined with those of the Pacific Invasive Learning Network and the Invasive Species Working Group of the Roundtable for Nature Conservation in the Pacific Islands to form the Pacific Invasives Partnership (PIP). Together these initiatives link the major regional intergovernmental organizations and provide strategic support for demonstration projects, skill sharing, training, networking and strategy development and a coordinated means to implement the Regional Invasive Species Guidelines for the Pacific. With the proven success of these efforts in the Pacific, the PIP provides a successful model to expand to other island regions and build regional capacity and support for this work. The end result would be a network of regional organizations to help strengthen and mobilize capacity on islands across the globe to deal with invasive species issues.

MUCH ADO ABOUT BIOCONTROL: OUTREACH TO A RISK AVERSE PUBLIC

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Biological control of weeds faces many significant biological and administrative challenges including finding suitable agents, obtaining appropriate permits and securing adequate long term funding. But without public support, these projects may be stopped in their tracks. With increasingly complex natural resource issues facing the public, many people have a distrust of science and public servants and are generally averse to taking risks they cannot understand. On the other hand, the ready availability to the public of a wide variety of media has made people feel empowered by knowledge, although often little interested in or aware of the accuracy of the information provided. Biocontrol practitioners face a major challenge in raising awareness and understanding of the problems associated with invasive plants and the benefits of using biological control as a tool in the integrated control of widespread weeds. We discuss here our experience with public involvement associated with the proposed release of *Tectococcus ovatus*, a Brazillian scale intended to control the widespread weed, strawberry guava (*Psidium cattleianum*) in Hawaii and provide valuable lessons learned in a long and controversial process.

CURRENT AND POTENTIAL INVASIONS BY *PROSOPIS* SPECIES IN SOUTH AFRICA: DEVELOPMENT OF A MODEL FOR ASSESSING THE IMPACTS ON GROUNDWATER RESOURCES

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This paper reports on an assessment of the impacts of Prosopis species on groundwater resources in South Africa. At least six *Prosopis* species have been introduced into South Africa to provide fodder for livestock and fuel, including *Prosopis chilensis, P. glandulosa* (var *torreyana*) and *P. velutina*. Hybrids between the latter two species are aggressive invaders which form impenetrable thickets in the alluvial deposits on the floodplains of the seasonal or ephemeral rivers and cover at least 2 million ha. At least 40 million ha is climatically suitable for invasion, so there is significant potential for further expansion. Stands in upland situations are limited to the annual rainfall and have a much less impact on groundwater resources. Stands in alluvial deposits can access groundwater and potentially use 350-500 mm of rain and groundwater per year, resulting in the depletion of groundwater resources. Although the alluvial deposits only comprise 5-10% of the area, the loss of groundwater has significant implications. Agriculture is based on extensive livestock farming which depends on groundwater, as do most towns and villages. Mechanical control is effective but very expensive so the best option is to introduce biological control agents which will kill the trees.

GENETIC DIVERSITY OF THE GLOBALLY INVASIVE GRASS *PENNISETUM SETACEUM*

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The role of genetic variation in facilitating biological invasions remains paradoxical. Population genetics theory predicts that responses to natural selection under novel conditions would be critical for the establishment and spread of invasive species. Quantitative and neutral genetic diversities were determined for the weedy grass *Pennisetum setaceum* Forsk. Chiov. (fountain grass) with differing global (North American and African) patterns of invasiveness. A comparison of these two genetic diversity indexes of globally invasive and native populations can elucidate whether rapid adaption occurred in invaded ranges. Numerous molecular markers (Microsatellite and ISSRs) indicated complete monoclonality and a lack of neutral genetic structure within and among all of these areas (F_{ST} = 0.0). Quantitative genetic variation (growth response to water availability, nitrogen availability, and total nutrient availability) showed a similar lack of structure (Q_{ST} = 0.00065–0.00952). These results suggest that no adaptive differentiation exists for any of the fitness correlates measured between invaded and native range. Fountain grass can tolerate a wide range of environmental variation as afforded by a general-purpose-genotype. This single genotype likely evolved high levels of plasticity in response to fluctuating historical environmental conditions. Differentially invaded environments show a comparable gradient of disturbance levels and this might be linked to the success of this single clone.

DOES COEVOLUTION OF WEEDS AND CROPS PREDICT MIGRATION SUCCESS? A COMPARATIVE STUDY OF MAIZE FIELD WEEDS FROM MEXICO AND ZIMBABWE

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We present the results of a comparison of the diversity and origins of the maize weed flora of smallholder maize fields in rural villages with similar physiographic conditions of Oaxaca, Mexico and of Honde Valley, Zimbabwe. Vegetation sampling showed that the Mexican villages had a richer weed flora and higher diversity than the Zimbabwean villages. The number of species, densities and cover of agrestal weeds depend on the rainfall received during the season; they are higher in humid areas and rather similar in the areas with similar environments of the two continents. The maize weeds from both countries had a considerable number of species that originated from America (80 % for Mexico and 32 % for Zimbabwe) which suggests that weeds may coevolve with crops, and that such coevolution leads to a higher probability of successful migration. There was a relatively high proportion of shared genera (20) between the weed floras suggest that there are predispositions for a weedy habit, in a similar way as some genera contain many domesticates.

INVASIVE PLANT SPECIES MANAGEMENT IN THE GRAND CANYON NATIONAL PARK: PAST CHALLENGES, CURRENT EFFORTS, AND FUTURE DIRECTION

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The Grand Canyon National Park's Vegetation Program has developed a comprehensive program for invasive plant species management, in a pro-active effort to minimize loss of native ecosystems, habitat and overall biodiversity due to invasive plant encroachment and spread. With over 1.2 million acres and more than 1750 vascular plant species, Vegetation leaders have needed to prioritize actions, develop partnerships, and creatively seek funding opportunities. I will provide an overview of the program, including a history of invasive plant species in the park and a description of how staff determined which of the 189 exotic plant species to focus control efforts on. I will then highlight the successful management program for tamarisk and other high priority invasive species in the Park's backcountry areas, the most logistically challenging areas of the park. The presentation will include details about the project, address specific challenges in implementation, provide an overview of the partnerships that were developed, and describe the invaluable contributions of volunteers. I will then discuss the future of the Park's overall program, including an update on the status of compliance and an overview of annual work plan and concluding with a description of research needs and challenges that lie ahead.

IMPLEMENTING BIOSECURITY AWARENESS ON DECLARED PLANTS AND OTHER INVASIVE WEED SPECIES: DEPARTMENTAL TRAINING

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Biosecurity Training focuses on the priorities for regional Biosecurity Officers from the Department of Agriculture and Food WA (DAFWA). The Declared Plants and other Weed Species Training Course outlines and provides awareness, knowledge and the tools for use in the front line defence against the invasion and spread of weeds in Western Australia. The training provides Officers improved liaison with community members, land managers, land care groups, local and state government authorities, thus promoting a better understanding of weed impacts on biodiversity and the environment. Pressure from increased imports and interstate movements continue to threaten our position as the most weed-free state in Australia. Officers attend a two day course which highlights theoretical and interactive training methods, that enabled them to map, collate and build databases for future references of invasive plants. Use of electronic resources such as Global positioning devices, digital photography also form part of the training, as does a pre course requirement to collect, identify and log examples of weeds to be presented during the course. Also covered are DAFWA's policies, procedures and Acts, which are required by Officers in their daily role. This training improves the awareness required to maintain the defence of this state's biodiversity.

ECOSYSTEM RESTORATION AFTER REMOVAL OF THE N_2-FIXING INVASIVE *ACACIA LONGIFOLIA*

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One of the most threatening invasive plants in the Portuguese dune ecosystems is *Acacia longifolia* (Andrews) Willd. This species was planted at the beginning of the 20th century to curb sand erosion but has now proliferated along several coastal dune systems. Experimental areas were installed in a coastal dune reserve, in Central-North Portugal, to assess 1) impacts of invasion by *A. longifolia* and 2) recovery potential after removal of the invasive species. Areas invaded for a long time (>20 years), areas recently invaded (<10 years) and areas with native vegetation were compared. For each type of invasion, (*i.e.*, long-invaded and recently invaded), three treatments were used: 1) *A. longifolia* left intact; 2) *A. longifolia* was removed; and 3) both *A. longifolia* and litter layer were removed. Areas were monitored for ca. 5 years, assessing vegetation, soil chemistry and microbiological properties. Results showed that the *A. longifolia* invasion promoted significant impacts at both the soil and vegetation level, and that recovery of invaded areas after removal is slowly taking place. In general, soil properties respond slower than vegetation both to invasion by *A. longifolia* and to removal of the invasive species. Results will be discussed considering implications for management and their use in broader scales along the Portuguese coastal areas.

DISTRIBUTION MODELLING AS A TOOL FOR PREDICTING THE DISTRIBUTIONS OF POTENTIALLY INVASIVE SUBMERGED AQUATIC WEEDS IN SOUTH AFRICA

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To date three submerged aquatic plant species have been declared weeds or invader species in South Africa; Canadian water weed (*Elodea canadensis*), dense water weed (*Egeria densa*) and spiked water-milfoil (*Myriophyllum spicatum*). Their control is subject to the "Conservation of Agricultural Resources Act": (Act 43 of 1983), as amended in 2001. However there are no effective control measures for submerged macrophytes in South Africa. Additionally a number of new submerged aquatic weeds have recently been identified in South African, such as hydrilla (*Hydrilla verticillata*) rated as the worst submerged weed in the USA, and cabomba (*Cabomba caroliniana*), a weed that is rapidly invading Australia. Little is known about these submerged aquatic weeds in South Africa, including their current and potential distributions. Distribution modelling using the programmes Climex, Floramap and Maxent was used to predict areas suitable for the establishment of these potentially invasive macrophytes. A number of systems throughout South Africa, and particularly the subtropical coastal regions were found to be climatically suitable for their establishment. However, these models do not take into consideration water quality, hydrology and biotic interactions, which are important aspects for establishment and persistence. Knowledge of the distribution of these species is important for implementation of effective management strategies and eventual control.

EFFECT OF FIRE ON REPRODUCTIVE BEHAVIOR OF *MELINIS MINUTIFLORA* (MOLASSES GRASS) IN THE BRAZILIAN CERRADO

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This study evaluated the effect of fire on initial establishment and reproduction of natural populations of two cultivars - Roxo and Cabelo-de-Negro of *Melinis minutiflora*. The effect of fire was evaluated in the following treatments: 1) control - plants established several years ago in a native Cerrado; 2) recently established plants in a native Cerrado; 3) recently established plants in a burned Cerrado; 4) resprouted plants after fire in May and 5) resprouted plants after fire in September. The results show that the use of fire is not efficient to control either of these cultivars of *M. minutiflora*. Despite the fact that fire slightly reduced seed production, burned plants were not eliminated and maintained their capacity to resprout. The use of fire also improved the development of recently-established seedlings and anticipated the reproduction.

COMPETITIVE ABILITY OF *SOLIDAGO CANADENSIS* L. IN SPONTANEOUS SUCCESSIONS OF POLLUTED WASTELANDS

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In spontaneous successions invasive plants can displace native species through competition for nutrients, water, light and space. Here we show that they may also exert indirect pressure by compensatory responses to pollutants. Such tolerance to toxic soils may play a key role in their establishment in industrial countries. For this purpose we use the perennial herbaceous *S. canadensis*, a successful invader of towns and wastelands of Europe. The study was conducted in an old industrial wasteland (north east of France), undisturbed for 30 years. Floristic investigations have revealed a rich array of species arranged in patches of various native pioneer plants and exclusive *Solidago* patches. *Solidago* patches present contrasted variations in sizes, colour, sexual reproduction, growth rate and photosynthetic efficiency. We determined the heavy metal and polycyclic aromatic hydrocarbons content in soils and in roots in four selected sites which present a gradient of these variations. The first results revealed a large range of concentrations in heavy metals in soils and in roots, partly related to the variations in life-traits of the plant. The consequences for population dynamics and dispersal will be discussed.

MANAGEMENT OF AN EMERGING WEED: *CYLINDROPUNTIA TUNICATA* IN GRAAFF-REINET

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The early detection and rapid response to invasive alien plants programme was initiated with seed funding obtained from the Working for Water programme of the South African Department of Water Affairs and Forestry. This initiative seeks to reduce the incidence of plant invasions in South Africa through the early detection and identification of emerging alien plants that display invasiveness. Once the identity of the potential invader is verified, it is subjected to risk assessment followed by a response planning programme that may lead to eradication. Where control methods are implemented these are monitored and evaluated. One such potentially invasive plant is the cactus *Cylindropuntia tunicata* (Lehm.) F.M. Knuth which has been detected in the Graaff-Reinet area in the Eastern Cape Province. This paper reports on the progress made in the development and implementation of a tailor made control programme aimed at eradication of this particular species at this specific location. Details of this programme and the envisaged control methods to be implemented will be discussed.

USING NATIVE PLANT SUCCESSION TO MANAGE WEEDS IN NEW ZEALAND

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We are investigating whether native plant succession could potentially be used as a weed management tool in New Zealand. If native plants can replace weeds without active weed control, conservation goals could be achieved at a significantly reduced cost. However, natural succession has seldom been considered explicitly as a way of managing invasive plants. Our aim is to develop a decision support system that can be used to predict whether native plants will replace weeds in the absence of active weed control. We conducted a literature review to investigate a) what factors influence native succession through weeds, b) which are likely to be most important in New Zealand, and c) what information already exists on the ability of native plants to regenerate through weeds in New Zealand. In New Zealand, the key weed attributes are probably seed bank persistence, shade tolerance and habit relative to native species. Site attributes likely to have the greatest influence in New Zealand include availability of native seeds, disturbance regime, climate (especially rainfall), and the presence of herbivorous mammals. We discuss the influence of these attributes on the potential for native plant succession through weeds, and illustrate with New Zealand case studies.

EVALUATION AND MODIFICATION OF THE AUSTRALIAN WEED RISK ASSESSMENT SYSTEM FOR USE AS A PREINTRODUCTION SCREEN IN CANADA

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In a recent assessment, the Australian Weed Risk Assessment system was shown to perform consistently well in predicting the invasiveness or non-invasiveness of introduced plant species in a number of countries and regions around the world. To test the system's potential usefulness as a pre-introduction screen in Canada, we evaluated it against 152 plant species with at least a 50-year introduction history in Canada, including major and minor weeds and species which have not naturalized. The weediness of each species was independently rated by a panel of Canadian agricultural, botanical, and conservation experts. Using the standard cut-off scores the system correctly rejected all major and 86% of minor weeds. However, it also incorrectly rejected 42% of non-weedy species. This high false positive rate is associated with the WRA scores in our evaluation, which were consistently about 6 points higher across all weediness categories than in other geographic areas in which the system has been evaluated. We are exploring the reasons for this discrepancy, and developing ways of modifying the scoring to improve the system's predictive power. Canada's diverse climatic and environmental conditions pose challenges in predicting the invasiveness of introduced plant species.

CURRENT AND POTENTIAL GEOGRAPHICAL DISTRIBUTION OF PARTHENIUM WEED IN EASTERN AND SOUTHERN AFRICA

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Parthenium hysterophorus (Asteraceae) is considered to be one of the world's most serious weeds. This South American species invades Australia, Asia and Africa, negatively affecting agriculture, biodiversity and animal and human health. As part of a USAID IPM CRSP funded project, this study attempted to improve the understanding of the geographical distribution of parthenium in eastern and southern Africa. The climate model CLIMEX was used to formulate survey methodologies. The model predicted that large areas of sub-Saharan Africa were climatically suitable for the growth and spread of parthenium. Roadside surveys were conducted in Botswana, South Africa, Swaziland, Ethiopia and Uganda. Prior to these surveys, only limited parthenium locality records existed and significantly more records were obtained from these surveys. Most infestations were of a high density (>3 plants/m^2). Distribution records were used to validate the CLIMEX model, which proved a useful prediction tool. This study (i) increased current understanding of the distribution of parthenium; (ii) developed a baseline from which to monitor future spread and abundance of parthenium; and (iii) generated site-specific information for the selection of appropriate management options such as biological, mechanical, cultural and, where necessary, chemical control in integrated control programmes. Additional surveys are required in other countries which are predicted by CLIMEX to be at risk.

CHANGES IN WEED SPECTRUM IN THE SOUTHERN AGRICULTURAL REGION OF AUSTRALIA OVER THE PAST 10 YEARS

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It is well known that weed communities change over time, and with changes in agricultural management practices weeds that were once considered rare or not of significance may now cause severe economic damage. In 1997 a weed field survey of 497 sites was conducted in the southern agricultural region of Western Australia. In order to determine if there have been changes in the distribution of known weeds and identify potentially emerging weeds problems, a second field survey was conducted during spring 2008 that revisited the previous sites. Initial results found that a total of 201 different weed species were recorded during both surveys. Statistical analyses are continuing and preliminary results will be completed by May 2009.

EVOLUTION OF RANGE MARGINS IN INVASIVE SPECIES

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The study of invasive species at their current range margin and beyond can provide information on its distributional limits and its response to changing climate. In this study, we planted native genotypes collected from the center (Czech Republic) and their range margin (France) along with introduced genotypes from the center (Vermont) and current range margin (North Carolina) of the invasive grass, *Phalaris arundinacea,* into common gardens along a climatic gradient (Vermont, North Carolina, and Georgia) to determine whether individuals have the potential to evolve with changing climate. Overall, survivorship declined sharply along this climatic gradient with no significant differences between native and invasive genotypes. Furthermore, there were no differences among populations in mean plant performance and no evidence for local adaptation. However, in North Carolina, where all plants grew best, both French and North Carolina genotypes exhibited higher evolutionary potential for plant traits than their northern counterparts (Czech Republic and Vermont); yet only invasive North Carolina genotypes maintained higher evolutionary potential under more extreme climate conditions (Vermont, Georgia). Thus, invasive genotypes maintain higher heritable variation than their native counterparts under climatically stressful conditions, suggesting that invasive populations from the current range margin may continue to evolve in response to climate change while their native counterparts will not.

JACARANDAS, HADEDAS AND FLOATING HEARTS: A CASE STUDY IN MANAGING SOCIAL CONFLICT THROUGH PARTNERSHIPS IN SOUTH AFRICA

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The Working for Water Nurseries Partnership Programme is a successful, decade-long partnership between the governments internationally acclaimed Working for Water programme and the green industries of South Africa. Its primary aim is to enhance and improve the level of awareness of invasive alien plants (IAPs) within the green industries, pet trade and general public. To achieve this, the partnership facilitates an ongoing discussion between government, the private sector and the public on issues of current and future legislation governing the prevention and control of IAPs. With the assistance of the gardening industry's close links with the media, the partnership promotes the use of products developed with IAP biomass, aims to build support for the registration of 'Green Flag Status' garden centres and is actively behind initiatives aimed at the development of emerging nurseries, growers and landscapers. This presentation sketches the history of how groups of unlikely partners have successfully joined forces to promote IAP issues in South Africa.

REPRODUCTIVE CHARACTERISTICS OF NATURALIZED PLANTS AS A TOOL FOR PREDICTION OF INVASIVENESS

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Reproductive characteristics are supposed to be crucial for the invasion outcome. Therefore, we aimed at obtaining quantitative information on reproductive characteristics of a representative sample of alien species (neophytes) of the Czech flora, which served as a basis for robust analysis of reproductive determinants of species invasiveness. Species were selected to include both widely naturalized and invasive aliens, and those with limited distribution. We investigated diaspores of 92 neophytes with different invasion status collected from 231 localities. We measured: diaspore germination, size, shape and weight, diaspore production, buoyancy, epichory and terminal velocity, genome size, seedling RGR and establishment. Regression trees were used to analyse the data, with invasion success expressed as the number of occupied grid cells in Czech Republic being the dependent variable and reproductive characteristics being the explanatory variables. We found that the invasion success of neophytes of the Czech Republic is affected by interactions of the diaspore germinability, shape and weight; genome size; dispersal by epichory; and seedling RGR. These results represent the first complex analysis of a large number of reproductive characteristics and have potential to improve our understanding of traits contributing to species invasiveness, as well as ability to predict invasions by plant species.

SIMULATING WEED SPREAD AND CONTROL STRATEGIES: A SIMULATION MODEL OF *RHAMNUS ALATERNUS* ON RANGITOTO ISLAND

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A simple, individual based, bottom-up, mechanistic, simulation model based on discrete time and discrete space was built using cellular automata theory. It was used to characterise the spread of the invasive plant *Rhamnus alaternus* and evaluate the effectiveness and efficiency of different control scenarios across the contextually rich, ecologically important Rangitoto Island in the Hauraki Gulf, Auckland, New Zealand. As the person responsible for managing the control of the invasion, earlier authors' research on modelling invasive spread has been applied to this complex problem. The parameterisation of local variables from previous research, spatial applications utilising a rich data set, and ground operational experience has provided a model that simulates the spread of *Rhamnus* through time, classifies spatial components of the invasion, and evaluates management scenarios using different levels of control effort as a measure of efficiency. The model has captured the flexible environmental patterns that influence both the spread and management of this invasion and has led to the adoption of the best strategy for implementation of the program. The model is an example of the application and assessment of modelling and invasive spread research, to practical management and implementation of a complex invasive issue, within a complex natural environment.

KNOWLEDGE GAPS ON INVASION POTENTIAL OF *CASUARINA CUNNINGHAMIANA* IN RIPARIAN HABITATS OF LIMPOPO PROVINCE, SOUTH AFRICA

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Casuarina cunninghamiana (River She-Oak) was introduced to South Africa about 200 years ago and is the most widely planted species in the genus *Casuarina* in tropical and subtropical countries. It is the preferred option for windbreaks to protect agriculture in arid and semi-arid lands, restoration of degraded sites and for production of high quality firewood and production of pulpwood and timber. *Casuarina cunninghamiana* is considered a category two alien plant species in South Africa according to the Conservation of Agricultural resources Act (Act 43 of 1983, as amended in 2001). As such, there is strict control of planting this species in South Africa to prevent future invasion. However, there are conflicting and highly speculative views on the invasion status, and the mapping of major areas of invasion by *C. cunninghamiana* and other *Casuarina* species in South Africa. Further, there is lack of research on natural regeneration ecology and other aspects of management of *C. cunninghamiana* as an alien invasive species in South Africa and elsewhere where this species has been introduced. This paper will summarize the key knowledge gaps on seed production pattern, the germination and establishment ecology of this species, around which studies are currently being conducted at the University of Venda. Further, the aim is to determine its potential to spread from planted areas and naturally establish in riparian habitats in the Limpopo Province.

COPING WITH THE INVASION OF THE KAFUE RIVER FLOODPLAIN IN SOUTHERN ZAMBIA BY THE INVASIVE PLANT *MIMOSA PIGRA*

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The productivity and biodiversity of wetlands has been compromised by biological invasions. The Kafue floodplain in Lochnivar National Park, a RAMSAR site in southern Zambia, has been affected by several invasive species including the semi-aquatic shrub *Mimosa pigra.* Mimosa was first recorded in the park in the early 1980s and has subsequently invaded almost 3000 ha of the floodplain and has the potential to invade an additional 9000 ha. This invasion has had a dramatic impact on bird diversity; restricted access to water by fisherman and livestock; deprived the endemic Kafue lechwe of habitat; and provided shelter for poachers. Efforts to manually control mimosa have been initiated and to date 16.6% of the invaded area has been cleared. Above-ground growth is removed using machetes which is then left to dry before being burnt. Rootstocks are subsequently removed, left to dry and also burnt. Removal of mature mimosa and the use of fire stimulated seed germination with up to 544 seedlings being recorded per m^2, 3–4 weeks after clearing. This paper will explore possible factors contributing to the invasion of *M. pigra* in Lochinvar National Park and the efficacy of current management practices.

A TANZANIAN PERSPECTIVE ON ALIEN PLANT CONTROL: THE IKORONGO GRUMETI GAME RESERVES PILOT ALIEN PLANT CONTROL PROGRAM

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Ikorongo Grumeti Game Reserves (IGGR's) lie on the north western corridor of the Serengeti National Park in Tanzania and form an integral part of the Serengeti Ecosystem. The area was previously occupied, during which time certain alien plant species, particularly *Opuntia* species, were introduced into the area. These are now spreading extensively and pose a threat the ecological integrity of IGGR's. A collaborative pilot control program, involving TAWIRI (Tanzanian Wildlife Research Institute), Wildlife Division (authority in charge of IGGR) and Grumeti Fund, was initiated in 2009 to address this problem and gain support for a full scale alien plant control program within IGGR's. We report on the progress of the project as well as some of the challenges faced. We discuss the project in relation to the greater needs for raising awareness and support for an alien plant control program for Tanzania as a whole.

IMPACT OF *IMPERATA CYLINDRICA* ON GRANIVORY AND SEEDLING DESTRUCTION IN MAIZE FIELDS IN CAMEROON

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In Cameroon, smallholder farmers report low crop establishment rates on land dominated by *Imperata cylindrica*. In a factorial, replicated field experiment, we assessed the effects of herbicide versus manual machete clearance, and, burning of grass residues versus mulching them on: maize establishment; seed granivory by nocturnal rodents, diurnal birds, insects; and, seedling damage by termites. We placed dishes in the plots using fixed seed numbers which were 1) open at night and closed during the day, 2) closed at night, open in day, 3) or caged with aluminium netting (insects only). We estimated seedling damage in sampling frames on maize plants. Herbicide use significantly reduced seed losses from birds (by 16%) suggesting that birds avoid areas devoid of vegetation cover. For insects the opposite effect was observed (13% damage in herbicide plots compared with 8% in no-herbicide plots), as the use of herbicide would remove food sources and thus insects would attack living plants. Seedling damage was mainly termite-mediated with greatest losses in the burnt plots where herbicide was applied as other food sources would have been removed. One compromise to maximise production would be to avoid burning, to mulch and use a low-toxicity herbicide.

ALLOZYME DIVERSITY IN NATIVE AND INVASIVE POPULATIONS OF MEDUSAHEAD (*TAENIATHERUM CAPUT-MEDUSAE*)

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Medusahead (*Taeniatherum caput-medusae*), a primarily self-pollinating Eurasian annual grass that was introduced into western United States in the late 1800s, is now invasive in portions of California, Idaho, Nevada, Oregon, Utah and Washington. We compared allozyme diversity in native and invasive populations of medusahead to i) identify its geographic origins, ii) assess its introduction dynamics and mechanism of range expansion in western U.S., and iii) determine the genetic consequences of these events. Multilocus genotype analysis indicates that source populations for this invasion were drawn from France, Sardinia and Turkey, although additional sampling of native populations is still required. Across invasive populations, a total of seven homozygous multilocus genotypes were detected, revealing a minimum of seven separate introduction events into western U.S. The distribution of multilocus genotypes among introduced populations indicates that range expansion occurred primarily on a local scale. Although invasive populations of medusahead experienced a genetic bottleneck (they had fewer alleles and polymorphic loci compared with native populations); on average, western U.S. populations contained more genetic diversity than native populations, a likely outcome of multiple introductions. Medusahead exhibits a mosaic of genotypes throughout the western U.S., and this information should be included in the management of the species.

ECONOMIC IMPACT OF *CYMBOPOGON NARDUS* ON LIVELIHOODS IN PASTORAL SYSTEMS OF UGANDA

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Cymbopogon nardus is an invasive grass, introduced from Asia, that has invaded thousands of hectares of grazing land in south-western Uganda. Eighty (80) farmers, 40 from each of two sub-counties participated in a study to determine the socio-economic impact and current control costs associated with *C. nardus*. One group consisted of landowners whose grazing land was highly infested with *C. nardus* and the other by those who had largely eliminated *C. nardus* from their farms. Questionnaires, focus group discussions, direct observations and key informants were used during data collection. Total annual costs associated with *C. nardus* invasion were estimated at US$3,875.97 per household. Presence of *C. nardus* reduced land values by 30%. Growth rates of animals were significantly reduced with malnourishment of livestock evident on *C. nardus* infested farms. The total cost of eradicating the invasive grass from one acre of land using manual control was twice the costs incurred using herbicides. The results have provided farmers and policy makers with sufficient information for them to make decisions on the management of *C. nardus*.

PINACEAE INVASION IN ARGENTINA: GENERAL PATTERNS AND FACTORS CONTROLLING THEIR SPREAD

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Introduction of numerous species of Pinaceae have occurred since the early 19th century in Argentina. Starting in second half of the 20th century large-scale plantations have been established, mostly for forestry. Invasion of different species have been recorded and studied in the last two decades in different locations, especially in central and southern regions of Argentina. Species being described as invasive include *Pinus halepensis* and *P. contorta* in the pampas region, *P. ponderosa* and *Pseudotsuga menziesii* in Patagonia. It has been proposed that *P. halepensis* invasion has been triggered by wildfires that stimulate seed release and/or reduce competition with grasses. In Patagonia, the presence of exotic deer has been proposed to promote Pinaceae invasion and the lack of mutualistic mycorrhizal fungi and seed predation have been shown to retard their subsequent spread. However, their invasion is poised to grow very rapidly in the next decades due to the large area of plantations not yet reaching the seed-bearing age. Despite the potential economic and environmental problems, there are few attempts to control and understand their impacts. Information on the impact and management techniques from other regions of the southern hemisphere with more history on Pinaceae invasion, such as New Zealand or South Africa, may be fundamental to prevent further detrimental effects.

THE IMPACT OF *PERESKIA ACULEATA* MILLER (CACTACEAE) ON NATIVE BIODIVERSITY AND MEASURING THE SUCCESS OF BIOLOGICAL CONTROL

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Pereskia aculeata Miller (Cactaceae) is a creeping cactus native to South and Central America that is invasive in South Africa. The weed reaches extremely high densities in South Africa's coastal forests where it outcompetes native vegetation. The effect of *P. aculeata* on native vegetation was measured using randomly selected quadrats along transects through areas of varying *P. aculeata* densities. Species richness, diversity and *P. aculeata* density were recorded in each quadrat. This procedure was repeated in five coastal forests spanning the weeds introduced distribution. By comparing the variation in species richness and diversity at different *P. aculeata* densities a threshold value was calculated. At densities lower than the threshold value species richness and diversity is not significantly affected by the presence of the weed. This threshold value is suggested as a target for the biological control program against *P. aculeata.*

CONSISTENT NEGATIVE RELATIONSHIP BETWEEN NON-NATIVE PLANT SPECIES AND ELEVATION IN SOUTH-CENTRAL CHILE

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A negative relationship between elevation and non-native plant species richness and abundance has been reported globally. However, the cause of this pattern remains uncertain. Elevation is an important indicator of the variation of the microclimate. In addition, elevation is also associated with an increase in barriers for plant dispersal. We studied multiple databases of field data collected in south-central Chile to determine the influence of elevation and other confounding factors such as land-use, vegetation cover and native species abundance on the number and abundance of non-native species. We used roadside and interior habitat plots. We found a consistent negative linear relationship for most study sites in south-central Chile. The role of land-use is difficult to isolate due to its correlation with elevation. Nonetheless, elevation is an important factor even after controlling for land-use. Roads play a fundamental role in the arrival of new species. Roadsides show higher non-native species richness and abundance, including species exclusive to roadside habitats. Overall, our results show that mid to high elevation areas are much less invaded than lowland environments in Chile and that most species are not able to invade native forests, which is the dominant natural vegetation. Funding provided by FONDECYT 1040528 and 1070488, ICM P05-002, PFB-23.

CO-OCCURRENCE: ALIEN AND INDIGENOUS PLANT SPECIES ALONG RIVERS ON MARION ISLAND

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Studies on co-occurrence patterns between alien and indigenous plants are limited within the sub-Antarctic. We investigated the co-occurrence of alien plants, *Agrostis stolonifera* and *Sagina procumbens*, with the indigenous *Acaena magellanica* along rivers on sub-Antarctic Marion Island. By examining these patterns, we also inferred how these species interacted with each other. The results demonstrated that environmental conditions were important for the species' individual occurrences, with 43 % and 25 % of the deviance in the occurrence of *A. stolonifera* and *S. procumbens*, respectively, being explained by environmental variables, compared to 17 % for *A. magellanica*. Only the co-occurrence of *A. magellanic*a with *A. stolonifera* was significantly influenced by environmental variables. Significant positive spatial associations between *A. magellanica* and *A. stolonifera* were found, while the interactions of either species with *S. procumbens* were either spatially dissociated or random. This study highlighted that the alien species differed in the way they co-occurred and interacted with the indigenous *A. magellanica* and with each other. Furthermore, the alien species were found to be responding to different environmental conditions on the island. Indeed, *S. procumbens* appeared to be less sensitive to Marion Island's environmental conditions, suggesting that it may be affecting biodiversity at broader ranges.

SPATIAL RELATIONSHIPS BETWEEN ALIEN AND INDIGENOUS PLANTS

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Darwin's naturalization hypothesis states that alien plants may be prevented from establishing in a new area by indigenous congenerics, through competitive exclusion. The invasional meltdown hypothesis suggests that alien plant species can facilitate each other's invasion by transforming the environment in ways unsuitable for indigenous species. Both hypotheses have been supported in some systems and rejected in others. Here, we examine the relationship between physical distance (in meters) and phylogenetic distance (in millions of years since the split within pairs of plant species) with data from moderately to heavily invaded subtropical grassland and forest systems on the east coast of South Africa. Our data suggest that phylogenetic relatedness matters most (both positive and negative relationships) in pairs of alien plants, less so between one indigenous and one alien plant, and very little in pairs of indigenous plants. The strongest physical distance-phylogenetic distance relationships – both negative and positive – are observed in the species with highest occupancy values (*Lantana camara* and *Chromolaena odorata*). This suggests that both Darwin's naturalization hypothesis and the invasional meltdown hypothesis, although based on correct observations in specific situations, are only special cases of a more complex ecological relationship.

SCATTERED WILDING CONIFER SURVEILLANCE, CONTROL AND MONITORING IN THE OTAGO CONSERVANCY, NEW ZEALAND

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Of particular concern for conservation in Otago is the undetected invasion of mainly *Pinus contorta* (lodgepole pine), and to a lesser extent *Pseudotsuga menziesii* (Douglas fir) and *Pinus radiata* (Monterey pine), into vast, isolated high country areas, because these ecosystems are important repositories of biodiversity. An accurate, reliable and repeatable new method that can be used for aerial surveillance, control and monitoring of wilding conifers within large high country reserves has been developed. Through the use of GIS and GPS technology, vast areas of high country can be systematically searched for wilding conifers (and other weeds) and the data mapped to show the helicopter flight path and the locations of destroyed wilding conifers for record keeping (storing information), management and analysis purposes (retrieving information).

FOUNTAIN GRASS (*PENNISETUM SETACEUM*) PERFORMANCE ALONG AN ENVIRONMENTAL GRADIENT IN SOUTH AFRICA

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The relative performance of plants across environmental gradients is critical for their effective management. *Pennisetum setaceum* is an invasive perennial grass found along roadsides and disturbed sites in South Africa. Performance of this grass in response to competition, habitat characteristics and resources were experimentally tested in three biomes (Karoo, Fynbos and Savanna) of South Africa. 846 Seedlings were translocated in May 2007 and grown in plots at randomly selected transects, of which alternate halves were cleared of vegetation and monitored for 15 months. Despite various environmental hazards, over 30% of the transplanted seedlings survived at all sites. Competition from resident vegetation was a major factor limiting the establishment of seedlings. However, under habitat conditions such as rainfall and disturbance (mine dump), competition effects were overridden. Despite site differences in survival and growth rates, some seedlings remained alive at all sites especially if they survived the first six months after translocation. *P. setaceum* is capable of persisting across a broad range of environmental conditions. Management efforts should aim to reduce seed production and establishment along roadsides that act as conduits into protected sites. This can best be done by maintaining indigenous cover along road verges as competition reduction favours seedling survival.

DISTRIBUTION AND SPREAD OF THE ALIEN INVASIVE PLANT *LANTANA CAMARA* IN A DRY TROPICAL FOREST PLOT AT MUDUMALAI, SOUTHERN INDIA

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Lantana camara, a woody shrub of central and South American origin, is currently widely distributed across India. In Mudumalai Tiger Reserve, *L. camara* dominates the understory in dry and disturbed moist deciduous forest zones, often replacing native ground vegetation. In a permanent plot of 50 ha , qualitative information about *L. camara* densities have been recorded at the scale of 10 m x 10 m, since 1989. The current patterns of distribution were expected to be affected by topographic characteristics such as slope and elevation, and also by large scale disturbances such as fire. The topographic classification of the 50 ha plot, based on slope and elevation serves as an indirect estimate of soil moisture availability. High densities of *L. camara* were found to be significantly associated with low elevation stream beds and subplots adjoining streams with high slope values. Also, *L. camara* was observed to expand rapidly in the plot following a major fire in 2002 followed by drought. This preliminary insight into topographic and environmental preferences by *L. camara* is now being used to develop spatio-temporal models of the spread of the invasive at the 50 ha scale.

DOES INVASIVE PLANT MANAGEMENT AID THE RESTORATION OF NATURAL ECOSYSTEMS?

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Invasive alien plants pose a significant threat to natural ecosystems. Using Australia's 20 'Weeds of National Significance' (WoNS) we investigated how natural ecosystems responded following their management. We reviewed the literature and surveyed land managers involved in WoNS management programs. While most of the 95 papers reviewed measured the effect of management on the WoNS, only 18 assessed the response of other plant species. In these studies, native plant species did not necessarily recover following management and the controlled WoNS was often replaced by other weeds. Three other studies investigated the response of invertebrate communities and an ecosystem process following WoNS management but none examined the response of vertebrates or microbial communities. A total of 168 replies were received to the survey. Of the 142 land managers who evaluated their WoNS management program, 86 monitored the response of native plant species and/or other weeds, mostly using qualitative assessments. These managers reported no vegetation response after WoNS management (7%) or re-colonisation by a combination of native and weed species (52%) or only by native plants (33%) or the targeted WoNS (2%). Our results emphasise the need to incorporate activities that facilitate recovery of native plant communities in conjunction with weed removal.

TREES AND SHRUBS AS INVASIVE ALIENS WORLD-WIDE: HOW DO PINES FIT IN?

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Until fairly recently, tall woody plants were not widely recognized as major invasive species. In the past few decades, however, humans have moved thousands of tree and shrub species out of their natural ranges for many purposes, and hundreds of species have become naturalized or invasive. In many parts of the world, trees and shrubs now feature prominently on lists of invasive alien plants, and in some areas non-native species in these life forms are now among the most conspicuous and damaging of invasive species. Invasive trees invade many habitats, have a wide range of impacts, and create many types of conflicts of interest. Issues related to invasiveness are now influencing how people perceive, use, and manage alien trees and shrubs. This presentation provides a brief overview of a recently compiled global database of invasive alien trees and shrubs that lists 350 taxa (250 trees, 100 shrubs). One of the most striking features of the objectively compiled list is the large number of taxa in the class Pinopsida, order Pinales: 4 families, 12 genera and 38 species are known to be invasive. Twenty-two species in the genus *Pinus* are invasive. As an introduction to the session on invasive pines, I explore what it is about pines that makes them such a prominent feature on list of woody invasive plants in many parts of the world.

DOES SELF FERTILISATION CONTRIBUTE TO INVASION? A CASE STUDY ON *LILIUM FORMOSANUM* IN SOUTH AFRICA

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It has been hypothesized that self-compatibility and autogamy enhance colonisation in plants because these characteristics allow them to reproduce in the absence of mates and pollinators respectively. Despite correlation between these characteristics and colonisation, the link between increased seed production due to selfing and invasion success has not been explored in detail for any species. Emasculation experiments conducted in *L. formosanum* in Kwa-Zulu Natal, South Africa show that although there is some cross pollination by native hawkmoths, self fertilization provides substantial reproductive assurance, particularly in single isolated plants. Moreover, selfed and outcrossed progeny show no inbreeding depression in seed mass, germination and survival to flowering. These findings strongly suggest that self-fertilisation contributes to the spread of *Lilium formosanum* by increasing fecundity above that which would be achieved by cross pollination alone.

CLIMATE CHANGE IMPACTS ON A NATIVE AND A NON-NATIVE INVADER

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Increases in temperature associated with climate change in temperate regions are often thought to favour plant invaders. Although plausible, this is based on limited experimental evidence and, given the potential complexity of climate change responses we should probably be more cautious of simplistic predictions. In order to examine the impact of climate change on plant invasions we report on field micro-climate simulations using passive enclosures that provided realistic increases in temperature and reductions in water availability. We examined two species, one an introduced invader, *Fallopia japonica*, the other, *Pteridium aquilinum*, a native invader. Micro-climate simulations resulted in a decrease in the productivity of the introduced invader*, F. japonica*, but had no effect on *P. aquilinum*. The effect of micro-climate simulations on neighbouring uninvaded areas also varied with a reduction in grass species in habitats associated with *P. aquilinum*, but with a slight increase in areas associated with *F. japonica*. This indicates that *P.aquilinum* may benefit from climate change at the community level, through an increase in relative productivity. Changes in decomposition processes and mycorrhizal inoculum potential varied inter-annually and were species-specific and habitat-dependent. These results further emphasize the potential complexity of the response of plant invasions to climate change.

TOWARDS MORE EFFICIENT MANAGEMENT OF INVASIVE ALIEN PLANTS IN THE CAPE FLORISTIC REGION: IDENTIFYING PRIORITY AREAS

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The management of invasive alien plants in the South Africa's Cape Floristic Region is a highly complex endeavour, subject to multiple uncertainties and interactions among factors of environmental and socio-political nature. Despite the large investment of resources and the implementation of the Working for Water program, it is unclear whether the extensive control operations are substantially reducing the dimensions of the problem and alleviating the threats to the region's biodiversity. We developed a conceptual framework for prioritizing areas for clearing and improving the efficiency of control operations at the scale relevant to management actions. We made use of structured techniques (named scenario planning, DPSIR, and Analytic Hierarch Process) to synthesize information derived from experimental research and management experiences, and derive a spatial prioritization of the areas for clearing by means of GIS interface. The results of these analyses, together with a sensitivity analysis in the factors identified as relevant in the prioritization scheme, indicate the management actions are highly context-dependent and the environmental and socio-political constraints affecting each particular management unit need to be considered when formulating efficient management decisions.

CAN WE PREDICT THE INVASIVENESS OF THE AUSTRALIAN *ACACIA* SPECIES ON THE BASIS OF LIFE-HISTORY TRAITS AND NATIVE DISTRIBUTION RANGES?

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Using the Australian wattle (*Acacia* spp.) dataset, which covers a wide range of species and controlling for phylogeny and geographical origin, we explored whether we could predict which species are more prone to becoming invasive,. Australian acacias introduced to other areas were grouped into invasive (n=28) and non invasive (n=73). Life-history traits and climatic variables of the native range were compared between groups. Invasive acacias showed higher height, larger phylode area, higher flower production, and smaller seeds than non-invasive acacias. No difference existed for the number of seeds per pod, flowering phenology and infra-generic taxonomy. Invasive acacias were native to regions of higher precipitation, lower temperature seasonality, but similar mean annual temperature than non-invasive species. Most climatic variables exhibited a wider range in the native area for the invasive than for the non-invasive acacias. These results suggest that both a high height and a large potential for producing numerous seeds contribute to increase the chances for successful colonization and establishment in new areas. Further, species spanning wider climatic conditions in the native area are more prone to becoming invasive elsewhere. Our contribution highlights the need to include climatic variables in early warning systems for the management of biological invasions.

MODELLING OF SPATIAL DISTRIBUTION OF ALIEN PLANT SPECIES: THE CASE STUDY OF *ACACIA* IN PORTUGAL

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In Portugal, the spread of alien invasive plants is an enormous threat to the native flora, and is becoming a serious environmental problem. Some of the most invasive plant species responsible for the eradication of native flora are *Acacia* species. The main purpose of this study is to explore the role of biotic and abiotic factors mediating the distribution of the *Acacia* species considered to be the most aggressive in the country (*A. dealbata*, *A. longifolia*, *A. melanoxylon* and *A. saligna*) at different scales and to develop predictive models of invasion. Three different spatial scales were chosen for this study: local (three Natural Protected Areas), regional (central coastal area of Portugal) and national. These models in association with GIS technology will provide maps of the current and potential distribution of *Acacia*, which in turn will support conservation and management efforts.

A SURVEY OF AUSTRALIAN FARMERS ON THE TOPIC OF *NASSELLA TRICHOTOMA* PREVENTION MANAGEMENT

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Nassella trichotoma, commonly called serrated tussock, is a Weed of National Significance in Australia. The weed is unpalatable and fibrous, with little nutritive value to grazing animals. A diet of *N. trichotoma*, unless supplemented with more nutritious feed, will cause sheep to lose condition and die. Once *N. trichotoma* has become established, control is difficult and expensive. Thus, it is typical for *N. trichotoma* management guidelines to emphasise the use of sound weed hygiene and other procedures for preventing the establishment of the species. However, the extent to which land managers are heeding this message is unclear. We therefore designed a survey that examines the use of prevention measures in the Northern Tablelands of New South Wales, a part of Australia where the weed is present but not yet widely established. In the context of this survey, prevention involves both weed hygiene practices and intervention measures to control *N. trichotoma* early in the invasion process. It is anticipated that this survey will reveal aspects of prevention that are well-practised by land managers, and those that either require greater emphasis in extension or re-examination given their impractical nature.

PLANT INVASION AS A DRIVER OF FUNCTIONAL DIVERSITY: SOUTHERN OCEAN ISLANDS AS A CASE STUDY

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The islands of the Southern Ocean span a wide latitudinal gradient from 37 S to 55 S. These cold, wet, windy isolated islands, several of which are World Heritage areas, support tundra-like vegetation. We have compiled a dataset of all indigenous and non-indigenous plants from the 22 islands comprising the region. The Southern Ocean Islands support 470 indigenous vascular plant species, many of which are widespread while some are single island endemics. Despite the islands' recent human visitation and low human activity over 350 non-indigenous plants occur on these 22 islands. Here we quantify how introduction of non-indigenous plants have not only altered taxonomic diversity but also increased functional diversity. We compare and contrast the functional traits of indigenous species with those of the non-indigenous species. By further examining the traits of transient, persistent and invasive non-indigenous species, we are able to identify which traits may be driving plant invasion of the Southern Ocean Islands.

WEEDY POTENTIAL BIOFUEL CROPS IN AUSTRALIA: REGULATORY AND RISK ASSESSMENT PROCESSES ASSOCIATED WITH CROSS SECTOR RISKS

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There have been a number of recent requests to import new plant genotypes into Australia for exploitation as potential biofuel crops as well as the development of new GM plant varieties for use in the bio-industries for bio-factories of new bio-materials. This has stimulated significant analysis and debate around weedy biofuel plants. This paper presents the current Australian regulatory environment around pre- and post- border weed risk assessment for processing and evaluating such applications and how this impacts on biofuel and bioindustry development. We will explore the concepts of polluter-pays, shared-responsibility, and cost-risk-sharing opportunities in policy for managing risk post-introduction and planting. We will also explore optimisation of management cost and economic benefit and the degree to which this might be usefully incorporated into weed risk assessment for commercial and economically important introductions using some case histories. We also report on conclusions from a recent "Biofuels and Biosecurity" international workshop in Australia that captured the international policy needs for the managing responsibility to ensure safe and sustainable development and application of new crop systems, based on: risk sharing and triple bottom line sustainability. The scope to which safe development and exploitation of new crops can assist the developing economies through the International Plant Protection Convention is also discussed.

ENEMY ESCAPE MAY INCREASE OPTIMAL FLOWERING SIZE IN MONOCARPIC INVASIVE PLANTS

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In monocarpic plants where reproduction is fatal, seed-feeding insects may have a major impact on the evolutionarily stable reproductive strategy by altering fecundity schedules in a size-dependent manner. We explored this in nodding thistle (*Carduus nutans* L.), a facultative biennial thistle that invades temperate grazing systems on four continents. Using data from populations in France (its native range) that are seed limited by seed predators, we used an integral projection model based on the demography of nodding thistle and patterns of herbivory. The model shows that seed predators select for smaller flowering size and have a greater effect on lifetime reproductive success than other plant demographic rates. This suggests that in the absence of seed predators in the invaded range, flowering size could evolve to be larger. We explore data that might support this conclusion and other monocarpic weeds. Furthermore the subsequent introduction of seed-feeding biocontrol agents may lead to different evolutionary outcomes dependent on the ecology of the seed-feeders. The direction and magnitude of evolutionary change in flowering size may be predictable based on which seed predators are introduced. Such data would allow us to distinguish between the effect of seed predators and other hypotheses for size increase in the invaded habitat.

THE CANADIAN PERSPECTIVE: HARMONIZING RISK ASSESSMENT FOR WEEDINESS AND INVASIVENESS FOR PLANTS WITH NOVEL TRAITS (LIVING MODIFIED ORGANISMS) AND PLANTS AS PESTS

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The Canadian Food Inspection Agency (CFIA) is Canada's competent national authority responsible for conducting environmental release assessments on plants with novel traits (PNTs) consistent with international guidance provided for living modified organisms (LMOs). The CFIA is also Canada's National Plant Protection Organization under the International Plant Protection Convention (IPPC) and is responsible for ensuring that phytosanitary measures taken to protect the health of Canada's plant resource base are consistent with the principles of the IPPC. The CFIA is working to determine if its applications of risk assessment approaches for LMOs and plants as pests can be blended when necessary in order to better assess some types of plants and more effectively address risk to the Canadian plant resource base, environment, economy and society. The drivers for this type of thinking include ornamental plants and industrial applications such as biofuel production and extraction of plant compounds for medical and other uses. To date, Canada has determined that certain taxa of concern to Canada could undergo a "Plants for Planting Risk Assessment". Plants that do not require a harmonized approach will continue to be assessed as before. A harmonized approach to risk assessment will help CFIA better protect Canada's plant resource base.

SEED GERMINATION AND SEEDLING TRAITS AS DETERMINANTS OF INVASION SUCCESS: COMPARISON OF INVASIVE AND NATIVE *IMPATIENS* SPECIES

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Traits associated with early ontogenetic stages are among the key factors determining the spread of alien annual plants in their secondary distribution areas. Their role was addressed by comparing four central European *Impatiens* species (Balsaminaceae) of different status: highly invasive *I. glandulifera*, less invasive *I. parviflora*, potentially invasive *I. capensis* and native *I. noli-tangere*. In order to investigate ecological characteristics and local differentiation of the species, we used seeds from 5 localities with stands of the three Czech species up to 1 km each from other, and seeds of *I. capensis* from 5 localities in Germany and Poland. We investigated (1) the germination dynamic, (2) seedling appearance and survival in experimental garden, (3) depletion of soil seed bank, (4) seedling RGR and biomass, (5) frost resistance of the seedlings, and (6) seedling growth under different nutrient, water and irradiation levels. The results showed differences between native and invasive species. Traits such as short stratification period, high germination rate and high biomass may explain the high invasiveness of *I. glandulifera*. On the other hand, the native species was more frost tolerant than the invasive ones. We found no constraint to further invasion of *I. capensis* into central and Eastern Europe.

CHALLENGES TO THE DEVELOPMENT OF A GLOBAL INDICATOR FOR INVASIVE ALIEN PLANT SPECIES

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Invasive alien species (IAS) are a major threat to biodiversity and as a result *trends in IAS* was selected as one of 22 Headline Indicators to measure progress towards the Convention on Biological Diversity's (CBD) target of reducing the rate of loss of biodiversity by 2010. Two indicators *number of IAS* and *number of operational management plans* have been proposed to measure progress towards goal 6 of the CBD framework, *to control threats from IAS*. These indicators have been populated for a stratified-random selection of countries. We assess the comprehensiveness of global IAS databases. We also determine the usefulness of the approach adopted to date for populating the invasion status indicator. The major challenges facing the population of the indicators are data availability and quality and the lack of transparency in the criteria used to designate species as invasive. The approach used to date to populate the invasion status indicator, although most practical based on time and resource constraints, provides a different list of species than lists of species suggested by invasive alien plant species experts. This suggests that to provide a comprehensive assessment of the global status of IAS, expert input is required for countries globally.

TACKLING PLANT INVADERS AT SPIER WINE ESTATE IN THE WESTERN CAPE

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Spier Wine Estate is nestled in an area of high conservation significance, harbouring threatened vegetation types, threatened plant species and hydrological processes of regional significance. The Estate aspires to achieving resource sustainability in its enterprise activities and as a member of the Biodiversity and Wine Initiative they are committed to implementing good environmental management practices. Recognising the risk posed by invasive plants, a Conservation Management Plan was commissioned in 2005. A systematic invasive plant eradication programme, well informed by groundtruthing and accepted good practice guidelines was included therein. Substantial progress has been made to date; however re-growth is a constant challenge. Alien plants at Spier negatively impact the water quality and quantity available to intrinsic processes and secondary users. They not only contribute to ecosystem degradation but also the aesthetic devaluation of our natural landscape. Effective and efficient intervention is imperative to maintain momentum and contribute to quality of life for all.

APPLICATIONS OF FLOW CYTOMETRY TO PLANT INVASION BIOLOGY

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The last decade has seen a growing number of studies that use flow cytometry (FCM) to understand the genetic determinants of plant invasions. There is some evidence that invasive behaviour and spread of alien plants may be positively correlated with genome copy number. This hypothesis can be tested by comparing diversity of ploidy variation in native and adventive parts of a species' range. Genome size (nuclear DNA content) is another intrinsic feature that needs to be carefully considered in the biology of invasions as genome size affects several plant traits that can be directly related to reproductive success. In addition, interspecific hybridization may stimulate invasiveness through the creation of transgressive phenotypes. By providing extensive data related to ploidy and genome size, FCM may be helpful in identifying polyploids and/or hybrid individuals, and in assessing the role of genome-wide processes in invasion success. Because of its high speed and reliability, FCM surpasses other cytogenetic methods of detecting ploidy/genome size, and allows for large-scale surveys at the landscape, population, individual, and tissue levels. Particular research avenues will be illustrated by case studies from different geographic regions, and future applications of FCM will be discussed.

PARTHENIUM WEED (*PARTHENIUM HYSTEROPHORUS* L.) IN ETHIOPIA: IMPACTS ON FOOD PRODUCTION, PLANT BIODIVERSITY AND HUMAN HEALTH

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Field surveys, plant biodiversity impacts, and analysis of secondary plant compounds in *P. hysterophorus* and its possible impact on human health have been studied in Ethiopia since 1998. The weed has invaded a variety of habitats ranging from roadsides to grasslands and crop fields. Infestations were found to be greater than 20 plants per m^2 and yield losses in sorghum reached 46-97% depending on the location and year. In grasslands dominated by parthenium, native plant species composition and abundance was found to be low. Manual control of parthenium by farmers resulted in the development of skin allergies, itching, fever, and asthma. These reactions could be attributed to the presence of secondary plant compounds (parthenin, chlorogenic acid, isocholorogenic acid, vanilic acid and caffeic acid) which were found in parthenium with significant variation in their concentrations among the different plant parts, dependent on plant locality, moisture content and plant size. The social cost of parthenium in Ethiopia was measured by Disability Adjusted Life Years and its equivalence in terms of monetary value was estimated at US$ 2,535,887 - 4,365,057. More resources have to be invested to tackle the parthenium problem as the estimated loss is disproportionate to the cost of investment in parthenium research and development activities.

TACKLING THE THREAT HEAD ON: INVASIVE ALIEN SPECIES MANAGEMENT IN EZEMVELO KZN WILDLIFE, SOUTH AFRICA

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Invasive alien plants (IAP) have been identified as one of the greatest threats to biodiversity in Ezemvelo KZN Wildlife's (EKZNW) protected areas. In order to reduce this threat, the EKZNW Invasive Alien Species Programme (IASP) was launched in 2006 with funding from the Department of Agriculture and Environment Affairs: Invasive Alien Species Programme. The first step was to develop an invasive alien species (IAS) strategy outlining what needs to be in place. Two important steps are currently underway: addressing IAS in the EKZNW strategy and integration of IAS management into EKZNW structures. The following has been achieved: standardization of all IAP procedures, mapping 80% of all protected areas, use of an information management system, prioritization schedule prioritizing between protected areas, annual IAP training courses for managers, creation of a provincial IAS Advocating and Communication Forum, internal funding of areas that have reached maintenance level (under 2% densities). There are also projects in various stages of completion: IAS training manual, mapping remaining areas, protected area clearing plans and sourcing of funding shortfall, EKZNW still has a long road ahead to successfully reduce IAS, but great strides are being made in the right direction.

GLOBAL WARMING AND RANGE EXPANSION OF INVASIVE AQUATIC SPECIES

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Due to global warming, species coming from tropical areas that previously were not able to survive in winter in France might be able to survive in the future. In this study I examined if exotic species could establish in France and throughout Europe, both at the current climate and in the future. The results show that the risk of introduction of invasive species to French freshwater habitats will increase in the future with many of the invasive species capable of establishlish under the current climate. Invasive Aquatic plants species with a worldwide spread, recently introduced in France, are now present in a few sites with no apparent colonization dynamics (they disappear quickly at the end of summer). However, other species recently found iat other sites have visible dynamics of colonization. The species which have the greatest possibility to establish in France are those coming from tropical areas and include *Eichhornia crassipes* (water hyacinth) and from temperate climates including *Crassula helmsii andHydrocotyle ranunculoides.* These species can possibly establish at both the current climate, and in a possible future warmer climate.

THE PORT JACKSON 4 - A MOLECULAR ANALYSIS OF *ACACIA SALIGNA* ACROSS ITS INVASIVE RANGE

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Acacia saligna (Port Jackson Willow) is native to Western Australia (W.A.) and is an aggressive invader in South Africa (S.A.). The rust fungus, *Uromycladium tepperianum,* was released as a biological control agent, with moderate success. Within the native range of *A. saligna*, there are at least four recognised sub-species with roughly discrete natural geographical distributions. While there are a number of known species of *Uromycladium* in *A. saligna'*s native range, the genetic entities present in S.A are unknown. Highly polymorphic morphological traits in *A. saligna*, and strain complexities within *U. tepperianum*, make molecular analyses necessary for accurate sub-species delimitation and their respective associations. The paper utilizes population genetics to: explore the introduction history and spread of invasive populations of *A. saligna;* compare the native and invasive genetic diversity; and investigate the co-evolution of host and pathogen to improve current biocontrol efforts. Results of genotypic analyses in *A. saligna* utilizing 10 informative microsatellite loci, suggests the presence of at least two sub-species in S.A. We discuss how these results give us a better idea of the global invasion ecology of *A. saligna* and its applications for improved management strategies.

IMPACT OF ALIEN PLANT INVADERS ON ISLAND POLLINATION NETWORKS

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Mutualistic interactions between plants and animals promote integration of invasive species into native communities. In turn, the integrated invaders may alter existing patterns of mutualistic interactions. Here, for the first time, we map in detail effects of invaders on parameters describing the topology of both plant-pollinator (bi-modal) and plant-plant (uni-modal) networks. We focus on the invader *Opuntia* spp., a cosmopolitan alien cactus. In addition, we compare two island systems: Tenerife (Canary Islands) and Menorca (Balearic Islands). *Opuntia* modified number of links between plants and pollinators, was integrated into the new communities via the most generalist pollinators and did not seem to affect the general network pattern. The plant uni-modal networks showed disassortative linkage, i.e. species with many links tend to connect to species with few links. Thus, by linking to a generalist native, *Opuntia* remained peripheral to network topology, and this is probably why native network properties were not affected at least in one of the islands. We conclude that the network analytical approach is a valuable step towards changing invasion biology into a more predictive science.

GALAPAGOS NATIONAL PARK IS ON THE BRINK OF FURTHER PLANT INVASION

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The Galapagos Islands are experiencing habitat loss and species extinctions as a result of alien plant invasions. Impacts are concentrated on the four inhabited islands, where humans have introduced plants to rural areas in the humid highlands and urban areas on the arid coast. We assessed the current status of alien plant invasion in Galapagos by evaluating the characteristics and spatial distribution of alien species recorded in the inhabited areas. Of the 919 recorded alien plants in Galapagos, 16% have already become invasive, despite a relatively short residence time in the archipelago. We predict this will change for the worse over time as more species find an opportunity to naturalize and invade, and as propagule pressure increases alongside rapid human population growth. This means Galapagos is at an early stage of invasion, poised to experience more invasions from the existing introduced flora. Fortunately, many of the potentially invasive species are not yet naturalized and currently have very small distributions, making them good candidates for eradication. Only with very rapid, coordinated efforts can we reduce the risk of existing alien plants invading into the National Park from adjoining inhabited areas.

STAKEHOLDER PERCEPTION AND MANAGEMENT OF ALIEN INVASIVE PLANTS ON PRIVATE LAND IN THE WESTERN CAPE, SOUTH AFRICA

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South Africa's Working for Water (WfW) is globally recognized for combining alien invasive plant management with job creation and skills development in previously disadvantaged communities. Landowner involvement has been identified as a limiting factor in the long-term success of this programme. WfW has developed a new policy approach combining social and economic incentives and disincentives to promote landowner responsibility and management of plant invasions. This policy requires a major shift in the rights and roles of landowners and the agencies working with them. Its success will depend on its ability to address the needs and constraints facing these stakeholders. The goal of our project is to describe perceptions of landowners, WfW managers, and local conservation professionals concerning invasion management on private land in the Western Cape. We use a combination of personal interviews, focus group interviews, and e-mail surveys to assess the strengths and limitations of WfW's new policy in promoting landowner awareness and control of plant invasions. This study will provide WfW with monitoring information to feedback into policy development and contribute to the global literature evaluating the use of policy incentives and disincentives to engage the public in alien invasive plant management on their land.

INVERTEBRATE FAUNAL EXCHANGE IN A MOSAIC OF MONTANE NATIVE AND ALIEN VEGETATION

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On the Cape Peninsula (South Africa) the spread of invasive woody aliens from commercial plantations into native vegetation threatens areas set aside for conservation. In an area of exceptional invertebrate endemism, invertebrate species richness in pine plantations has been shown to be half that of contiguous Afrotemperate forest. Nevertheless, there is still a poor understanding of the processes in pine plantations that impact terrestrial invertebrate diversity, in terms of displacement of native invertebrates and in facilitating the spread of alien invertebrates. This study examines (1) the impact of pine plantations on invertebrate species richness and community composition, (2) turnover of native and alien invertebrates among the mosaic of forest, fynbos and pine, and (3) the potential for restoration of native invertebrate communities post-felling pine. Thirty-two sites across the eastern slopes of Table Mountain National Park were sampled in summer 2008/2009. Eight sites each in Afrotemperate forest; fynbos, pine plantation and clear-felled pine were sampled for ground-dwelling invertebrates. At each site collecting methods included 10 soil cores; 10 leaf litter samples; 10 pitfall traps; 10 sugar-baited ant traps and two decayed logs. Preliminary results show potential for future monitoring for impacts of disturbance and restoration progress, especially in clear-felled pine.

DO FUNCTIONAL TRAITS OF PLANT SPECIES DETERMINE INVASIVENESS?

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A long-standing question in invasion biology is whether invasiveness is associated with functional species traits. We report the results of three studies using different approaches to test for invasiveness traits. In the first study, we did a statistical meta-analysis of published studies that compared invasive alien plant species and non-invasive, mostly native, species. On average, invasive species had higher values than non-invasive species for traits related to physiology, leaf-area allocation, shoot allocation, growth rate, size and fitness. In the second study, we assessed in a common garden experiment growth and performance of 14 European species that are invasive elsewhere and 14 congeneric European species that are not invasive elsewhere. On average, invasive species germinated earlier, produced more biomass, and were more likely to flower than non-invasive species. In the third study, which is still ongoing, we test whether establishment success of 91 plant species that we sowed in grasslands is associated with independently assessed functional traits. Our preliminary results show that seedling establishment in the field is positively associated with seed mass and germination characteristics measured under greenhouse conditions. Overall, these three multi-species studies on invasive and non-invasive plant species indicate that functional traits are associated with invasiveness.

THE MANAGEMENT OF ALIEN CONIFERS IN SOUTH AFRICA: THREE CENTURIES OF BENEFITS, IMPACTS AND CONFLICT RESOLUTION

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Alien conifers have been planted in South Africa for a range of purposes for over 300 years. The introduction of alien conifers, mainly pines, has brought many benefits but has also resulted in many unforeseen problems. The management of alien conifers has evolved in response to emerging problems, changing values and markets, and the realities of a new and largely irreversible ecological order brought about by invasive alien conifers. South Africa also has a long history of research in the fields of forestry and environmental management. Priorities with regard to environmental management have changed over the past three centuries, human values have changed, and markets have become increasingly globalised. This paper reviews the history of conifer introductions to South Africa, the benefits and impacts with which they are associated, and the ongoing and evolving research that has been conducted to underpin their management. The South African experience has involved a number of novel and innovative approaches aimed at maximising benefits and minimising impacts. Some of these, such as restrictions placed on forest expansion to reduce the impacts on surface water runoff have worked well; others, such as the clearing of planted areas to restore biodiversity, remain controversial. The approaches, and lessons learnt, are summarised.

EARLY DETECTION AS A COMPLEX ADAPTIVE SYSTEM: LESSONS FROM THE PAST AND IMPLICATIONS FOR PREPARING FOR IMMINENT ALIEN PLANT INVASIONS

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Early detection systems in alien plant management have placed emphasis on approaches that establish the risk of emergence and invasion. Such predictive approaches have been proposed in an effort to prioritise control attempts. The assumption is that predictive approaches to risk of invasion allows for proactive surveillance and action. In contrast, experience indicates that delayed institutional reaction times, diverse societal values attached to alien plants as well as the emergence and detection of unanticipated invasions confound attempts to predict and control invasions before they enter a phase of rapid spread. Thus imperfect prediction, unanticipated invasions and response discrepancies contribute to the difficulty in detecting invasion sufficiently early so as to afford opportunities for eradication or limiting spread. \n this paper we analyse examples of past successes and failures in order to illustrate early detection and action as a complex adaptive social-ecological system. The examples are used to illustrate connectedness between the predictive system, actual emergence of invasion, field detection and institutional recognition of emergence, and the response systems (policy, legal and on-site control). Implications for risk assessment in early detection and rapid response programmes are discussed.

HOLDING UP A MIRROR TO BIO-CONTROL: EMERGING ASSOCIATIONS ARE REFLECTED IN THE NATIVE RANGE

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The use of host-specific biological control agents is widely considered an effective option for the management of invasive alien plant species. However, the formation of novel associations between released biological control agents and indigenous species poses risks. Currently novel higher trophic food web links that may accumulate once biological control agents become established cannot be predicted. However, here, we find that two host plant-specific biological control agents accumulate food web links with higher trophic levels in their introduced range, similar in number, higher taxonomy and guild composition to those in their native range. Bray-Curtis percentage similarity between native and novel food webs was 30-50% and 50-75% at the family and superfamily taxonomic level respectively, and 45-50% if considering shared phylogenetic diversity. We propose that the establishment of higher order interactions with biological control agents can be predicted prior to release and should therefore be added to current risk assessment procedures.

SCALE-AREA CURVES AS A TECHNIQUE TO TEST PREDICTED RANGE EXPANSION OF INVASIVE PLANTS

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Predicting the future range expansion of an invasive species is vital for management decisions regarding the impact of these species. Unfortunately, only coarse scale occurrence data are usually available, which in themselves are confounded by several factors such as habitat suitability and propagule pressure. Here, we make use of scale area curves to test whether the invasive plant, *Acacia longifolia*, accepted to be under successful biological control, is likely to increase its distribution as predicted by climatic envelope suitability modelling. The quarter degree occupancy of the weed was used to select equal sized areas within the centre, range margins and climatically unsuitable areas within different zones of the national distribution. These areas were surveyed from a linear resolution of 25 km to 2.5 m. Resulting scale area curves indicated greater occupancy in the core than edges in parts of the national range with continuous suitable habitat, while patterns were reversed when suitable areas were more fragmented. In addition, scale area curves suggest that the potential for *A. longifolia* to increase its distributional range is limited, possibly due to a lack of suitable habitat. We encourage future use of scale area curves to assess the predicted landscape-invasion potential of invasive species.

A PRAGMATIC FRAMEWORK FOR ASSESSING INVASIVE SPECIES AND EMERGING DISEASE RISK

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Frameworks for analysing the risks of invasive species and emerging diseases often have relied on unstructured estimates of likelihoods and consequences. We suggest a flexible alternative that offers more transparent analysis without the need for additional data. We describe a system in which cognitive maps, Bayes nets and multicriteria analysis can be used in tandem to structure a problem, identify exposure pathways, combine data and expert judgement to estimate the likelihoods, and assess consequences of alternative decisions. These tools may be employed in participatory settings or as part of standard regulatory practice. We illustrate this approach with an assessment of the management of an emerging disease that poses a hazard to Australia.

CAN WE PREDICT WETLANDS AT RISK FROM INVASIVE MACROPHYTES IN NORTHERN AUSTRALIA?

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Invasive plant species are an increasing threat to the existence and functioning of wetland systems. These systems can be difficult to assess for the presence of an invasive species. Therefore, limited information exists on the distribution of invasive wetland plants and the factors which influence their spread. Within North Queensland, wetland areas are extensive, forming large interconnected systems, which perform key functions for region. One particular invasive species, *Hymenachne amplexicaulis*, has established in wetland areas in northern and north-eastern Australia. Currently, there is limited knowledge on the current distribution of hymenachne in wetlands at risk to invasion. To address this limitation, the current study used Maxent (maximum entropy) to distinguish potential supportive habitat areas in a subregion of northern Australia. Habitat suitability modeling was used in conjunction with spatial analysis to account for the connectivity of wetlands and the current distribution of the species to determine areas most at risk. Those areas with suitable habitat as well as areas connected to infested wetlands were identified as areas at highest risk. Predictive methods such as the one used here may be applied to other sub-regions and regions, and be used to identify wetland areas at risk to other invasive species.

ASSESSING THE FEASIBILITY OF ERADICATING AUSTRALIAN ACACIA SPECIES FROM SOUTH AFRICA

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Did humans do the best job of selecting invasives? There are about a thousand phyllodinous *Acacia* species native to Australia. Of these, at least seventy were introduced to South Africa (according to herbarium records). However, only seven are categorised as landscape transformers, with a further four included in general management operations. So what happened to the other sixty species? And the other nine hundred or so? Here we describe on-going work to prevent Australian Acacia species from becoming widespread as part of the Early Detection and Rapid Response Programme funded by Working for Water and the South African National Biodiversity Institute. We describe current efforts to eradicate *A. paradoxa* in Table Mountain National Park, initial assessments of *A. implexa*, *A. stricta*, and *A. adunca* populations, and the search for the missing acacias. Our initial conclusions are that plants are often much more widespread than initially thought, eradication depends on species-specific control programmes and a good understanding of the seed-bank dynamics, and taxonomic issues can easily be overlooked. We also discuss insights in how science can aid the management of established but not yet widespread invaders, and some of the broader ecological questions that these issues raise.

WEEDS IN A WARMER WORLD: UNDERSTANDING THE IMPLICATIONS OF CLIMATE CHANGE FOR AUSTRALIA'S WEEDS

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The impact of climate change in weeds is a significant issue from both agricultural and conservation perspectives. In Australia, several hundred weed species are considered to be of concern, but a pool of about 3,000 species is also recognised as showing invasive potential. The general assumption is that weed species presently infesting a region will spread under climate change, however few studies have look at a large ensemble of species to enable an objective test of this assumption. We are using the MaxEnt bioclimatic modelling tool to predict the impact of climate change on 296 significant weed species for the whole Australian continent. To date, we have modelled 50 species and have found that Australian weed species fall into two broad groups. Some will contract in range under climate change (e.g. Chilean needle grass *Nassella neesiana*) or will show little change in distribution, but others will expand in distribution (e.g. Gamba grass *Andropogon gayanus*). Based on these initial results, we discuss the implication for weed management policy and the need for the development of more sophisticated modelling procedures that will aid routine and on-going surveillance of the pool of 3,000 emerging or potential weeds.

THE EUROPEAN LEGACY OF PLANT INVASIONS: WHY IS EUROPE SUFFERING LESS FROM INVASIONS THAN OTHER REGIONS?

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There is a general agreement among invasion ecologist that Europe is less invaded by alien species compared to the USA, Australia and South Africa and the overall impact of aliens is remarkably lower. There has been considerable progress in understanding the invasibility of habitats and impact of alien species on native biodiversity at finer scales. Nevertheless, there were no attempt to analyse the potential differences between the continents at large scales and the assumption that Europe is suffering less from invasive species has not been rigorously tested. In our study we focused on the comparison of the level of invasion across large continental scales by using several confounding factors (e.g. habitat fragmentation, pattern of homogeneity at large scales) that may help to disentangle the pure level of invasion.

LOSING UNIQUENESS: PLANT EXTINCTIONS AND INTRODUCTIONS LEAD TO PHYLOGENETIC AND TAXONOMIC HOMOGENIZATION OF THE EUROPEAN FLORA

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Human activities have altered the composition of biota by influencing two fundamental processes: extinction of native species and introduction of alien species, which can lead to increased (homogenization) or decreased similarity (differentiation) of formerly distinct biota. We analyzed the impacts of these two processes on the taxonomic composition and phylogenetic structure of European floras, considering only naturalized alien species. As a result of species loss and introductions, numbers of species in European floras increased, but the various regions became more similar in their floristic composition. Phylogenetic distinctness, however, decreased, which contributed to phylogenetic erosion. Nevertheless, extinctions occurred only regionally, and not continentally, and hence led to taxonomic differentiation. This differentiation is superimposed by a homogenizing effect of introduced species; the effect size of species extinctions is ca 1/10 of the homogenizing effect of introduced species. Introduced species are very dissimilar among regions but they are closely related to resident natives. This resulted in a decrease in average phylogenetic distinctness. Moreover, aliens introduced in some regions are often members of native floras of other regions, and thus lead to overall homogenization. Hence, species diversity should not only be considered as species numbers, but also as species turnover and in a phylogenetic context.

TOWARDS THE SUSTAINABLE MANAGEMENT OF A CONFLICT OF INTEREST SPECIES: ESTABLISHING THE COSTS and BENEFITS OF PROSOPIS IN THE NORTHERN CAPE

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A few Prosopis hybrid species are “conflict of interest” species in South Africa having positive and negative impacts on nature and society. Currently a mix of manual, chemical and biological (seed-feeding beetles) control are combined with managed utilisation, but Prosopis continues to spread (exceeding 2 million ha) and it is uncertain what the net societal impacts are. Ecological-economic assessments across numerous social-ecological contexts were undertaken to determine these. Preliminary findings are that the impacts on biodiversity and grazing remain poorly known but water losses (350-500 mm of rain and groundwater yr^{-1} in the ‘leegtes’) and associated costs are substantial (excluding control costs exceeding R25million yr^{-1}). The economic benefits are mainly derived from the pods for fodder (R2.50 kg^{-1} during droughts) and pharmaceuticals (R35 kg^{-1}, limited to 100 m^3yr^{-1}) and the wood for firewood (R1 kg^{-1}). These benefits, however, are generally not by choice, but because people are forced to exploit the trees to control them. Also, it is often the case that the beneficiaries differ from those baring the costs – exacerbating the ‘conflicts of interest’. Finally, a comprehensive

cost-benefit analysis framework has been developed that provides a robust means for evaluating such species to guide future decision making, particularly regarding the release of additional forms of biological control.

INTEGRATED WEED MANAGEMENT: COMPARISON OF TWO CASES FROM SOUTH AFRICA

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Typically in the past, biological control has been seen as an alternative to mechanical and/or chemical control methods. Recent studies on the environmental invasive weed *Hakea sericea* (Proteaceae) in South Africa have highlighted the success of an integrated approach to the control of this weed. It is suggested that an extensive clearing effort dramatically reduced the range of this weed. Biological control has largely been responsible for preventing reinvasion of cleared areas, and likely reduced the density of the weed in other areas. This situation is in contrast to that of *Acacia saligna* (Fabaceae). Despite the presence of a highly destructive agent, the gall rust fungus *Uromycladium tepperianum*, the plant continues to occupy extensive areas of the landscape albeit at much reduced densities. It is suggested that any large scale clearing efforts done now would be highly successful, as biological control has reduced the number of trees to be cleared and the number of seed in the soil seed bank. Biological control should be initiated early in any environmental weed control programme, to maximize the efficiency of clearing operations.

PATTERNS OF PLANT INVASIONS IN THE PRESERVES AND RECREATION AREAS OF SHEI-PA NATIONAL PARK IN TAIWAN

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To estimate the differences of plant invasions in neighbouring preserves and recreation areas experiencing different intensity of anthropogenic activities, we employed Shei-Pa National Park in Taiwan as our study site. Our hypotheses were: (1) the recreation areas harbour more naturalized species, and plant invasion patterns are different in these areas under various land management strategies, and (2) species inhabiting the preserves could also be found in the recreation areas. A total of 230 quadrats (1m x 1m) were randomly selected along the roads and trails in both areas. Naturalized floras of these two areas were represented by analogous dominant families, Asteraceae and Poaceae, and dominant species, *Bromus catharticus* and *Trifolium repens.* However, the number and coverage of naturalized species, α diversity, elevation, and naturalness degree, suggested different patterns of plant invasions of these two areas. Recreation areas contained significantly more naturalized species, which had a higher coverage, and may serve as a source of naturalized species for protected areas. Furthermore, environmental factors that change with the elevation, such as temperature, topography, and native vegetation, may contribute to different patterns of plant invasions presented by preserves and the recreation areas in the subtropical mountains.

PATTERNS AND PROGNOSIS OF PINE INVASIONS IN SUB-TROPICAL BRAZILIAN ECOSYSTEMS

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Silvicultural planting of pines in Brazil is a relatively recent phenomenon. The first large plantations were created around 1950 and there was a dramatic increase in planting during the 1970s. Today almost two million hectares are under pine, predominately in sub-tropical areas. From these plantations, and to some extent also from trees planted for beautification or wind breaks, pines started invading natural grasslands, wetlands, degraded areas and forest edges. Invasions are found from the sea level up to altitudes of 2,000 meters, mostly in latitudes higher than 20°, in humid temperate climates (Cfa and Cfb). The main planted species are *Pinus taeda* and *P. elliottii*. *Pinus elliottii* is highly invasive in sub-tropical savannas while *P. taeda* is mainly found in sub-tropical grasslands and in grassland relicts in Atlantic Forests. Other pine species such as *P. caribaea*, *P. oocarpa* and *P. patula* are also found established in semi-natural areas, but to a lesser extent. It is expected that these pine invasions will grow in frequency and intensity, as there are still many suitable areas for invasions, propagule pressure is high and constant, and there is little effort made to control and limit the spread of pines. Work is in progress to define viable strategies for containment.

PROVIDING CAPACITY FOR THE MANAGEMENT OF INVASIVE ALIEN SPECIES: BUILDING PUBLIC POLICIES IN BRAZIL

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The South America Invasive Alien Species Program of The Nature Conservancy (TNC) works with governments in the development of public policies on invasive species. There are about 300 species in the Brazil Invasive Alien Species database (www.institutohorus.org.br). Brazilian states present distinct contexts in their knowledge of occurrences of invasive species and at the structural level in the government. Although some states have pointed out priorities and actions to develop public policies, there is a general tendency to start work through protected areas. Training modules on IAS were provided to public managers of 15 states in the Northeast, Southeast and South of Brazil and one in the Central area. These training modules helped managers to build action plans for the control of invasive alien species and to incorporate control as a routine activity. Many states are building legal instruments related to the prevention and the control of IAS, following the example of Parana state, which has developed laws for the control of invasive alien species in protected areas and recognized an official list of invasive alien species.

COMPARISON OF LEAF DECOMPOSITION BETWEEN EXOTIC AND NATIVE TREES IN A FRESHWATER ECOSYSTEM

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Invasion of exotic trees into riparian areas can alter the function of freshwater ecosystems. In the present study leaf litter decomposition (as % breakdown material) was compared between two exotic (*Robinia pseudoacacia* and *Ailanthus altissima*) and two native tree species (*Fraxinus angustifolia* and *Ulmus minor*). Senescent leaves were collected during autumn and their N content was analyzed. Leaf litter bags, containing 3g of air-dried senesced leaves, were situated in an artificial lake at the Alcalá University Botanical Garden. After 2, 25, 39, 71 and 95 days, four bags per species were collected and the dry weight and nitrogen content of the remaining leaf material were measured. Additionally, after 25, 39 and 95 days the number of macroinvertebrates in each bag was also estimated. The ranking of mass loss was *Fraxinus* > *Ulmus* = *Ailanthus* > *Robinia*, in spite of the highest N content of the later. However, the total number of macroinvertebrates colonizing leaf bags was similar across species. Most of these macroinvertebrates were collectors (i.e. they feed on fine particulate organic matter), suggesting that leaf material of either invasive or native species was used as substrate and indirect food source in this artificial lake. Our results suggest that the effects of litter on decomposition are species-dependent, rather than on species origin (native/exotic).

PLENTY OF HEAT, WIND, AND WEEDS

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In the arid zone of Western Australia, suitable soil moisture environments for weed seed germination and early seedling growth coincide with periods of extreme temperatures (>40^{o}C). These factors, combined with site remoteness, makes weed control incredibly difficult, with many precepts of weed control unable to be simply followed. An applied research program has focussed on identifying the most effective control strategy for the perennial environmental weed *Aerva javanica* (kapok weed) at the edge of the Great Sandy Desert, Western Australia. Kapok weed has invaded large areas of arid zone Western Australia with no effective control program presently in place. The research presented in this paper has focussed on identifying effective chemical control strategies linked with a better understanding of kapok weed seed/plant biology. This research provides the foundation for establishing effective weed control strategies in arid environments.

HABITAT-RELATED MAPPING OF *GUNNERA* INVASIONS ON LOCAL AND REGIONAL SCALES

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Regional information on the distribution of invasive plant species is often to coarse to provide meaningful data on habitat preferences or the scale of plant invasions. Habitat-related mapping on a local scale, however, can provide information on the areas most susceptible to invasion as well as the vectors of spread. We have conducted a survey of *Gunnera tinctoria* invasions on a small Island, Achill Island, located off the West Coast of Ireland. Using 1:7500 maps and GPS, plants and plant stands were recorded and distribution maps produced using GIS and related to the presence of major habitat types using the CORINE land cover map. Based on this analysis *G. tinctoria* has a dispersed distribution centred on areas of human habitation, with the major spread along roads that may serve as the major conduit for range expansion. *G. tinctoria* is mainly associated with former agricultural land, whilst also encroaching on land used mainly for pasture. Although the dominant (~90%) land cover of the Island are peat bogs dominated by Ericaceous species these are infrequently colonised. A minor, but increasingly significant habitat is cliff faces and these populations may have an origin that is distinct from the source of the other colonies.

ASSESSMENT OF THE EFFECTIVENESS OF TWO CONTROL OPTIONS FOR *SENNA SPECTABILIS* IN BUDONGO FOREST RESERVE

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Senna spectabilis was introduced in Uganda as a forest live boundary marker but it has now escaped and invaded the interior of many forests including Budongo Forest Reserve. This study was undertaken to assess the effectiveness and cost of ring-barking, hack and squirt and foliar herbicide applications to control *Senna spectabilis.* In the ring-barking trials, barks of 0.5, 1.0 and 2.0m lengths were removed from trees 15 – 30cm in diameter at a height of 1.0m from the soil surface. All trees, irrespective of size, with ring-barks of 1.0 and 2.0m lengths were dead after one year, while only 70% of those with ring-barks of 0.5m length had died after the same period of time. All the ring-barked trees coppiced but all coppices on trees with 1.0 and 2.0m ring-backs were dead after one year while some of the coppices on trees with 0.5m ring-backs were still alive. Hack and squirt method using Tordon herbicide, resulted in 80% mortality while foliar spraying yielded poor results with leaves on the saplings merely deformed but not dead. Chemical control was cheaper than mechanical control with hack and squirt method costing 1,675 US$ per ha and ring-barking 1,955 US$ per ha.

CLEAR FELL VS. REHABILITATION OF INDIGENOUS FOREST

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Forests are particularly resistant to alien plant invasions and it is therefore, difficult to eradicate invasive species within a forest ecosystem. Literature shows that invasive alien plant species can be managed to facilitate the rehabilitation of natural forest. By introducing a collaborative forest management system for sustainable utilization and re-habilitation, the spread of invasive plants can be controlled and manipulated to improve natural regeneration of forest. In general, alien invaders and invasions have different relevance in natural forests when compared to other biomes in South Africa. Most alien invaders in the forest environment complement the ecological processes and stand dynamics of natural forests. Manipulation rather than clearing of invader plant stands in the forest environment provides a cost-effective approach to convert alien invader stands to natural forest. The preferred clearing method within Working for Water was to clear-fell invasive alien plants. Whether in mountainous areas; forested areas, riverine or fynbos ecosystems, the clearing method was standard throughout. Recently, the Working for Water Programme started to adapt their clearing methods within Indigenous forests and riverine ecosystems to a "selective thinning clearing technique". The Programme is currently developing norms and standards for this technique and great success has already been achieved.

ECOLOGICAL IMPACTS OF INVASIVE ALIEN PLANTS IN FYNBOS AND ITS RELATION TO FIRE: LESSONS FROM THE CAPE PENINSULA

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The Cape Peninsula suffered from intense fires in January 2000 where more than 8000 hectares of pristine and alien-invaded fynbos burnt. These fires were considered unusually intense, particularly in alien-invaded areas. This poster compares results from two studies, conducted 7 years apart within permanently-marked plots, to determine the ongoing ecological impact of invasive alien plants and fire. The results describe the successional changes experienced in these permanent plots. Similar species richness was obtained for pristine and cleared areas in 2007, which was is in contrast to the 2000 study, where these differences were found to be significant. Similar results are discussed for vegetation cover, vegetation composition and changes to regeneration modes within the permanently marked plots. With regard to indigenous vegetation recovery, areas cleared prior to the fires proved to mirror pristine areas better than areas where alien plants were burnt standing. Cleared sites are often left to recover naturally and this process is aided by the continuous clearing of alien plants. This serves to deplete alien seed banks and maintain alien plants at manageable levels. This poster provides insights for biologists and managers in relation to the recovery of fynbos vegetation following large fires.

SINAPSIS ALBA SEED MEAL AS A PRE–EMERGENT CONTROL FOR FRENCH BROOM (*GENISTA MONSPESSULANA*) SEEDLINGS

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Over two growing seasons, 2007-2009, the authors tested *Sinapsis alba* pressed seed meal as a pre-emergent inhibitor of French broom (*Genista monspessulana*) seedlings in at Quail Hollow County Park, Felton, CA, USA. *Sinapsis alba* seed meal, known to contain 4-hydroxybenzyl isothiocyanate, releases a quinone that hydrolyzes in soil to form SCN-, a known bioherbicide. The meal was applied by broadcasting it on the surface of the soil of six replicate per treatment, 3 sq meter blocks at a rate of approximately 8.8 kg of SCN-/ha, and 13.2 kg of SCN-/ha. A significant decrease ($F=14.2$, $P=0.001$) of broom seedlings was observed in treated plots compared to controls at both levels of application. No significant differences found in quality or quantity of soil fauna between treated and untreated blocks at the lower application rates, but a small but significant decrease in quantity and of soil fauna in the upper 10 cm of soil was found at the higher application rate in the middle of the germination season ($F=4.8$, $P=.01$). There was a slightly elevated (6 %) level of nitrogen observed in treated blocks with the higher application rate. While the lower application rate of *S. alba* seed did inhibit seedling germination over an 8 month germination season, it did not stop germination of 100 % of broom seedlings, limiting its usefulness as a control agent. The higher application rate inhibited all broom seedling germination.

LEARNING FROM THE PAST FOR AN UNCERTAIN FUTURE: A NEW BIOSECURITY APPROACH TO WEED MANAGEMENT

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Past legislative approaches have not prevented the State of Victoria from bearing an increasingly heavy burden from the impact of weeds. Increasing trade and movement of people along with climate change are all leading to increased potential threats from alien invasive plants. Previous approaches have been reactive and heavily weighted towards enforcing compliance on landholders for species already well established across the landscape. Increasingly the Victorian Government is emphasising a risk-based approach, based on a sound understanding of the potential impact of weeds on productivity, environmental and social assets. This approach is being revised further to account for climate change. This approach results in an increased emphasis on prevention, preparedness and eradication for species in the early stages of invasion. Early stage interventions in general provide the greatest return in public benefit from government investment. Gains can still be made from containment of established species, where those species have yet to reach their ecological limits of spread. For widespread established species, careful consideration needs to be paid to the feasibility of managing all the threats to assets, not just weeds, before any decision is made to invest in their management.

RISK OF INVASION BY *EUCALYPTUS GLOBULUS* IN NATIVE FORESTS AND IN PINE PLANTATIONS IN NW SPAIN

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In many countries, plantation forestry depends on a small number of fast-growing exotic species. These species contribute significantly to the economy of these countries but they often have important ecological impacts, which may be reduced with appropriate management. One of the risks that these species pose is their capacity to naturalize and spread in native communities. In NW Spain, *Eucalyptus globulus* is intensively planted. It is naturalized and can spread to adjacent communities causing important economic and ecological impacts. Within the framework of the research project, we focused on the invasive behavior of *E. globulus* in NW Spain and monitored its impacts on biodiversity. The germinability of *E. globulus* seeds in native *Quercus robur* forests and *Pinus pinaster* plantations was studied. *Eucalyptus globulus* germination is more than 30 times higher in *P. pinaster* plantations than in native *Q. robur* forests. This shows that the risk of invasion is lower in native *Q. robur* forests, although the potential ecological impact is much higher. To limit the uncontrolled spread of these species in this territory we propose the use of safety margins around *E. globulus* plantations planted with native forests.

MONITORING INVASIVE PLANTS WITH AIRBORNE IMAGING SPECTROSCOPY IN TWO INSULAR NATIONAL PARKS IN SPAIN

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Effective management of non-native plants cannot be achieved without a good knowledge of their spatial extent and spreading patterns. Remote sensing is a convenient alternative to traditional mapping methods based on direct field observations. Airborne hyperspectral sensors for imaging spectroscopy have both higher spatial and spectral resolution than traditional satellite borne sensors (e.g. Landsat TM, SPOT, ASTER, Quickbird). We use a custom hyperspectral sensor with 195 3-nm spectral bands [350, 950 nm], and 0.25-2 m spatial resolution, depending on height and speed of flight. The low cost sensor is designed to operate from ultralight aircraft, dramatically decreasing the operational costs and also increasing its availability. Overall, the characteristics of the sensor and platform hint at an improved suitability for precise mapping of invasive species, and general monitoring of protected areas. Our current research aims at the detection and quantification of invasive plants in two insular National Parks in Spain: Galician Atlantic Islands National Park (NW Spain) and Cabrera Archipelago National Park (Balearic Islands, NE Spain). The ultimate aim is to test the validity of our technology, determine its limits and assess the convenience and implementation costs of its adoption for monitoring invasive plants in the Spanish Network of National Parks.

SEED DISPERSAL OF NATIVE AND ALIEN PLANTS BY NATIVE AND ALIEN HERBIVORES (EMUS, KANGAROOS AND RABBITS)

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Seed dispersal determines to a large extent plant species' ability to colonize new areas and expand their ranges, and is critical to the success of alien species. Herbivores, while feeding on plants (antagonists), may ingest large quantities of seeds and disperse a portion of them undamaged, thus acting as seed dispersers (mutualists). In the Eneabba Plain (centered 275 km north of Perth, Western Australia) we studied the role of native herbivores, emus and western grey kangaroos, and alien rabbits as dispersers of alien and native plants. We found a total of 101 plant species in the herbivores' faeces: 59 native species, 32 aliens and 10 unidentified species. Emus dispersed most species, both native and alien, in natural shrublands and near farms. However, near the farms emus dispersed more native species, but rabbits dispersed more alien and total species. All dispersers proved to be highly adaptable, with the native herbivores (emu and kangaroo) dispersing many alien species, and the alien (rabbit) dispersing many native species. Since these herbivores move frequently between natural and farming areas, they may be an important vehicle for the introduction of alien plants into natural areas.

IDENTIFYING INVASIVE ALIEN PLANT SPECIES FOR RAPID RESPONSE PROGRAMMES IN KWAZULU-NATAL, SOUTH AFRICA

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South Africa's Early Detection and Evaluation of Invasive Alien Plants Programme was started at the end of 2008. It is funded by the Working for Water Programme with the intention of identifying species that are showing tendencies of becoming invasive and thus enabling eradication measures to be initiated before they become well established. This poster reports on the first year's field work in KwaZulu-Natal province. It will address the principles we have used to select priority species, the distribution of these species in the province and the characteristic of the places in which most of these emerging invasive species are being found.

GENE FLOW AND POPULATION ADMIXTURE AS THE PRIMARY POST-INVASION EVOLUTIONARY PROCESSES IN COMMON RAGWEED POPULATIONS IN FRANCE

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A correct inference of evolutionary history may be achieved by analyzing genetic variation and population differentiation of currently established populations and their ancestral populations. We investigated the post-invasion evolution of common ragweed by comparing the genetic structure between historical and recent population. Historical populations were collected from herbarium specimens dated from late 19th to early 20th century, whereas recent populations were collected within the latest five years. Our results indicated that recent populations possessed greater allelic and genetic diversity than historical populations. The low level of population differentiation in historical populations suggests that gene flow is primary effect in the early stages of invasion. Recent populations appear to arise from the admixture of historical populations incorporating more rare alleles, but with greater population differentiation than historical populations. Our results suggest that the influx of alleles and genetic admixture played a crucial role in establishing invasive common ragweed populations.

ERADICATING PROCUMBENT PEARLWORT *SAGINA PROCUMBENS* ON GOUGH ISLAND, A WORLD HERITAGE SITE

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The European plant, Procumbent Pearlwort *Sagina procumbens*, was first reported from Gough Island, a cool-temperate island and World Heritage Site in the South Atlantic, in 1998, adjacent to the meteorological station, its assumed point of arrival. Since then it has spread along a few hundred metres of coastal cliff, but has not as yet been found in the sub-Antarctic-like mountainous interior. At South Africa's sub-Antarctic Prince Edward Islands *Sagina* is invasive and is spreading rapidly into many vegetated and unvegetated habitats, and is considered beyond control. It is thought a similar situation will eventuate on Gough if the plant spreads inland. An eradication programme commenced soon after discovery. To date, eradication has not been achieved, but the plant has been curtailed to its current small distribution. Techniques used

include mechanical removal and dumping of plants and seed-infested soil at sea well away from the island, use of herbicides, gas flames and near-boiling water to kill plants and seeds in soil and rock cracks, and most recently a high-pressure water jet to strip infested areas down to bedrock. Treatment with pumped salt water that has been shown to kill germinating seeds and young plants in trials is planned to commence this year.

THE ALIEN WOODY FLORA OF CRETE: PATHWAYS, ECOLOGY AND DISTRIBUTION

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Alien woody species represent a substantial proportion of the most noxious alien species worldwide. Many exotic trees, introduced for commercial exploitation, wind protection, or ornamental purposes, subsequently became invaders and possibly change the character, condition, form, or nature of ecosystems. The aim of this research is to analyze the woody component of the alien flora of Crete. For this reason an information database was created for 141 species of trees, shrubs and sub-shrubs, woody vines and succulent belonging to life forms of the Phanerophytae and the Chamephytae. Taxonomy, geography, invasion status, pathways and uses, distribution and habitats, biology and ecology characteristics were collected from bibliographic records, field surveys and from catalogues of seeds and living plants of specialized gardening shops. The research highlighted that 69% are planted-only species, 18% are naturalized and 10% casual. Most species were deliberately introduced by man for ornamental and horticultural purposes. Most of the naturalized species spread into urban and disturbed habitats but some become invasive in natural habitats. In order to understand the relationships between species attributes and invasions mechanisms and to establish management protocols that can be applied in several sectors related to alien plants these preliminary results are required for future developments.

ALIEN PLANTS AND BIODIVERSITY: WHEN AND WHERE SHOULD WE UNDERTAKE CONTROL TO SAVE NATIVE SPECIES?

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Invasion by alien plants is considered a significant factor in the decline of native biodiversity. However, decision making with respect to (1) which alien plants to manage, (2) which native species to protect and at which site/s, and (3) when to implement or not implement management has been lacking. Here we outline a three-step triage approach to address these questions. The first step assesses and prioritises the threat posed by alien plant species to biodiversity. The second the biodiversity at risk and the third the sites for control based on the (i) biodiversity present, (ii) impact, (iii) value of the site to the species survival, and (iv) ability to deliver effective control. Using these three steps a triage system has been developed to establish priorities for management based on the urgency of action e.g. a site with high impacting alien plants, highly at risk biodiversity, and of high conservation value, where effective control is possible is given priority. Whilst at low priority sites the threat of the alien plant on biodiversity is low, and/or control is ineffective, irrespective of the density of the alien plant. This triage system is now being used widely in New South Wales to direct alien plant management.

PHENOTYPIC VARIATION TRAITS IN THE INVASIVE PLANT *ESCHSCHOLZIA CALIFORNICA* (PAPAVERACEA) ACROSS ALTITUDINAL GRADIENTS CENTRAL CHILE

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High-elevation ecosystems are regarded resistant to plant invasion due to climatic conditions that limit plant performance. However, recent evidence suggests that some species may overcome abiotic constraints imposed by altitude. In this context, it is interesting to elucidate if altitude affects phenotypic attributes relevant for plant fitness. We sampled six populations of *Eschscholzia californica*, introduced from California (USA), in two altitudinal gradients (localities) of Central Chile. Twelve reproductive and vegetative traits and five environmental factors were measured at 1000, 1500 and 2200 m.a.s.l. Specifically, we assessed the effect of nutrients, soil moisture and ph as well as the altitude and locality on floral traits and individual and leaf size. The six populations differed among altitudes and localities. Water availability and nutrient soil affected floral trait while altitude affected only vegetative traits. Thus, we detected population differences in phenotypic traits but these variations are not concordant with the presumed increase of stress expected by an increase of altitude.

ANALYSIS OF CHENOPODIACEAE FAMILY OF STEPPES: INVASIONS OR NATURAL ASSOCIATIONS

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The aims of the study were to investigate and compare sets of Chenopodiaceae species complexes of dry steppes and desert-steppes communities (Lower Volga and Caspian lowlands), in order to answer the following questions; (i) what is the composition of Chenopodiaceae species? and (ii) the strategies of species invasions in steppes zones? Desert-steppes communities in dry steppes zone are dominated by long-leaved grasses and rare annual species *Salsola tragus*, *S. collina*, *S. tamariscina*, *Climacoptera brachiata*, *Petrosimonia triandra*, *P. monandra*.. These species occur on anthropogenic and naturally broken habitats (chalk, limestone, sandy, road) and not matted soils and do not influence community structure. The perennial species, *Salsola laricina* grows on souslik (ground squirrel) casts only. The *Anabasis salsa* are perennials of desert steppes and deserts adapted to saline soils and distributed on non-matted soils. The perennials *Comphorosma lessingii* and *Kraschenninnikovia ceratoides* grow on naturally and anthropogenically-broken habitats. Thus, the Chenopodiaceae members of dry steppes are distributed on natural and anthropogenic habitats disturbed by animal activities and ruderalization. The annual species distributed on non-matted soils do not change the community structure. Results show that the invasions strategies of Chenopodiaceae species in dry steppes zone is distribution on natural and anthropogenically-disturbed habitats.

TOWARD A FRAMEWORK TO IMPLEMENT EUROPEAN STRATEGY ON INVASIVE SPECIES IN FRANCE

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European states have approved a pan-European Strategy on Invasive Alien Species (IAS), which is a regional implementation of the guiding principles on IAS approved under the Convention on Biological Diversity. The next step is to adapt the strategy at a national level: each guiding principle is discussed according to what already exists in France and what could be further implemented. Beyond the assessment of the current ecological situation (of IAS), the national strategy proposed here takes into account the human dimensions of the IAS problem. A review of different options of management is presented. It highlights the necessity of financial support and above all, the requirement of better coordination with an institutional interlocutor clearly identifiable by the various role players. Relevant legal and institutional elements are identified as well as the current gaps, in order to build a more effective action plan. Technical reasons and inadequacy of existent system often do not allow the application of effective preventative measures. One of the main reasons of inefficiency highlighted in this review could be the lack of motivation for what should be the priority of the strategy: the detection of species which are only "potential" threats.

A NEW SCREENING PROCESS FOR PRIORITIZING ALIEN PLANTS: FIRST RESULTS AND COMMENTS ON ITS APPLICATION ON 217 SPECIES IN FRANCE

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In line with the European and Mediterranean Plant protection Organization activities, France develops a strategy against invasive alien plants. Given the number of alien species already present in Europe and the time needed to conduct a full pest risk analysis (PRA), the establishment of a prioritization process is necessary as a preliminary step. This process is designed to determine which of the invasive alien plants, established or that could potentially established, have the highest priority for a PRA. These species are the ones qualifying to the following criteria: they are known to spread rapidly, they are capable of causing major economic and/or environmental impacts, they still have a significant area suitable for further spread and can still be eradicated or contained, they are moved from country to country primarily by human activities. This process can be used at the country level, and has been tested for France. Of the 217 species, this prioritisation process enables us to distinguish priority species for preventive action in France. For instance, *Alternanthera philoxeroides* and *Nassela trichotoma* emerged as priorities. The results are discussed according to species traits and are compared to a previous classification based on expert judgments.

CHANGES IN HABITAT PREFERENCES OF *HERACLEUM MANTEGAZZIANUM* (APIACEAE) DURING ITS INVASION IN FRANCE

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Heracleum mantegazzianum, a perennial monocarpic species native to the Caucasus, was introduced in Europe for ornamental purposes in the 19th century. After a long latency period, the species became invasive in the second half of the 20th century, particularly in Central and North Europe. It is less widespread in France (southwestern limit range in Europe), where it occurs mainly in the Alps and in the northeastern regions. Many new locations have been found in recent years. This study aims to review the current distribution and impact of the species in France and to reconstruct its historical invasion dynamic with a particular attention to the habitats occupied. Herbarium records, literature data and floristic databases were compiled to gather as much information as possible on each location. In the beginning of the 20th century, like elsewhere in its introduced range, *H. mantegazzianum* was initially confined to gardens, urban areas and linear habitats (roads, railway). In France, the species started to spread in abandoned fields and pastures since the early 1990s. The number of invaded locations along roads increased sharply in the new millennium and forests, riparian and hygrophilous meadows were reported to be the main habitat of the species.

SPECIES RICHNESS AND ABUNDANCE IN AN INVASION GRADIENT OF *ACACIA DEALBATA* (MIMOSACEAE) IN THE CENTRAL-SOUTH REGION OF CHILE

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Acacia dealbata is native to continental Australia and Tasmania and has been documented for its invasive potential in many ecosystems. *Acacia dealbata* may have negative effects on species richness in invaded patches, thus reducing local biodiversity. In Chile, *A. dealbata* was introduced as a forestry species, mainly for erosion control. However, the effects on native ecosystem of these introductions are poorly understood. In order to evaluate the effect of the invasion of *Acacia dealbata* on native communities of south-central Chile, we recorded species richness and abundance under a canopy of *A. dealbata*, on stand edges and under native forests. We selected five study sites near Concepcion (Region of Bio-Bio, 37ºS). We determined the floristic composition using three transects of 20 x 2 meters located along a gradient of *A. dealbata* invasion. The results show that species richness tends to be 75% higher on the edge of the stand and 80% higher under the native forest canopy compared to conditions under *A. dealbata*. We conclude that the *A. dealbata* invasion has a negative effect on species richness, declining the local biodiversity and homogenizing the ecosystem. Funding provided by FONDECYT 1070488, ICM P05-002, PFB-23.

ALIEN PLANT INVASIONS IN FORESTS: A PROBLEM, OR A FACILITATION IN REHABILITATION OF NATURAL EVERGREEN FOREST?

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Various studies have shown that most alien plant invaders cannot invade forests. Concepts have been developed around the natural disturbance regimes affecting forests, and how changes in these affect the invasion potential of alien species. The small-gap (<150 m^2) natural disturbance regime inside the forest prevents the establishment of shade-intolerant invader plant species. Fires in the landscape have confined the small, very fragmented and widely distributed patches of natural evergreen forest in South Africa to fire refugia. Controlling fire through commercial forestry, intensive agriculture, and urban development, allowed trees to grow back into the landscape. Alien invader plant species, as typical pioneers in their natural environment, are the first to become established. Such species are intolerant of shade, but facilitate the establishment of shade-tolerant forest species – a typical forest succession process. Information obtained from several studies and observations in many areas provided the basis for the guidelines to manage invader plant stands to control them in the natural forest (controlling gap size) and to convert them outside the forest to regrowth natural forest. Alien invader plant stands can be converted successfully and cost-effectively through manipulative thinning to regrowth natural forest, with the potential to develop small business over a longer period.

DIFFERENCES IN EMERGENCE, SEEDLING MORTALITY AND MORPHOLOGY BETWEEN COEXISTING NATIVE AND ALIEN PLANT SPECIES UNDER DIFFERENT SOIL MOISTURE AND IRRADIANCE

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Our aim was to identify the scenarios that favour alien tree species to the detriment of coexisting native trees in the Iberian Peninsula. Riparian forest native species *Fraxinus angustifolia* and *Ulmus minor* coexist with alien *Ailanthus altissima*, *Robinia pseudoacacia*, *Acer negundo* and *Eleagnus angustifolia* in central Spain. Exotic *Acacia dealbata* and *Eucalyptus globulus* form mixed forest with native *Quercus pyrenaica* and *Pinus pinaster* in North Spain. On 30th April 2008 we sowed all species under three levels of soil-moisture (90-100, 70-80, 50-60% of the field capacity) nested within four treatments of light (100, 70, 40 and 10% of full sunlight). We sampled weekly seedling emergence and mortality until 30th September 2008. North Spain native species had higher percentage of emergence and lower mortality than alien species. By contrast native from Central Spain had lower emergence and similar mortality as compared to aliens. Responses to treatments were species specific: we found no general conditions favoring all exotics or natives. During 2009 spring-summer we will monitor growth and survival in 2008 seedlings.

WILDLING CONIFER CONTROL IN THE SOUTH ISLAND OF NEW ZEALAND

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In New Zealand wildling conifers threaten over 300 000 hectares of conservation land. Diquat, applied aerially at 3,000 g active ingredient in 400 ℓ/ha, is the current operational treatment to control wildlings, however, it is not very effective. The objective of this study was to evaluate alternative herbicides for control of *P. contorta*, *P. mugo* and *Pseudotsuga menziesii*.. Alternative herbicides can be categorised into two groups: those based on glyphosate and those based on triclopyr. Herbicide treatments were applied to potted seedlings in spring. Damage and mortality were assessed. Analysis of variance showed highly significant differences between herbicide treatments ($F_{10,99}$=112.6, p<0.0001), species ($F_{2,99}$=106.55, p<0.0001) and also a significant interaction ($F_{20,99}$=4.4, p<0.0001). When averaged across treatments damage was significantly different between all species and was 84%, 70% and 59% for *P. contorta*, *P. menziesii* and *P. mugo*, respectively. Triclopyr, applied as Grazon at 20 ℓ/ha in oil, was the most effective herbicide with damage averaging 86% across all species.

WHAT TURNS A QUIET ALIEN INTO A POWERFUL INVADER? AN ASSESSMENT OF INVASIVE PLANT TRAITS

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There is a need for predictive frameworks that can help us set priorities for the control of introduced invasive species and allow us to foresee the risk of future invasion. The critical questions are: what attributes make invasive species successful and why do only some introduced species become invasive? More than 550 exotic plant species are listed for continental Portugal (~17% of the Portuguese flora). Almost 40% of the listed species are actually, or potentially invasive, and ca. 7% are considered harmful invaders. Understanding how and why certain biological characters promote invasiveness is of utmost importance, so we are completing this dataset with plant functional traits (vegetative, leaf, regenerative) and with an assessment of belowground mutualists and antagonists. The addition of ecologically meaningful functional traits and the belowground interaction dimension to the exotic species listed may allow us to identify patterns in the life traits of invaders. We expect to find sets of traits that consistently characterize present day invasive plants and that may allow us to pinpoint future potential invasive species that may come either from the pool of alien species already naturalized (but at present innocuous), or from new additions.

ALIEN AND NATIVE PLANTS IN PROTECTED NATURAL AREAS OF CHILE: PATTERNS ACROSS DISTURBANCE AND CLIMATIC GRADIENTS

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In Chile the National Parks (NP) are conservation relicts inserted in an agronomic and forestry matrix of the zone center-south of Chile, exposing a constant antrophic disturbance and the invasion of introduced species. Diversity and richness of exotic and native species were compared in seven NP and the adjacent matrix, considering the factors: park/no park and road/inside. The index of diversity of Shannon (H') and Equitability (J) of the total of species only present significant differences between parks. The diversity (H') of exotic species present significant differences between parks, roads and regions. We postulate that homogenization of the diversity relating to landscape scale does not exist. The greater diversity is outside the NP and along road borders. The floristic similarity of the richness of species between communities is greater between the exotic species than entering natives, making evident the major taxonomic homogenization in the landscape. The greater richness and abundance of exotics are concentrated in the families Poaceae, Asteraceae, Fabaceae, Polygonaceae and Rosaceae. The NP would be acting as protectors of the wild flora while maintaining a smaller number of exotic species. Nevertheless, it is impossible to assure that these conditions will be maintained in the future. Acknowledgements: FONDECYT 1040528, ICM P05-002, PFB-23.

INVASION PATTERNS OF *PINUS CONTORTA* DOUGL. EX LOUD. IN THE CHILEAN PATAGONIA

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Pinus contorta was first introduced in the Chilean Patagonia for erosion control created by historical fires and cattle raising. Lately, it has been widely planted for commercial purposes. As an excellent adaptor species, however, it is spreading into natural areas. This study analyzes the natural regeneration of *Pinus contorta* in the Coyhaique Province, where five study sites were selected. In each site, the plantation (seed source) was characterized using morphological attributes and density studies. Regeneration was characterized using the transect method. Their density, height and age at different distances from the seed source were recorded, and ground cover was measured as an environmental factor influencing the invasion process. *Pinus contorta* regeneration is significantly influenced by distance from the seed source and ground cover. Higher densities are found close to the parent stand (up to 13222 trees/ha), decreasing as distance from the seed source increases. Areas with higher ground cover tend to have less regeneration. Age and height are significantly related to each other, but there is no clear trend between these variables and the distance from the seed source. These results confirm that the

invasion process is at an early stage in Patagonia and potentially might become a threat to natural environments and grazing pastures.

PROMOTING GOOD PRACTICES IN THE USE OF ALTERNATIVE PLANTS

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An interesting perspective for local authorities, in the field of limitation of invasive species impacts in France, is to fund only projects that meet requirements of non-invasive specifications. These specifications will prompt landscape managers to use indigenous plants or exotic alternatives and are based on voluntary codes of good practices existing elsewhere. This is going to promote the use of indigenous species and exotic plants passed through weed risk assessment procedures before setting up a more voluntary process. This proposition will finally provide an extra tool well in advance of legislative work always long to come. However, it needs to provide efficient tools to select alternative species. Existence of selecting tools for alternative species is of major importance to insure efficiency of this proposal.

RAPID RESPONSE TO EMERGING POPULATIONS OF POMPOM WEED, *CAMPULOCLINIUM MACRACEPHALUM* IN SOUTH AFRICA

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Through the Early Detection and Rapid Response (EDRR) programme, South Africa is instituting a partnership between SANBI, Working for Water, SMME's, provincial government agencies and civil society for rapid response to emerging weeds. The South African National Biodiversity Institute (SANBI) has been given a legal mandate to promote the conservation of South Africa's exceptional biodiversity and also to monitor and report on invasive alien species. The EDRR program together with provincial, local, and regional governments, along with numerous non-government organizations and members of the public are working together to effectively manage pompom weed in KwaZulu-Natal, Mpumalanga, Limpopo, North West and Free State Provinces and seek to contain the expansion of this species in the Gauteng province. This poster reports on the progress made in the development and implementation of a strategy for rapid response to pompom weed invasion of the Grassland Biome. This strategy is a pilot contribution to the systematic development and progressive improvement of the overall EDRR programme. Details of this strategy will be discussed.

IDENTIFYING THE CONSTRAINTS AND OPPORTUNITIES FOR COST-EFFECTIVE RESTORATION OF INVADED FYNBOS AREAS

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To date, sub-catchment scale ecological assessments and monitoring of Working for Water (WfW) operations have been relatively scarce. Such studies are integral for the necessary organisational learning to take place to deal with the constraints it confronts. Drawing from the WIMS database and extensive site assessments, this paper aims to assess the cost-effectiveness of Working-for-Water in reducing alien plant cover across 750 sites, covering 19 400 hectares, in the Kouga and Krom catchments of the Eastern Cape, South Africa. Using a Bayesian approach it sought to determine what biophysical, social and management variables affect the cost-effectiveness of restoration. This Bayesian approach allowed for the important incorporation of WfW manager prior knowledge in the analysis.

IS *SOLANUM MAURITIANUM* A PREFERENTIAL FOOD RESOURCE FOR NATIVE FRUGIVORES IN THE CAPE FLORISTIC REGION?

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Identification of keystone plants as food-resources for birds is important for biodiversity conservation since birds promote long distance dispersal of their seeds. Surprisingly, those species that possess the potential for being keystone species are either aliens or share characteristics with typical aliens. *Solanum mauritianum* with its exceptionally high reproductive output is potentially a keystone food-resource for native frugivorous bird species in the Cape Floristic Region (CFR). This alien species' advanced fruit presentation strategies potentially threaten native species seed dispersal by out-competing them for seed dispersal agents. This proposal was tested by measuring the annual frequency and amounts of fleshy fruits produced by the alien shrub *Solanum mauritianum* (Bugweed) and the indigenous shrub *Chrysanthemoides monilifera* (Bietou) at four diverse locations within the CFR where these species co-occur. At the same time, the frequency and duration of visitations and foraging activity by frugivorous birds on the fleshy-fruited alien and indigenous shrubs were recorded with the aid of a digital camcorder and faecal samples collected for assay of viability of avian ingested seeds. Provisional results indicate a wider variety of different bird species, especially nomadic types such as the African Olive-Pigeon *Columba arquatrix* forage fruits of the alien *S. mauritianum* than the indigene *B. monilifera* which supports its proposed keystone status.

EFFECT OF *ACACIA MEARNSII* (BLACK WATTLE) ON VEGETATION GROWTH IN TSOMO VALLEY OF THE EASTERN CAPE PROVINCE OF SOUTH AFRICA

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Many communal grazing areas in South Africa are being converted to bush lands by encroaching trees like *Acacia mearnsii,* which tends to exclude grasses and herbs where they grow. The effect of *Acacia mearnsii* on vegetation growth was monitored on four plots, measuring 20m x 10m each. Two of the plots were cleared of *A.mearnsii*. In each plot, herbaceous biomass production and species composition were determined according to Van Oudtshoorn, (1999). Herbaceous vegetation was clipped and oven dried at 60^0C for 48 h. Clearing *A. mearnsii* had a significant effect ($p < 0.05$) on herbaceous biomass production. Production in cleared plots (290 $kgha^{-1}$) was 10 times more compared to uncleared plots. The dominant grass species in all plots were *Cynodon dactylon* (50%), *Eulalia villosa* (25%) and *Panicum equiniva* (17%). *Cynodon dactylon* was the dominant species because it occurs in almost all soil types especially in localities with high levels of nitrogen. It is common in disturbed areas such as uncultivated lands, and is often found in moist sites along rivers or water wells. We conclude that *A. mearnsii* reduces herbage production in rangelands, therefore, reducing grazing capacity. We recommend that management of grazing areas should include the eradication of such invasive plants.

PLANT INVASIONS ON ITALIAN ISLANDS

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The presence of a high number of islands whose geological origins, size and distance from the mainland vary considerably is a peculiar characteristic of the Mediterranean Basin. Although the presence of humans on these islands dates back millennia, environmental changes caused by human activities have become considerably more intense over the past 60 years, following intense land use changes such as the abandonment of traditional agricultural methods and the development of tourism. The increasing number of non-native taxa, introduced prevalently for ornamental use, the well-known susceptibility of islands to invasion processes, as well as the high rate of endemism, makes the study of alien flora in these areas a priority for biodiversity conservation purposes. Therefore, within the project “A survey of the Italian non-native flora”, particular attention was paid to the distribution and invasive status of alien plant species on 47 small Italian islands so as to provide a general overview of the composition and structure of their alien flora. Here, we present the results of part of the project, describing the prevalent distribution patterns, the main environmental drivers, the most invasive species at present, and the species attributes associated with invasiveness in these insular ecosystems.

THE ATTEMPTED CONTROL OF DENSE INFESTATIONS OF WILDING CONIFERS WITH AERIALLY APPLIED HERBICIDES IN NEW ZEALAND

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Control of wilding conifers is based on two activities, namely physical and chemical control methods. Physical control is the most common and most cost effective method used in planned operations where the trees are accessible. For dense infestations or situations where trees are inaccessible chemical control is often seen as the solution but has very variable success and has yet to be consistently proven. Chemical control of wilding conifers using different application methods has been trialled in New Zealand for the past 30 years with mixed results. Despite this research, the scientific literature contains little information on sprayed or aerially applied herbicides that are effective in killing conifers. A study was commissioned in an attempt to develop new effective herbicide-based management strategies which will cause the death of five different species of wilding conifers (*Larix decidua, Pseudotsuga menziesii, Pinus contorta, Pinus mugo* and *Pinus nigra* ssp. *larico*) which occur as weeds within New Zealand.

CURRENT STATUS AND FORECAST OF ALIEN PLANT SPECIES COVERAGE ON SUB-ANTARCTIC MARION ISLAND

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Species have been intentionally or accidentally moved outside their natural geographic ranges, often posing serious threats to the new areas to which they have been introduced. Despite its cold climate and remote location, sub-Antarctic Marion Island has 18 established alien vascular plant species. The changing climate of Marion Island is predicted to influence the establishment and spread of alien plant species on the island. To date, surveys of the island's alien plant species have not been spatially comprehensive or explicit at a fine resolution. Here, we provide the first spatially explicit, comprehensive assessment of the current distribution of all alien plants species on Marion Island. A combination of ad hoc and systematic surveys were used to examine the abundance and occupancy of each species across the island. We found that species such as *Stellaria media* have not expanded their range in 31 years. However, species such as *Sagina procumbens* have spread widely in 8 years. Hotspots of invasion have been identified and their environmental characteristics determined, so providing a means to understand the likely future spread of species.

PERFORMANCE OF INVASIVE SHRUB *LANTANA CAMARA* L. IN TWO OF ITS INVADED RANGES: INDIA AND SOUTH AFRICA

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Ecosystems around the world are invaded by a variety of exotic plant species, many of which are shared between continents. A common assumption in many studies is that invasive species perform better in their introduced ranges than in their native ranges. A comparative approach has often been useful in helping to understand what makes invasive species so successful. Demographic comparisons on a biogeographical scale cannot distinguish between phenotypic plasticity and genetic differentiation; however they are crucial to the understanding of plant invasions in general. In this study we evaluated the performance (in terms of growth and reproductive traits) of *L. camara* populations, one of the world's worst invaders, in two of its invaded ranges *viz.* India and South Africa. Comparative field observations of the performance of lantana in these invaded ranges revealed that the Indian populations were more vigorous than those from South Africa in terms of several vegetative and reproductive traits. Differences in performance of populations in the different invaded ranges suggest that management strategies might also need to differ between invaded ranges. A natural extension to the study and a focus for future research is on genetic differentiation between and within the two continents.

EARLY DETECTION OF INVASIVE ALIEN PLANTS IN KWAZULU-NATAL (KZN), SOUTH AFRICA

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The poster will introduce the new Early Detection and Evaluation of Emerging Invasive Alien Plants Programme (EDRR), which is funded by the Working for Water Campaign of the Department of Water Affairs and Forestry of the South African Government. It is positioned in the South African National Biodiversity Institute so as to obtain the relevant technical expertise and resources, and because the focus of the EDRR programme is on protecting biodiversity from invasive alien plants. The main aims of the programme are to detect and identify *emerging* invasive alien plants, and prepare and initiate implementation of appropriate management plans to reduce the threat of these plants to biodiversity. Although the programme is currently operational in three provinces (Gauteng, Western Cape and KwaZulu-Natal (KZN)), this poster will introduce the KZN EDRR team, outline how the programme operates in this province, emphasize activities to take place during 2009, and highlight the short-term and long-term goals of the programme.

CLIMATIC EFFECTS ON PERFORMANCE OF POTENTIALLY INVASIVE CULTIVARS OF ENGLISH HOLLY (*ILEX AQUIFOLIUM* L.)

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Plant invasions are often linked to garden cultivars that have developed some local adaptations. Garden plants can be more frost tolerant and often have more abundant fruiting, which may promote naturalization. This topic is investigated in the evergreen shrub *Ilex aquifolium* L. which recently has expanded its eastern distribution margin in central and northern Europe. This change might be due to milder winter temperatures, but it could also be caused by naturalized garden plants. A transplant experiment, with two cultivars and one native provenance planted at 1 and 10 m distances from native adult *I. aquifolium* plants, was set up in 18 Danish forests to test if native and ornamental genotypes respond differently to dispersal and establishment limitations. Factors measured were survival, growth and leaf miner abundance. In addition, frost tolerance of the three genotypes was investigated in the laboratory. Transplant survival, growth and leaf miner abundance were higher within the native range and in transplants close to adult plants. Frost tolerance was significantly higher in one cultivar. Since the transplants performed worse outside the native range, it is questionable how fast these new naturalized populations of *I. aquifolium* will establish and spread.

ESTABLISHING A RESEARCH – MANAGEMENT INTERFACE TO IMPROVE INVASIVE ALIEN SPECIES MANAGEMENT IN THE GREATER CAPE FLORISTIC REGION

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Managers dealing with invasive species are facing with escalating and increasingly complex problems. Many of the challenges faced by managers require the attention of researchers, but the interface between research and management is sadly lacking. Despite major advances in some aspects of invasion biology these advances are lacking effective translation to management. This lack of interface between researchers and managers is resulting in a situation described by Philip Hulme as *"winning the science battles but losing the conservation war*". Sustainable management depends on sensible and scientifically sound actions. Managing invasive species involves a multi-faceted approach and research in invasion ecology needs to engage with a suite of disciplines to facilitate effective transfer of key results to implementation. This poster illustrates how the relevant stakeholders plan to establish a research-management interface in the Greater Cape Floristic Region.

GENOME-WIDE PROCESSES IN *ACACIA*: INSIGHTS FROM FLOW CYTOMETRY

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Whole genome processes such as polyploidy, hybridization and genome expansion / contraction have been shown to have profound influences on invasiveness, but these aspects are often overlooked. We used flow cytometry to address the presence of genome-wide processes during invasions of *Acacia* species (Fabaceae) in South Africa. *Acacia* is an interesting model genus because it encompasses the most invasive plants in South Africa, plants that have naturalized but not yet become invasive, and (in the genus *sensu lato*) a significant number of native species. Considerable variation (more than 1.8-fold) in monoploid genome size was detected, however, there was no clear pattern between invasive and native species. Intraspecific ploidy heterogeneity occurred in invasive *A. mearnsii*, but variation seen in putative samples of *A. saligna* from Australia could be ascribed to field mis-identification of morphologically similar *A. rostellifera* and *A. blakelyi*. Collectively, our study illustrates the need to integrate genome-wide processes into mainstream analytical methods used in plant invasion biology.

PARTHENIUM WEED (*PARTHENIUM HYSTEROPHORUS* L.) RESEARCH IN ETHIOPIA: INVESTIGATION OF PATHOGENS AS BIOCONTROL AGENTS

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Surveys to determine the presence and distribution of pathogens associated with parthenium and further evaluation of the pathogens found as potential biocontrol agents were carried out in Ethiopia since 1998. Several fungal isolates of the genus *Helminthosporium, Phoma, Curvularia, Chaetomium, Alternaria, and Eurotium* were obtained from the seeds and other plant parts. However, all of the isolates tested were non-pathogenic except *Helminthosporium* isolates. The two most important diseases were the rust, *Puccinia abrupta* var. *partheniicola* and the phyllody, caused by a phytoplasma belonging to the species "*Candidatus Phytoplasma aurantifolia*". Host specificity tests revealed that the rust, *P. abrupta*, only sporulates on parthenium while the phyllody infected parthenium, groundnut, sesame, grass pea, lentil, and chickpea. Suspected insect vectors were examined for phytoplasma infection by means of Polymerase Chain Reaction (PCR). The successful acquisition of phytoplasma's by the leafhopper, *Orosius cellulosus* Lindberg (Cicadellidae), was determined by molecular detection of phytoplasma. Phytoplasma was also detected from a single bait plant after feeding by the leafhopper. Sequencing data from phytoplasma obtained from parthenium and the above mentioned crops was identical with

sequence identities > 98%. The rust was commonly found at 1400 – 2500 m.a.s.l. with disease incidence up to 100% in some locations while phyllody was observed in low to mid-altitude regions (900 – 2300 m.a.s.l.) of Ethiopia.

WEED RISK ASSESSMENT: A CRUCIAL TOOL IN THE MANAGEMENT OF BIOLOGICAL INVASIONS

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Everyday new species arrive in South Africa from other parts of the world and it is very important to determine their invasive potential prior to their introduction. Adapting the Australian Weed Risk Assessment model (AWR) for use in South Africa has resulted in a number of species being prohibited from importation. The Agricultural Pest Act supported by CARA and the National Environmental Management: Biodiversity Act focus on preventing the introduction and spread of invasive alien species. The Directorate Plant Health, as a member of the IPPC, develops import conditions that protect South Africa's natural environment from the introduction of exotic pests including weeds by assessing the risk associated with importation of plants and plants products. This poster discusses issues relating to the effective implementation of biosecurity measures in South Africa.

CLOSING IN ON THE ENEMY: AN OVERVIEW OF GREATER WELLINGTON REGIONAL COUNCIL'S DELIMITING PROGRAMME FOR TARGETTED PEST PLANTS IN THE WELLINGTON REGION

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Under Greater Wellington's Regional Pest management Strategy 2002, eleven species have been targeted for eradication from the Wellington Region. Due to a large landmass and the potential of areas to harbour pest plants, prioritising areas to survey is a key step in making progress towards eradication. Until 2004 methods to find sites included random surveys, general surveys and vast amounts of publicity. Delimiting or surveying around bird and wind species sites was not introduced until 2004. The poster shows graphically the huge spike in new sites and the success of the eradication programme for 7 of these species: *Solanum mauritanium*, *Araujia sericifera*, *Celastrus orbiculatus, Andredera cordifolia, Passiflora caerulea, Valissneria* spp*., and Pennisetum macrourum.*

INFLUENCE OF *ACACIA MEARNSII* INAVSION ON SOIL PROPERTIES IN THE KOUGA MOUNTAINS, EASTERN CAPE, SOUTH AFRICA

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The invasion of *Acacia mearnsii* in the Kouga catchment, South Africa, has various negative impacts on the ecosystem. These impacts include; reduced species richness, increased water use, increased nutrients and increased N cycling rates. The native fynbos vegetation has adapted to the acidic nutrient poor soils and Mediterranean climate of the Kouga Mountains. Fynbos is currently, however, being out competed by the *Acacia mearnsii*, due to its ability to fix nitrogen thereby enriching the soil. The invaded sections of the valley bottoms and lower hill slopes are characterized by an almost complete monoculture of *Acacia mearnsii*, with the very few fynbos species still present. The Department: Water and Environmental Affairs sponsored Working for Water programme started clearing *Acacia mearnsii* in 1998. Cleared sites have remained bare for long periods, indicating that soil properties are not favourable for indigenous propagule re-establishment. This study aims to assess how *Acacia mearnsii* clearing affects fynbos recovery through its impact on soils. It focuses on chemical and physical properties of the soils and relates these to the potential or suitability for germination and seedling establishment of fynbos. Erosion measurements will also be used to assess the influence of altered vegetation cover on soil erosion.

SOMETHING IN THE WAY YOU MOVE: DISPERSAL PATHWAYS AFFECT INVASION SUCCESS

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Biological invasions are caused by human-mediated extra-range expansion. Unlike natural extra-range dispersal, this form of range expansion is often the result of multiple introductions from multiple sources to multiple locations. The processes and opportunities that result in propagules moving from one area to another can be used more broadly to differentiate all types of extra-range dispersal. By examining key properties of dispersal pathways (notably propagule pressure, genetic diversity and the potential for simultaneous movement of coevolved species), the establishment and evolutionary trajectories of extrarange dispersal can be better understood. Moreover, elucidation of the mechanistic properties of dispersal pathways is crucial for scientists and managers who wish to assist, minimise or prevent future movements of organisms.

EVALUATING THE INVASIVENESS OF *ACACIA PARADOXA* IN SOUTH AFRICA

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Acacia paradoxa DC (Kangaroo Thorn) is known to occur in South Africa only on the Northern Slopes of Devil's Peak, Table Mountain National Park, and is currently restricted to a small population (~ 11,000 plants over ~ 220 ha). The species is listed under the Conservation of Agricultural Resources Act as a category one invasive plant and, until 2008, was being managed as part of Working for Water general alien clearing operations. The distribution is highly clumped, and at a local scale it has formed thick stands of up to 20 plants m^{-2}. Using a bioclimatic model, we predict that it has a large potential distribution in South Africa, especially along the southern coast. We confirmed the categorisation of *A. paradoxa* as a potential landscape transformer that requires immediate control by conducting a formal risk assessment. However, the population appears to be spreading slowly, and, while there is a significant seed-bank in some places (~1000 m^{-2}), this is largely restricted to below the canopy of existing plants. Therefore, the population has not and likely will not rapidly spread in area, and so containment is feasible. We provide some management insights, in particular annual dedicated follow ups are required as plants can reproduce after one year and **standard** clearing operations have missed flowering plants.

ORAL ABSTRACTS SORTED BY FIRST AUTHOR WITH REFERENCE TO THE TIME OF PRESENTATION		
SCHEDULE	**1ST AUTHOR**	**TITLE**
Thur 14:45	**Adamowski**	ORNAMENTAL NON-WOODY PLANTS THAT THREATEN THE NATIVE FLORA IN BIAŁOWIEŻA FOREST (NE POLAND)
Thur 10:15	**Akpabey**	PRELIMINARY ASSESSMENT OF THE SOCIAL, ECONOMIC AND ENVIRONMENTAL IMPACTS OF WATER HYACINTH, *EICHHORNIA CRASSIPES* (MART) SOLMS-LAUBACH (PONTEDERIACEAE) IN THE RIVER OTI ARM OF THE VOLTA LAKE, GHANA
Tue 09:15	**Alexander**	GLOBAL PATTERNS OF PLANT INVASION ALONG ALTITUDINAL GRADIENTS
Thur 09:30	**Ansari**	CATTLE GRAZING REDUCES FIRE HAZARD FROM INVASIVE GUINEA GRASS ON A MILITARY TRAINING AREA AND ITS NEIGHBORING RESIDENTIAL COMMUNITY IN HAWAII
Tue 11:30	**Ansari**	LIFE HISTORY VARIATION OF THE INTRODUCED WEED *VERBASCUM THAPSUS* ALONG AN ELEVATIONAL GRADIENT OF MAUNA KEA MOUNTAIN IN HAWAII
Tue 10:00	**Arévalo**	DO ANTHROPOGENIC CORRIDORS HOMOGENIZE PLANT COMMUNITIES AT A LOCAL SCALE? A CASE STUDY IN TENERIFE (CANARY ISLANDS)
Tue 16:00	**Bar**	MANAGEMENT TOOLS FOR CONTROLLING THE SEEDBANK OF INVASIVE PLANTS –THE CASE OF *ACACIA SALIGNA*
Mon 11:00	**Baret**	MANAGEMENT STRATEGY OF INVASIVE ALIEN SPECIES ON RÉUNION ISLAND (MASCARENE ARCHIPELAGO, INDIAN OCEAN)
Tue 10:15	**Barnaud**	PATTERNS AND PATHWAYS OF WEED INVASION: EVIDENCE FROM THE SPATIAL GENETIC STRUCTURE OF *RAPHANUS RAPHANISTRUM*
Mon 16:30	**Bedada**	ASSESSMENT OF HERBIVOROUS INSECTS ASSOCIATED WITH INVASIVE PROSOPIS (*PROSOPIS JULIFLORA*) IN AMIBARA DISTRICT, AFAR REGIONAL STATE, ETHIOPIA
Tue 11:15	**Beukes**	CLASSIFYING SPATIAL DISTRIBUTION OF WOODY ALIENS IN SOUTH AFRICA, SWAZILAND AND LESOTHO: QUANTIFYING THE RELATIONSHIP BETWEEN WOODY ALIEN SPECIES AND THE ENVIRONMENT USING THE SAPIA DATASET
Tue 10:15	**Blanchard**	BIOFUELS - FUELLING BIOLOGICAL INVASIONS?
Thur 09:15	**Braack**	THE COSTS OF MANAGING *CAMPULOCLINIUM MACROCEPHALUM* IN THE PROVINCE OF KWAZULU NATAL, SOUTH AFRICA
Tue 14:30	**Brock**	INVASION OF *PENNISETUM CILIARE* AND ITS CONTROL IN THE DESERTS OF SOUTHWESTERN NORTH AMERICA
Thur 14:30	**Brundu**	WOODY ALIEN INVADERS IN ITALY: DISTRIBUTION AND THREATS
Tue 16:15	**Brunel**	A CODE OF CONDUCT ON HORTICULTURE AND INVASIVE ALIEN PLANTS FOR EUROPE
Mon 16:15	**Bustamante**	PINES INVASION IN CHILE: PATTERNS, PROCESSES AND ECOLOGICAL CONSEQUENCES
Thur 14:45	**Byenkya**	EVALUATION OF CONTROL STRATEGIES FOR *CYMBOPOGON NARDUS* AND THEIR IMPACT ON PLANT DIVERSITY IN THE RANGELANDS OF UGANDA
Thur 10:15	**Byrne**	MANAGEMENT OF WATER HYACINTH IN SOUTH AFRICA: OPTIONS FOR BIOCONTROL AND IPM
Tue 12:00	**Carvalho**	A HYPERSPECTRAL REMOTE SENSING APPROACH TO STUDY THE BIOCHEMICAL PROPERTIES OF *SENECIO INAEQUIDENS* AND *JACOBAEA VULGARIS*
Tue 11:15	**Chiarucci**	SPATIAL DETERMINANTS AND DIVERSITY PARTITIONING OF ALIEN AND NATIVE SPECIES ALONG ROADSIDE ELEVATIONAL GRADIENTS IN TENERIFE, CANARY ISLANDS
Tue 16:45	**Chrobock**	HUMAN-MEDIATED SELECTION IN ORNAMENTAL PLANT SPECIES CAN INCREASE THEIR POTENTIAL INVASIVENESS
Mon 10:15	**Coetzee**	BETTER THE DEVIL YOU KNOW THAN THE DEVIL YOU DON'T: SUBMERGED AQUATIC WEED INVASIONS IN SOUTH AFRICA
Thur 10:15	**Coutts**	DO PLANTS HAVE COMMON DRIVERS OF SPREAD, AND CAN WE USE THEM TO AID MANAGEMENT?
Tue 11:45	**Cuneo**	TACKLING THE NEXT GENERATION OF WOODY WEEDS: ECOLOGY AND MANAGEMENT OF INVASIVE AFRICAN OLIVE IN EASTERN AUSTRALIA
Mon 16:00	**Darin**	PRIORITIZING WEED POPULATIONS FOR ERADICATION AT A REGIONAL LEVEL
Thur 10:00	**De Lange**	ASSESSING THE COSTS AND BENEFITS OF THE BIOLOGICAL CONTROL RESEARCH PROGRAMME ON INVASIVE PLANTS IN SOUTH AFRICA
Tue 14:45	**Dechoum**	CONTROL OF INVASIVE ALIEN PLANTS IN PROTECTED AREAS IN BRAZIL
Mon 10:00	**Den Breeÿen**	ROLE OF FUNGAL ENDOPHYTES IN PROMOTING INVASIVENESS OF *ACACIA* SPECIES IN SOUTH AFRICA
Mon 12:00	**Douwes**	INVASIVE ALIEN PLANT CONTROL - INTERVENTIONS IN DURBAN, SOUTH AFRICA
Mon 16:15	**Downey**	THE ROLE OF BIRDS IN ALIEN PLANT INVASIONS AND NATIVE PLANT DECLINE: CONSEQUENCES FOR BIODIVERSITY, CONSERVATION AND REVEGETATION

Tue 15:00	**Downey**	EVALUATING ALIEN PLANT MANGEMENT ACROSS PROTECTED AREAS IN NEW SOUTH WALES, AUSTRALIA
Mon 09:15	**Esler**	HOW WIDE IS THE "KNOWING-DOING" GAP IN INVASION BIOLOGY?
Tue 09:15	**Fennell**	MOLECULAR ECOLOGY OF *GUNNERA TINCTORIA* INVASIONS
Thur 14:30	**Fessehaie**	INVASIVE ALIEN PLANT SPECIES IN ETHIOPIA: STATUS AND MANAGEMENT
Tue 14:30	**Fierro**	EXOTIC AND NATIVE TREE LITTER EFFECTS ON SOIL PROPERTIES IN TWO CONTRASTING SITES IN THE IBERIAN PENINSULA
Tue 14:30	**Foxcroft**	KEEPING UNWANTED NEIGHBOURS OUT: PROTECTED AREA BOUNDARIES AS BARRIERS TO ALIEN PLANT INVASIONS
Mon 14:30	**Gaertner**	FACT OR FICTION: SPECIES RICHNESS DECLINE AFTER ALIEN INVASIONS - A META-ANALYSIS
Mon 11:15	**Geldenhuys**	REHABILITATION OF NATURAL FOREST THROUGH INVADER PLANT STANDS: CONCEPTS, PROCESS AND PRACTICE
Thur 10:00	**Gerber**	NON-CHEMICAL MANAGEMENT METHODS AGAINST INVASIVE KNOTWEEDS (*FALLOPIA* SPP.) – IMPACT ON TARGET WEED AND RECOVERY OF NATIVE BIODIVERSITY
Tue 11:30	**Godoy**	PHENOTYPIC PLASTICITY OF INVASIVE ALIEN PLANT SPECIES IN SPAIN: A BROAD PHYLOGENETIC COMPARISON
Tue 15:15	**Grice**	ECOLOGICAL BASIS OF GRASS INVASIONS IN AUSTRALIA
Tue 09:30	**Haider**	DISTRIBUTION PATTERNS OF MEDITERRANEAN AND TEMPERATE NON-NATIVE SPECIES IN MOUNTAIN REGIONS: COMPARISONS BETWEEN SWITZERLAND AND TENERIFE
Tue 11:15	**Harris**	COMPARING THE REPRODUCTIVE OUTPUT OF INTRODUCED PLANTS IN THEIR NATIVE VERSUS INTRODUCED RANGES: DO MORE OR LARGER SEEDS CONTRIBUTE TO INVASION SUCCESS?
Mon 15:00	**Hejda**	IMPACT OF ALIEN PLANTS ON SPECIES DIVERSITY OF INVADED COMMUNITIES IS DETERMINED BY DIFFERENCES IN VIGOUR OF THE INVADER AND NATIVE DOMINANT
Thur 09:30	**Henderson**	SAPIA AND RANGE EXPANSION OF SOME INVASIVE SPECIES IN SOUTH AFRICA
Tue 11:45	**Howison O**	USING REMOTE SENSING AND GIS TO MAP INVASIVE ALIEN PLANTS AND ASSESS IMPACTS ON BIODIVERSITY: A STUDY ON *CHROMOLAENA ODORATA* IN KWAZULU-NATAL, SOUTH AFRICA
Tue 16:30	**Howison R**	THE EFFECT OF THE INVASIVE WEED *CHROMOLAENA ODORATA* ON THE CRITICALLY ENDANGERED BLACK RHINO IN HLUHLUWE-IMFOLOZI PARK, SOUTH AFRICA
Thur 10:00	**Hui**	IDENTIFYING THE OPTIMAL SAMPLING SCHEME AND EFFORT FOR MONITORING INVASIVE ALIEN PLANTS
Tue 16:15	**Impson**	ASSESSING THE BENEFITS OF SEED REDUCING BIOLOGICAL CONTROL AGENTS FOR PERENNIAL INVASIVE PLANTS
Tue 10:00	**Jahodová**	MOLECULAR ECOLOGY OF INVASIVE *HERACLEUM MANTEGAZZIANUM* ACROSS EUROPEAN CONTINENT AND IN THE NATIVE CAUCASUS
Tue 10:15	**Jakobs**	NATURALIZED AND INVASIVE PLANT DISTRIBUTIONS ALONG ALTITUDINAL TRANSECTS IN HAWAI'I
Tue 11:45	**Jakobs**	ADAPTIVE EVOLUTION AND PLASTICITY DEFINE THE DISTRIBUTION OF EUROPEAN WEEDS ACROSS ELEVATION GRADIENTS IN HAWAI'I
Mon 11:00	**Khena**	RIPARIAN RESTORATION: DEVELOPING BEST MANAGEMENT PRACTICES
Mon 09:30	**Kotanen**	ESCAPE FROM ENEMIES: THE ROLE OF RELATIVES
Thur 09:45	**Kotzé**	SOUTH AFRICAN INVASIVE ALIEN PLANT SURVEY
Mon 11:45	**Krug**	TOWARDS MORE EFFICIENT MANAGEMENT OF INVASIVE ALIEN PLANTS IN THE CAPE FLORISTIC REGION: OPTIMISING THE PRIORITIES
Thur 11:00	**Lamoureaux**	*NASSELLA TRICHOTOMA*: POTENTIAL GLOBAL DISTRIBUTION UNDER FUTURE CLIMATES
Mon 11:15	**LaRosa**	PACIFIC INVASIVES PARTNERSHIP: A SUCCESSFUL MODEL FOR GLOBAL INVASIVE SPECIES COORDINATION AND MANAGEMENT
Mon 09:30	**LaRosa**	MUCH ADO ABOUT BIOCONTROL: OUTREACH TO A RISK AVERSE PUBLIC
Tue 15:15	**Le Maitre**	CURRENT AND POTENTIAL INVASIONS BY *PROSOPIS* SPECIES IN SOUTH AFRICA: DEVELOPMENT OF A MODEL FOR ASSESSING THE IMPACTS ON GROUNDWATER RESOURCES
Tue 15:00	**Le Roux**	GENETIC DIVERSITY OF THE GLOBALLY INVASIVE GRASS *PENNISETUM SETACEUM*
Thur 11:00	**Madamombe-Manduna**	DOES COEVOLUTION OF WEEDS AND CROPS PREDICT MIGRATION SUCCESS? A COMPARATIVE STUDY OF MAIZE FIELD WEEDS FROM MEXICO AND ZIMBABWE
Tue 16:45	**Makarick**	INVASIVE PLANT SPECIES MANAGEMENT IN THE GRAND CANYON NATIONAL PARK: PAST CHALLENGES, CURRENT EFFORTS, AND FUTURE DIRECTION

Tue 09:45	**Mallett-Johnson**	IMPLEMENTING BIOSECURITY AWARENESS ON DECLARED PLANTS AND OTHER INVASIVE WEED SPECIES: DEPARTMENTAL TRAINING
Mon 11:45	**Marchante**	ECOSYSTEM RESTORATION AFTER REMOVAL OF THE N_2-FIXING INVASIVE *ACACIA LONGIFOLIA*
Thur 11:15	**Martin**	DISTRIBUTION MODELLING AS A TOOL FOR PREDICTING THE DISTRIBUTIONS OF POTENTIALLY INVASIVE SUBMERGED AQUATIC WEEDS IN SOUTH AFRICA
Thur 09:45	**Martins**	EFFECT OF FIRE ON REPRODUCTIVE BEHAVIOR OF *MELINIS MINUTIFLORA* (MOLASSES GRASS) IN THE BRAZILIAN CERRADO
Tue 15:00	**Masfaraud**	COMPETITIVE ABILITY OF *SOLIDAGO CANADENSIS* L. IN SPONTANEOUS SUCCESSIONS OF POLLUTED WASTELANDS
Tue 16:15	**Mashope**	MANAGEMENT OF AN EMERGING WEED: *CYLINDROPUNTIA TUNICATA* IN GRAFF-REINET
Mon 11:30	**McAlpine**	USING NATIVE PLANT SUCCESSION TO MANAGE WEEDS IN NEW ZEALAND
Mon 14:45	**McClay**	EVALUATION AND MODIFICATION OF THE AUSTRALIAN WEED RISK ASSESSMENT SYSTEM FOR USE AS A PREINTRODUCTION SCREEN IN CANADA
Tue 11:30	**McConnachie A**	CURRENT AND POTENTIAL GEOGRAPHICAL DISTRIBUTION OF PARTHENIUM WEED IN EASTERN AND SOUTHERN AFRICA
Mon 10:00	**Michael**	CHANGES IN WEED SPECTRUM IN THE SOUTHERN AGRICULTURAL REGION OF AUSTRALIA OVER THE PAST 10 YEARS
Tue 11:00	**Molofsky**	EVOLUTION OF RANGE MARGINS IN INVASIVE SPECIES
Tue 16:30	**Montgomery**	SA NURSERIES PARTNERSHIP PROGRAMME
Tue 16:45	**Moravcová**	REPRODUCTIVE CHARACTERISTICS OF NATURALIZED PLANTS AS A TOOL FOR PREDICTION OF INVASIVENESS
Thur 11:45	**Moverley**	SIMULATING WEED SPREAD AND CONTROL STRATEGIES: A SIMULATION MODEL OF RHAMNUS ALATERNUS ON RANGITOTO ISLAND
Tue 16:00	**Mwihomeka**	KNOWLEDGE GAPS ON INVASION POTENTIAL OF *CASUARINA CUNNINGHAMIANA* IN RIPARIAN HABITATS OF LIMPOPO PROVINCE, SOUTH AFRICA
Thur 15:00	**Nkandu**	COPING WITH THE INVASION OF THE KAFUE RIVER FLOODPLAIN IN SOUTHERN ZAMBIA BY THE INVASIVE PLANT *MIMOSA PIGRA*
Tue 16:00	**Nkya**	A TANZANIAN PERSPECTIVE ON ALIEN PLANT CONTROL: THE IKORONGO GRUMETI GAME RESERVES PILOT ALIEN PLANT CONTROL PROGRAM
Mon 16:45	**Norgrove**	IMPACT OF *IMPERATA CYLINDRICA* ON GRANIVORY AND SEEDLING DESTRUCTION IN MAIZE FIELDS IN CAMEROON
Tue 09:30	**Novak**	ALLOZYME DIVERSITY IN NATIVE AND INVASIVE POPULATIONS OF MEDUSAHEAD (*TAENIATHERUM CAPUT-MEDUSAE*)
Thur 09:45	**Ntakyo**	ECONOMIC IMPACT OF *CYMBOPOGON NARDUS* ON LIVELIHOODS IN PASTORAL SYSTEMS OF UGANDA
Mon 16:00	**Nuñez**	PINACEAE INVASION IN ARGENTINA: GENERAL PATTERNS AND FACTORS CONTROLLING THEIR SPREAD
Mon 14:45	**Paterson**	THE IMPACT OF *PERESKIA ACULEATA* MILLER (CACTACEAE) ON NATIVE BIODIVERSITY AND MEASURING THE SUCCESS OF BIOLOGICAL CONTROL
Tue 09:45	**Pauchard**	CONSISTENT NEGATIVE RELATIONSHIP BETWEEN NON-NATIVE PLANT SPECIES AND ELEVATION IN SOUTH-CENTRAL CHILE
Tue 11:00	**Phiri**	CO-OCCURRENCE: ALIEN AND INDIGENOUS PLANT SPECIES ALONG RIVERS ON MARION ISLAND
Mon 11:15	**Procheş**	SPATIAL RELATIONSHIPS BETWEEN ALIEN AND INDIGENOUS PLANTS
Mon 14:45	**Raal**	SCATTERED WILDING CONIFER SURVEILLANCE, CONTROL AND MONITORING IN THE OTAGO CONSERVANCY, NEW ZEALAND
Tue 14:45	**Rahlao**	FOUNTAIN GRASS (*PENNISETUM SETACEUM*) PERFORMANCE ALONG THE ENVIRONMENTAL GRADIENT IN SOUTH AFRICA
Tue 14:45	**Ramaswami**	DISTRIBUTION AND SPREAD OF THE ALIEN INVASIVE PLANT *LANTANA CAMARA* IN A DRY TROPICAL FOREST PLOT AT MUDUMALAI, SOUTHERN INDIA
Mon 12:00	**Reid**	DOES INVASIVE PLANT MANAGEMENT AID THE RESTORATION OF NATURAL ECOSYSTEMS?
Mon 14:30	**Richardson**	TREES AS INVASIVE ALIENS WORLD-WIDE: HOW DO PINES FIT IN?
Mon11:30	**Rodger**	DOES SELF FERTILISATION CONTRIBUTE TO INVASION? A CASE STUDY ON *LILIUM FORMOSANUM* IN SOUTH AFRICA
Mon 09:15	**Rodriguez-Tunon**	CLIMATE CHANGE IMPACTS ON A NATIVE AND A NON-NATIVE INVADER
Mon 11:30	**Roura-Pascual**	TOWARDS MORE EFFICIENT MANAGEMENT OF INVASIVE ALIEN PLANTS IN THE CAPE FLORISTIC REGION: IDENTIFYING PRIORITY AREAS
Thur 12:00	**Saldaña**	CAN WE PREDICT THE INVASIVENESS OF THE AUSTRALIAN *ACACIA* SPECIES ON THE BASIS OF LIFE-HISTORY TRAITS AND NATIVE DISTRIBUTION RANGES?

Tue 11:30	**Santos**	MODELLING OF SPATIAL DISTRIBUTION OF ALIEN PLANT SPECIES: THE CASE STUDY OF *ACACIA* IN PORTUGAL
Mon 09:45	**Schneider**	A SURVEY OF AUSTRALIAN FARMERS ON THE TOPIC OF *NASSELLA TRICHOTOMA* PREVENTION MANAGEMENT
Mon 11:45	**Shaw**	PLANT INVASION AS A DRIVER OF FUNCTIONAL DIVERSITY: SOUTHERN OCEAN ISLANDS AS A CASE STUDY
Tue 10:00	**Sheppard**	WEEDY POTENTIAL BIOFUEL CROPS IN AUSTRALIA: REGULATORY AND RISK ASSESSMENT PROCESSES ASSOCIATED WITH CROSS SECTOR RISKS
Mon 09:45	**Sheppard**	ENEMY ESCAPE MAY INCREASE OPTIMAL FLOWERING SIZE IN MONOCARPIC INVASIVE PLANTS
Mon 15:00	**Sissons**	THE CANADIAN PERSPECTIVE: HARMONIZING RISK ASSESSMENT FOR WEEDINESS AND INVASIVENESS FOR PLANTS WITH NOVEL TRAITS (LIVING MODIFIED ORGANISMS) AND PLANTS AS PESTS
Tue 16:30	**Skálová**	SEED GERMINATION AND SEEDLING TRAITS AS DETERMINANTS OF INVASION SUCCESS: COMPARISON OF INVASIVE AND NATIVE *IMPATIENS* SPECIES
Tue 09:15	**Spear**	CHALLENGES TO THE DEVELOPMENT OF A GLOBAL INDICATOR FOR INVASIVE ALIEN PLANT SPECIES
Mon 10:15	**Spier Estate**	TACKLING PLANT INVADERS AT SPIER WINE ESTATE IN THE WESTERN CAPE
Tue 12:00	**Suda**	APPLICATIONS OF FLOW CYTOMETRY TO PLANT INVASION BIOLOGY
Mon 15:15	**Taye**	PARTHENIUM WEED (*PARTHENIUM HYSTEROPHORUS* L.) IN ETHIOPIA: IMPACTS ON FOOD PRODUCTION, PLANT BIODIVERSITY AND HUMAN HEALTH
Tue 16:15	**Terblanche**	TACKLING THE THREAT HEAD ON: INVASIVE ALIEN SPECIES MANAGEMENT IN EZEMVELO KZN WILDLIFE, SOUTH AFRICA
Mon 09:45	**Thiébaut**	GLOBAL WARMING AND RANGE EXPANSION OF INVASIVE AQUATIC SPECIES
Tue 09:45	**Thompson**	THE PORT JACKSON 4 - A MOLECULAR ANALYSIS OF *ACACIA SALIGNA* ACROSS ITS INVASIVE RANGE
Mon 09:15	**Traveset**	IMPACT OF ALIEN PLANT INVADERS ON ISLAND POLLINATION NETWORKS
Tue 15:15	**Trueman**	GALAPAGOS NATIONAL PARK IS ON THE BRINK OF FURTHER PLANT INVASION
Mon 10:00	**Urgenson**	STAKEHOLDER PERCEPTION AND MANAGEMENT OF ALIEN INVASIVE PLANTS ON PRIVATE LAND IN THE WESTERN CAPE, SOUTH AFRICA
Mon 16:00	**Uys**	INVERTEBRATE FAUNAL EXCHANGE IN A MOSAIC OF MONTANE NATIVE AND ALIEN VEGETATION
Mon 12:00	**Van Kleunen**	DO FUNCTIONAL TRAITS OF PLANT SPECIES DETERMINE INVASIVENESS?
Mon 15:00	**Van Wilgen**	THE MANAGEMENT OF ALIEN CONIFERS IN SOUTH AFRICA: THREE CENTURIES OF BENEFITS, IMPACTS AND CONFLICT RESOLUTION
Mon 16:45	**Van Wyk**	EARLY DETECTION AS A COMPLEX ADAPTIVE SYSTEM: LESSONS FROM THE PAST AND IMPLICATIONS FOR PREPARING FOR IMMINENT ALIEN PLANT INVASIONS
Mon 10:15	**Veldtman**	HOLDING UP A MIRROR TO BIO-CONTROL: EMERGING ASSOCIATIONS ARE REFLECTED IN THE NATIVE RANGE
Thur 09:15	**Veldtman**	SCALE-AREA CURVES AS A TECHNIQUE TO TEST PREDICTED RANGE EXPANSION OF INVASIVE PLANTS
Mon 15:15	**Walshe**	A PRAGMATIC FRAMEWORK FOR ASSESSING INVASIVE SPECIES AND EMERGING DISEASE RISK
Mon 14:30	**Wearne**	CAN WE PREDICT WETLANDS AT RISK FROM INVASIVE MACROPHYTES IN NORTHERN AUSTRALIA?
Mon 16:30	**Wilson JR**	ASSESSING THE ERADICATION FEASIBILITY OF EMERGING *ACACIA* SPECIES
Mon 09:30	**Wilson PD**	WEEDS IN A WARMER WORLD: UNDERSTANDING THE IMPLICATIONS OF CLIMATE CHANGE FOR AUSTRALIA'S WEEDS
Thur 15:00	**Winter**	THE EUROPEAN LEGACY OF PLANT INVASIONS: WHY IS EUROPE SUFFERING LESS FROM INVASIONS THAN OTHER REGIONS?
Mon 11:00	**Winter**	LOSING UNIQUENESS: PLANT EXTINCTIONS AND INTRODUCTIONS LEAD TO PHYLOGENETIC AND TAXONOMIC HOMOGENIZATION OF THE EUROPEAN FLORA
Thur 09:30	**Wise**	TOWARDS THE SUSTAINABLE MANAGEMENT OF A CONFLICT OF INTEREST SPECIES: ESTABLISHING THE COSTS & BENEFITS OF PROSOPIS IN THE N. CAPE
Thur 09:15	**Wood**	INTEGRATED WEED MANAGEMENT: COMPARISON OF TWO CASES FROM SOUTH AFRICA
Tue 11:00	**Wu**	PATTERNS OF PLANT INVASIONS IN THE PRESERVES AND RECREATION AREAS OF SHEI-PA NATIONAL PARK IN TAIWAN
Mon 15:15	**Zenni**	PATTERNS AND PROGNOSIS OF PINE INVASIONS IN SUB-TROPICAL BRAZILIAN ECOSYSTEMS
Tue 09:30	**Ziller**	PROVIDING CAPACITY FOR THE MANAGEMENT OF INVASIVE ALIEN SPECIES: BUILDING PUBLIC POLICIES IN BRAZIL

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FIRST AUTHOR	**TITLE**
Alonso	COMPARISON OF LEAF DECOMPOSITION BETWEEN EXOTIC AND NATIVE TREES IN A FRESHWATER ECOSYSTEM
Anthony	PLENTY OF HEAT, WIND, AND WEEDS
Armstrong	HABITAT-RELATED MAPPING OF *GUNNERA* INVASIONS ON LOCAL AND REGIONAL SCALES
Beine	ASSESSMENT OF THE EFFECTIVENESS OF TWO CONTROL OPTIONS FOR *SENNA SPECTABILIS* IN BUDONGO FOREST RESERVE
Bezuidenhout	CLEAR FELL VS. REHABILITATION
Blanchard	ECOLOGICAL IMPACTS OF INVASIVE ALIEN PLANTS IN FYNBOS AND ITS RELATION TO FIRE: LESSONS FROM THE CAPE PENINSULA
Bossard	*SINAPSIS ALBA* SEED MEAL AS A PRE–EMERGENT CONTROL FOR FRENCH BROOM (*GENISTA MONSPESSULANA*) SEEDLINGS
Burley	LEARNING FROM THE PAST FOR AN UNCERTAIN FUTURE: A NEW BIOSECURITY APPROACH TO WEED MANAGEMENT
Calviño-Cancela	RISK OF INVASION BY *EUCALYPTUS GLOBULUS* IN NATIVE FORESTS AND IN PINE PLANTATIONS IN NW SPAIN
Calviño-Cancela	MONITORING INVASIVE PLANTS WITH AIRBORNE IMAGING SPECTROSCOPY IN TWO INSULAR NATIONAL PARKS IN SPAIN
Calviño-Cancela	SEED DISPERSAL OF NATIVE AND ALIEN PLANTS BY NATIVE AND ALIEN HERBIVORES (EMUS, KANGAROOS AND RABBITS)
Cheek	IDENTIFYING INVASIVE ALIEN PLANT SPECIES FOR RAPID RESPONSE PROGRAMMES
Chun	GENE FLOW AND POPULATION ADMIXTURE AS THE PRIMARY POST-INVASION EVOLUTIONARY PROCESSES IN COMMON RAGWEED POPULATIONS IN FRANCE
Cooper	ERADICATING PROCUMBENT PEARLWORT *SAGINA PROCUMBENS* ON GOUGH ISLAND, A WORLD HERITAGE SITE
D'Agata	THE ALIEN WOODY FLORA OF CRETE: PATHWAYS, ECOLOGY AND DISTRIBUTION
Downey	ALIEN PLANTS AND BIODIVERSITY: WHEN AND WHERE SHOULD WE UNDERTAKE CONTROL TO SAVE NATIVE SPECIES?
Durán	PHENOTYPIC VARIATION TRAITS IN THE INVASIVE PLANT *ESCHSCHOLZIA CALIFORNICA* (PAPAVERACEA) ACROSS ALTITUDINAL GRADIENTS CENTRAL CHILE
Feodorova	ANALYSIS OF CHENOPODIACEAE FAMILY OF STEPPES: INVASIONS OR NATURAL ASSOCIATIONS
Fried	TOWARD A FRAMEWORK TO IMPLEMENT EUROPEAN STRATEGY ON INVASIVE SPECIES IN FRANCE
Fried	A NEW SCREENING PROCESS FOR PRIORITIZING ALIEN PLANTS: FIRST RESULTS AND COMMENTS ON ITS APPLICATION ON 217 SPECIES IN FRANCE
Fried	CHANGES IN HABITAT PREFERENCES OF *HERACLEUM MANTEGAZZIANUM* (APIACEAE) DURING ITS INVASION IN FRANCE
Fuentes-Ramírez	SPECIES RICHNESS AND ABUNDANCE IN AN INVASION GRADIENT OF *ACACIA DEALBATA* (MIMOSACEAE) IN THE CENTRAL-SOUTH REGION OF CHILE
Geldenhuys	ALIEN PLANT INVASIONS IN FORESTS: A PROBLEM, OR A FACILITATION IN REHABILITATION OF NATURAL EVERGREEN FOREST?
González-Muñoz	DIFFERENCES IN EMERGENCE, SEEDLING MORTALITY AND MORPHOLOGY BETWEEN COEXISTING NATIVE AND ALIEN PLANT SPECIES UNDER DIFFERENT SOIL MOISTURE AND IRRADIANCE
Gous	WILDING CONIFER CONTROL IN THE SOUTH ISLAND OF NEW ZEALAND
Gouveia	WHAT TURNS A QUIET ALIEN INTO A POWERFUL INVADER? AN ASSESSMENT OF INVASIVE PLANT TRAITS
Jimenez	ALIEN AND NATIVE PLANTS IN PROTECTED NATURAL AREAS OF CHILE: PATTERNS ACROSS DISTURBANCE AND CLIMATIC GRADIENTS
Langdon	INVASION PATTERNS OF *PINUS CONTORTA* DOUGL. EX LOUD. IN THE CHILEAN PATAGONIA
Mandon-Dalger	PROMOTING GOOD PRACTICES IN THE USE OF ALTERNATIVE PLANTS
Manyama	RAPID RESPONSE TO EMERGING POPULATIONS OF POMPOM WEED, *CAMPULOCLINIUM MACRACEPHALUM* IN SOUTH AFRICA
McConnachie M	IDENTIFYING THE CONSTRAINTS AND OPPORTUNITIES FOR COST-EFFECTIVE RESTORATION OF INVADED FYNBOS AREAS
Mokotjomela	IS *SOLANUM MAURITIANUM* A PREFERENTIAL FOOD RESOURCE FOR NATIVE FRUGIVORES IN THE CAPE FLORISTIC REGION?
Moyo	EFFECT OF *ACACIA MEARNSII* (BLACK WATTLE) ON VEGETATION GROWTH IN TSOMO VALLEY OF THE EASTERN CAPE PROVINCE OF SOUTH AFRICA
Pretto	PLANT INVASIONS ON ITALIAN ISLANDS
Raal	THE ATTEMPTED CONTROL OF DENSE INFESTATIONS OF WILDING CONIFERS WITH AERIALLY APPLIED HERBICIDES IN NEW ZEALAND
Ramaswiela	CURRENT STATUS AND FORECAST OF ALIEN PLANT SPECIES COVERAGE ON SUB-ANTARCTIC MARION ISLAND
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