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FYNBOS FORUM MISSION

The Fynbos Forum is an affiliation of researchers, planners, managers, landowners and a range of other stake-holders that meets annually to discuss management issues and research results, and to formulate priorities for future research and conservation management actions required to ensure the conservation and sustainability of Fynbos ecosystems.

In order to achieve this goal, we undertake to assess biological resources, ensure institutional capacity and consider socio-economic issues.

PREVIOUS FYNBOS FORA

1987:	23-25 June, Saasveld School for Forestry, George
1988 :	27-29 July, Avalon Hotel, Montagu
1989 :	18-20 July, ClanWilliam
1990 :	1-2 October, The University of Stellenbosch, Die Ark, Stellenbosch
1991 :	11-13 August, Potberg, Dist Bredasdorp
1992 :	UCT, Cape Town
1993 :	16-17 March, Drosdy Museum, Swellendam
1994 :	13-15 July Bien Donné, Stellenbosch
1995 :	5-6 December, Mispah Youth Centre, Grabouw
1996 :	17-18 July, The Nekkies Dist. Worcester
1997 :	16-18 July, Genadendal
1998 :	22-24 April, Die Herberg, Waenhuiskrans, Arniston
1999 :	September, Rein's Nature Reserve, Albertinia
2000 :	7-9 June, Ganzekraal Holiday Resort & Conference Centre, Ganzekraal
2001 :	01-03 August, Calitzdorp Spa
2002 :	14-16 August, Goudini, Rawsonville
2003 :	05-08 August, Hartenbos Resort, Hartenbos, Dist. Mossel Bay
2004 :	10-13 August, Club Mykonos, Langebaan
2005 :	01-05 August, Pine Lodge, Port Elizabeth
2006 :	9-11 August, Goudini Spa, Rawsonville, Dist. Worcester

2007-10-12

1-3 August, Club Mykonos, Langebaan.

Interfaces 3-7 August 2008 Programme

Time	Sunday 3 August
15h00	Registration & Tea
18h00	Talk by Paul Britton: Drowning in a sea of Acronyms: are we comprehensible to "outsiders"?
19:00	Cocktail Dinner

Time	Monday 4 August
7h15	Late registration
8h00	Welcome: Julia Wood (Fynbos Forum) & Colleen Seymour (AZEF)
8h25	Opening Address: Karen Esler Interfaces: issues, opportunities, challenges and approaches to creative problem solving within, between and beyond the Fynbos Forum and Arid Zone Ecology Forum communities
8h50	Plenary Address: James Blignaut: Economic development in South Africa: Facing the reality of resource constraints and political schizophrenia
	Chair: Sue Milton
	Session 1: Ecosystem services
9h15	<i>Desmet, P.G.</i> Do market prices reflect the economic potential of grazing land in Namaqualand?
9h30	<i>Chisholm, R.</i> Fungibility and price elasticity of ecosystem services: The Fynbos as a case study
9h45	<i>Du Plessis-Reed, L.L.</i> The multifunctional nature of agricultural land: opportunities for conservation?
10h00	<i>Stanway, R.</i> Plant-pollinator interactions and implications of global change on web structure
10h15	<i>Seymour, C.</i> Biological control – always an ecosystem service?
10h30	Tea
	Chair: Colleen Seymour
11h15	Plenary Address: Jan Vlok Species Richness and Complexity in Transitional Zones
	Session 2: Making & breaking patterns
11h45	<i>Todd, S.</i> Why this place is the greatest interface. Determinants and drivers of vegetation pattern and process in a remarkably diverse region, the Bokkeveld Plateau.
12h00	<i>Koopman, R.</i> Fynbos midst the Strandveld
12h15	<i>Kongor, R.Y.</i> Response of Cape lowland vegetation to fragmentation: Clues from plant traits
12h30	<i>Kieck, M.</i> Bird Species and Feeding Guild Responses to Habitat Fragmentation
12h45	<i>Burgoyne, P.</i> The Mesemb Mapping Project: progress to date
13h00	Lunch

	Chair: Philip Desmet
	Session 3: Soils & Nutrients
14h00	<i>Ellis, F.</i> Soil variation in and between two heuweltjies in the Oudtshoorn area
14h15	<i>Hawkins, H.</i> "Nothing stays the same but if you're willing to play the game it's coming around again" Cluster roots and nutrients
14h30	<i>Hunter, R.</i> Do cluster roots of Proteaceae facilitate access to soil organic phosphate?
14H45	<i>Jordaan, M.</i> Soil biodiversity conservation: Ecotoxicology as a tool to investigate the effects of commercially important pesticides on selected soil organisms
15h00	Tea & Poster Session
	Chair: Annelise Vlok
	Session 4: Fire ecology
16h15	<i>Ballantyne, F.</i> Palaeoecology, Fire Management and Vegetation Dynamics in the Cederberg Wilderness Area
16h30	<i>Southey, D.</i> Exploring weather as a driver of large fires
16h45	<i>Rahlao, S.</i> Firing the interface! Fountain grass invasion could change fire regime in the Succulent Karoo and Fynbos interface
17h00	<i>Van Staden, H.</i> Effect of recurrent fires on subapline reseeding Proteaceae
17h15	<i>Pasquini, L.</i> Spreading the word: key elements of success of an awareness-raising campaign such as Firewise South Africa
19h00	Dinner

Time	Tuesday 5 August
7h15	Breakfast & late registration
	Chair: Nicky Allsopp
08h00	Plenary Address: Richard Cowling Is the diversity of the Cape flora unique?
08h25	Plenary Address: SAEON invited speaker- Anna Jacobsen Comparative Shrub Community Hydraulics in Mediterranean-type Ecosystems: Session 5: Water Water everywhere?
08h50	<i>Le Maitre, D.</i> The role of water in ecosystem services: flows, exchanges and interdependencies
09h05	<i>Pratt, R.B.</i> Using traits to predict vegetation response to climate change: An example from the chaparral
09h20	<i>West, A.</i> Patterns of drought sensitivity in the fynbos: Implications under changed climate?
09h35	<i>Kaseke, K.</i> The influence of soil properties on "non rainfall" atmospheric water input
10h00	Tea & depart on Field trips

Time	Wednesday 6 August
7h15	Late registration
	Chair: Pat Holmes
08h00	Plenary Address: Sue Milton Taking what we do to the people who use it Session 6: Conservation planning & partnerships
08h25	<i>Raimondo, D.</i> Identifying Key priorities for threatened plant conservation

08h40	<i>Gallo, J.</i> Lorax: How to estimate the conservation value and recommended action for every site in a region while still incorporating targets, connectivity, and solution sets	
08h55	<i>Curtis, O.</i> Linking research and management to conserve <i>Critically Endangered</i> Renosterveld in the Overberg	
09h10	<i>Purnell, K.</i> Mainstreaming C.A.P.E. Fine-scale Biodiversity Planning & Stewardship into CapeNature Business: A means to addressing Climate Change	
09h25	<i>Holness, S.</i> Parks in living landscapes: Moving protected areas beyond the fences	
09h40	<i>Jangle, R.</i> Bumpy, dusty road to voluntary conservation	
	Session 7: Time to contemplate tea	
09h55	<i>Koelle, B.</i> Take a walk on the wild side: Stewardship of wild rooibos as a climate change adaptation strategy	
10h10	<i>Malgas, R.</i> Throwing out the baby with the bathwater? Vulnerability of threatened plant species associated with “ecotypes” of wild rooibos (<i>Aspalathus linearis</i>)	
10h25	Tea	
	Chair: Karen Esler	Chair: Julia Wood
	Parallel Paper Session 8: Restoration	Parallel Paper Session 9: Urban Ecology
11h00	<i>Gaertner, M.</i> Sustainable conservation and self-sufficient restoration: The Flower Valley Story	<i>Davis, G.</i> Bouncing ideas about resilience in urban ecosystems
11h15	<i>Ruwanza, S.</i> Resource manipulation for control of alien invasive grasses in lowland vegetation of the CFR	<i>Dorse, C.</i> Halting the loss of irreplaceable Biodiversity in Cape Town. Challenges in Implementation
11h30	<i>Krüger, R.</i> Restoration interventions on post-mining landscapes in Namaqualand	<i>Patrickson, S.</i> Conserving Urban Biodiversity through global lesson-sharing between local governments
11h45	<i>Carrick, P.</i> Four years of the Namaqualand Restoration Initiative – Is there hope for a post-mining landscape on the west coast?	<i>Cumming, T.</i> Biodiversity and Property Rates: A Tale of Three Municipalities
12h00	<i>Fourie, S.</i> Kouga Riparian Rehabilitation Project	<i>Retief, K.</i> Securing a small urban protected area through intensive management and stakeholder involvement
12h15	<i>Wilman, V.</i> Growing Plants and People, Working for Woodlands Restoration Nursery	<i>Stafford, M.L.</i> C.A.P.E. Invasive Alien Species Project: a matter of sustainability
12h30	<i>McConnachie, M.</i> Optimising cost-efficiency in restoring natural capital	<i>Peter, Z.</i> Framing the whole of conservation management practice
12h45	Speed presentation: <i>Pieterse, A.</i> A fluvial geomorphological perspective on the river rehabilitation of <i>Acacia mearnsii</i> infested rivers in the Kouga region	<i>Zylstra, M.</i> Climate Culture: an interface for investing in the restoration of living landscapes
12h51	Speed presentation: <i>van der Waal, B.</i> Influence of <i>Acacia mearnsii</i> invasion on soil properties in the Kouga Mountains	
13h00	Lunch	
	Chair: Guy Palmer	Chair: Rupert Koopman
	Parallel Paper Session 10: Animals in space and time	Parallel Paper Session 11: Partnerships & civil society
14h00	<i>McGeoch, M.A.</i> Distribution of the invasive Argentine ant in South Africa 100 years after its introduction	<i>Ebrahim, I.</i> Working with civil society across Biomes
14h15	<i>Bragg, C.J.</i> Some preliminary particulars of porcupine patch-use: GPS telemetry data of an ecosystem engineer in Renosterveld fragments, Nieuwoudtville.	<i>Morkel, A.</i> Elevating Biodiversity Value: Do we have effective Marketing Strategies
14h30	<i>Keswick, T.</i> Seasonal changes in habitat use of the kalahari tent tortoise <i>Psammobates oculifer</i>	<i>Marais, S.</i> The Climate Action Partnership adapting to and mitigating for Climate change

14h45	<i>Hoffman, T.</i> The spatial ecology of the chacma baboons (<i>Papio h. Ursinus</i>) of the Cape Peninsula, South Africa	<i>Ogilvie, M.</i> Environmental Education at the False Bay Ecology Park: "The good, the bad and the beautiful"
15h00	<i>Minnie, L.</i> Socio-economic and ecological correlates of leopard-stock farmer conflict in the Baviaanskloof Mega-Reserve.	<i>Strydom, W.F.</i> Evidence of people's awareness of and attitude towards river conservation in the Buffalo and Hartenbos & Klein Brak catchments
15h15	<i>Rautenbach, T.</i> The utility of camera traps for determining prey preference of leopards (<i>Panthera pardus</i>) in the Cederberg Mountains, South Africa	<i>Ketse, N.</i> The Adopt-a-river project with Eerste River as a pilot study area
15h30	Tea	
	Chair: Rhoda Malgas	Chair: Tilla Raimondo
	Parallel Speed Session 12: Animals in space and time	Parallel Speed Session 13: Partnerships & civil society
16h00	<i>Impson, D.</i> New freshwater fish taxa in the Cape Floristic Region: Management challenges	<i>Koopman, R.</i> Building botanical capacity in the CFR
16h06	<i>Cooper, J.</i> The dispersal of the Argentine ant in the Kogelberg Biosphere reserve	<i>Kula, S.</i> The Project: INTELEZI Nature conservation project
16h12	<i>Spence, K.</i> A Seasonal Comparison of the Ecological Activities of Bat Species found at Rondevlei Nature Reserve.	<i>Younge-Hayes, A.</i> Building Capacity for decision making in the Eastern Cape
16h18	<i>Atmore, S.</i> A Genetic Analysis of the Cape Galaxia (<i>Galaxias zebratus</i>) Populations in the South Western region of the Cape Flats	<i>Burger, E.</i> Learners helping management while being trained in hands-on GIS operation education
16h24	<i>Uys, J.</i> A comparative study on the small mammal population in different ages of Boland Granite Fynbos on Helderberg Nature Reserve	<i>Mortimer, G.</i> Breaking ground in the Boland! (2 x 6 min slots available! – best we can do!)
16h30	<i>Potter, L.</i> Cats and Dogs: An age-old solution to an age-old problem...	
16h40	Fynbos Forum & AZEF AGM	
19h00	Dinner & dance	

Time	Thursday 7 August	
7h15	Late registration	
	Chair: Patrick O'Farrell	
08h00	Plenary Address: Timm Hoffman 'That was then...this is now': The impact of disturbances across space and time on fynbos and karoo environments	
08h25	Plenary Address: Gillson, L. Thresholds and resilience in the Palaeorecord	
	Session 14: Grazing effects & management	
08h50	<i>Horn, A.</i> Effects of sheep farming on plant dispersal in Southern Kalahari Duneveld	
09h05	<i>Samuels, I.</i> Livestock mobility on the commons of Namaqualand	
09h20	<i>Anderson, P.</i> The impact of grazing along an environmental gradient in the Kamiesberg, South Africa	
09h35	<i>Meyer, P.A.</i> Grazing Guidelines for Karoo veld types within the Namaqualand District Municipality	
09h50	Tea	
	Chair: Onno Huyser	
	Session 15: Monitoring & Evaluation	
10h20	<i>Damons, M.</i> Compiling a Monitoring & Evaluation Framework for the C.A.P.E. programme: Some lessons learned	
10h35	<i>Allsopp, N.</i> SAEON: Understanding Global Environmental Change in the Fynbos Biome	
10h50	<i>Gouws, J.</i> Water quality assessment in the Breede WMA: SASS 5 biomonitoring	
11h05	<i>Blanchard, R.</i> Re-survey and analysis of permanent Cape Peninsula vegetation plots	

11h20	<i>Magidi, J.T.</i> Land cover changes in the northern Sandveld: implications for conservation
11h35	<i>Wistebaar, T.</i> Using Remote Sensing And Expert Knowledge To Map Landscape-Level Land Degradation In The Arid Grasslands Of Bushmanland – South Africa
11h50	<i>Britton, P.</i> The Management Effectiveness Tracking Tool (METT): A very simple yet highly effective management tool.
12h05	Prize Giving and Closure
12h30	Lunch packs and Depart

POSTER DISPLAYS

INTERFACES 2008

No	Title	Authors
	Soil, Water & Nutrients	
1	Plant and soil properties on and off <i>heuweltjies</i> in the Succulent Karoo and Fynbos regions of South Africa	Booi, N.
2	The role of fog and dew as moisture sources on soil respiration and nutrients recycling in the succulent Karoo biome	Nyaga, J. M.
3	Occult Precipitation And Related Seasonal Variations In Chlorophyll Fluorescence, Leaf Nitrogen, Phosphorous And Water Content Of Different Succulent Karoo Species	Matimati, I. ¹
4	Soil nutrient enrichment by the invading <i>Acacia mellifera</i> in the Molopo Area	Malan, P.
	Invasives:	
5	Fungal endophytes: are they a potential mechanism for plant invasiveness?	Den Breeyen, A.*
6	Evaluating the Management of Invasive Alien Plants in the CFR: Overview of the project	Roura-Pascual, N.¹
7	Evaluating the Management of Invasive Alien Plants in the CFR: Identifying Priority Areas for Alien Clearing	Roura-Pascual, N. ¹
8	Evaluating the Management of Invasive Alien Plants in the CFR: Impact of Different Management Strategies over Time	Krug, R. M.
9	Plastic responses to different habitat types contribute to <i>Echium plantagineum</i> invasiveness in the Western Cape, South Africa	Sharma, G.P.
10	Phenotypic Plasticity in Wood Anatomical Properties: Relation to plant-water relations of selected woody native and invasive riparian species	Crous, C.J.
11	Impacts of Alien <i>Acacia</i> on Fire Regime and Their Influence on Plant Succession	Harvey, W.
	Animals in space and time	
12	Indian House Crow Eradication Project – Cape Town Metropole	Gudlindlu, D.
13	Eradication of Alien Fish at Century City	Miller, J.

14	Toads sharing secrets of dispersal: unraveling how western leopard toads survive in an urban environment	Feldman, F.
15	The means of polyploidy by the African tetraploid sand frog <i>Tomopterna tandyi</i> , potentially having crossed biome boundaries	Jacobs, K.
16	The Impact of Habitat Destruction on <i>Heleophryne rosei</i> population of the Cape Peninsula	Lumkwana, E.S.
17	Fragmentation and birds: Do species and feeding guilds response differently to fragmentation in different vegetation types?	Kieck, M. B.
18	Re-Introduction of Klipspringer (<i>Oreotragus oreotragus</i>) into the Table Mountain National Park	Marell, E.
19	Is the Cape Floristic Region insect poor? Identifying research needs	Veldtman, A.
20	Mite (Acari) diversity in the infructescences of <i>Protea</i> species	Theron, N .
	Ecosystem service identification, characterisation and degradation	
21	Forage availability across temporal and spatial scales in the Western Cape: The hidden pollination ecosystem service.	Rademan, M.
22	Fungibility and scalability of ecosystem services: The Fynbos as a case study	Chisholm, R.
23	Biological Assessment of the Breede Water Management Area using Geomorphology index	Radzilani, P. M. & Williams, G.
24	Wetland types of the North-West Sandveld and Saldanha Peninsula	Snaddon, K.
25	Forage preference and plant palatability across a grazing gradient in an alluvium Fynbos-Renosterveld mosaic	Makady, E.
26	Impacts of degradation on critically endangered Oudtshoorn Gannaveld	Wheeler, Alan
	Fire ecology	
27	The Fire History of Protected Areas in the Western Cape: GIS as a Management Tool for protected Area Managers	Purves, A.
28	The consequences of frequent fires on Strandveld vegetation, Cape Town	Hoarau, M.
29	Rock protects succulents from Fynbos fire	Dean, W. R. J.
	Climate change, mapping and monitoring	
30	Effects of climate warming, soil N enrichment and an alien-invasive grass on post-fire recruitment in a fynbos ecosystem	Ruwanza, S. ¹
31	Demography of the Kokerboom <i>Aloe dichotoma</i>	Rebelo, A.G.
32	The decline of the Clanwilliam cedar (<i>Widdringtonia cedarbergensis</i>) over the last 75 years as revealed by historical photographs	Bonora, D.V.
	Restoration	

33	Fallow land recovery at Postberg, West Coast National Park	Kraaij, T.
34	Restoration of the Tokai Core Conservation Site: the significance of fire	Rebelo, A.G.
	Conservation partnerships & civil society	
35	Evidence of environmental education effectiveness	Strydom, W.F.
36	Our Van Der Kempkloof! Our Heritage!	Jonas, P.N.
37	Performance Based Management System in the City of Cape Town	Wood, J.
38	Urban Nature Conservation The Broader Picture	September, J.
39	Flagships of Stewardship Success	Fourie, H.C. ¹
40	The Greater Cederberg Biodiversity Corridor : Expansion of Protected Areas	Lotter, D.
41	The Milnerton Conservation Area a Little Known Gem 1 Year Later	Nofke, M.
42	Plant Monitoring Day: Outdoor Education and Conservation Action in South Africa's Biodiversity Hotspots	von Witt, C.
43	Update on the City of Cape Town's Biodiversity Network	Holmes, P.
44	Linkages in the Landscape: Integrating Ecological Corridors into Urban Landscapes (A Case Study)	Holder, D.
45	Biodiversity Corridors on the Schapenberg	Groenwald, A ¹

POSTERS

INTERFACES

3-7 AUGUST 2008

Plant and soil properties on and off *heuweltjies* in the Succulent Karoo and Fynbos regions of South Africa

Nozuko Booï, University of Stellenbosch

The Mima-like mounds of South Africa occupy much of the south-western part of the country, creating landscapes filled with circular, evenly spaced pimply features. They are known locally as *heuweltjies*. As with mima in other of the world, their origin is controversial. However, the general consensus is that they are the mound of a harvester termite, *Microdotermes viator*. The work done of them has revealed differences between on and off *heuweltjie* areas even at small spatial scales. *Heuweltjii*e soils generally have higher pH, and nutrient levels, including N, P, K, Na, Ca and Mg, than surrounding soils. Also *heuweltjie* soil shows a higher percentage of clay and loam. The plant species on the *heuweltjies* are different from surrounding areas. Plants on *heuweltjies* are fast-growing and short lived whereas adjacent off *heuwetjies* vegetation would be long-lived and grow slow. Also with common species, on mound individuals seem to be more productive. It is expected for the vegetation in these two areas to have different physiological behaviors. It is probable that *heuweltjie* vegetation has enhanced photosynthesis which would explain why fast growers are common in these sites. This study aims to quantify the plant and soil properties and processes that are the underlying factors that set these sites apart from nearby areas. It will also look at across different climate regions to see if general trends that are observed hold across these regions.

The role of fog and dew as moisture sources on soil respiration and nutrients recycling in the succulent Karoo biome

Key words: Dew, Fog, CO₂ efflux, Warming, Respiration

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Dew and fog have been viewed as important sources of moisture in many arid ecosystems and are likely to influence soil nutrient availability and soil CO₂ efflux. The frequency, variability and spatial extent of fog and dew are poorly documented in the succulent karoo. In this study, seasonal changes soil respiration (CO₂ efflux) rates and physical and chemical properties were

measured in vegetated and non vegetated areas on quartz and shale covered substrates in ambient environments and in those artificially manipulated with open top warming and fog exclusion chambers in the Knersvlakte. Results show that intermittent increases in soil water content closely correspond with fog but not dewfall. That soil CO₂ efflux was positively correlated with soil water content but negatively correlated with soil nitrogen and phosphorus content and was higher in shale than quartz covered substrates and in vegetated than non vegetated shale covered substrates.

OCCULT PRECIPITATION AND RELATED SEASONAL VARIATIONS IN CHLOROPHYLL FLUORESCENCE, LEAF NITROGEN, PHOSPHOROUS AND WATER CONTENT OF DIFFERENT SUCCULENT KAROO SPECIES

Key words: water stress, fog, dew, quantum yield, fv/fm, chlorophyll index, titratable acidity

Matimati Ignatious^{1,2}; Musil Charles F¹, Raitt Lincoln²

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Oculta precipitation (fog and dew) contributes significantly to the hydrology of coastal terrestrial ecosystems, but related seasonal responses in photosynthetic competence, nutrient dynamics and hydration of plants inhabiting an arid coastal ecosystem, Succulent Karoo, are largely unknown. Here, we evaluate these plant responses to natural fog and dew precipitation at a BIOTA observatory, Luiperskop (31° 17' 09.2" S / 18° 36' 01.3"E) South Africa, a site that receives winter rainfall (160mm/annum) and dry summers characterised by fog and dew. Chlorophyll fluorescence, leaf nitrogen, phosphorous levels and water content gradually declined during the dry summer, despite an increase in oculta precipitation events and intensity. Stem microvariations trends showed immediate, though short-lived, responses of plants to oculta precipitation. Whilst fog and dew ameliorated immediate plant water requirements, the quantities were inadequate to recharge stressed plants to their original water status. Similarly fog did not significantly increase leaf nutrient levels. The photosynthetic efficiency parameters, nutrient content and water content only increased after consistent winter rains.

Soil nutrient enrichment by the invading *Acacia mellifera* in the Molopo Area

Key words: grazing capacity, soil nutrient status, woody plant encroachment

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Woody plant (bush) encroachment into grasslands is a global phenomenon and has serious environmental and economic consequences. Grasslands in the rangelands of Selosesha Village in the Molopo Area are overgrazed and the invasion of woody plants in these areas is evident. The area is located on communally managed land in the former homeland of Bophuthatswana. Woody plant invasion in these areas decreases the grazing capacity of the area. It is considered by farmers to be a serious problem in large areas of South Africa, particularly in savanna regions. Mismanagement, the lack of land ownership in communal areas and the incorrect grazing strategies by local farmers contribute to the thickening of *Acacia mellifera*. Three target sites in Selosesha (4 hectares each) were identified and the vegetation and soil nutrient status compared with the nearby Disaneng Dam Area that served as benchmark reference. Land-use history (e.g. livestock grazing and fire wood collection), rather than environmental factors appear to be the most important determinants of the extent and rate of bush encroachment. Woody plant density in the study area was significantly higher ($p > 0.02$) than in the reference site and compared to the benchmark. Soil nutrient status was significantly ($p > 0.02$) higher in the soil of the encroached study area than the reference site (benchmark). Bush clearing in the area is advised to recover the much needed grass growth, while retaining some of the beneficial effects of trees in terms of soil nutrient enrichment ("islands of fertility").

Fungal endophytes: are they a potential mechanism for plant invasiveness?

Key words: fungal endophytes, plant invasiveness, *Acacia saligna*

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Understanding why a few plant species are highly successful when invading native communities in the new range compared to the failure of most introduced plant species to establish is one of the more challenging environmental problems. To become successful in a new region, plant species have to pass through a series of ecological filters that include transportation, colonization, survival, reproduction and extensive spread. Consequently, these filters will act on the enemies, competitors and mutualists from the invader's native range. Fungal endophytes are asymptomatic colonizers of virtually every plant species for all, or at least a significant part, of their life cycle. These fungi are known to be important to the structure, function, and health of plant communities. In fact, without fungal symbioses, plant communities do not survive many environmental stresses. Mutualistic fungi have been shown to provide the host with additional defences against diseases and pests with induced resistance and/or competitive exclusion, enhanced drought, salt and temperature tolerances and enhanced growth, independent of apparent biotic or abiotic stresses. The mechanisms through which invasive species alter native ecosystems may depend on association of the invaders with microbial mutualists. Current research suggests that invasive species can strongly affect ecosystem properties. One of our research objectives is to determine to what extent fungal endophytes are responsible for the invasiveness of *Acacia saligna* in introduced habitats. Specifically, we will test the hypotheses that introduced (non-native) plant species will have a less diverse endophyte community than indigenous (native) plant species.

Evaluating the Management of Invasive Alien Plants in the CFR: Overview of the project

Keywords: invasive alien species, management, decision making tool

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South Africa's Cape Floristic Region (CFR) biodiversity is threatened by the introduction and spread of invasive alien species, which alter the natural diversity and crucial ecosystem services. Despite considerable progress in managing invasions in recent decades, there is an urgent need to improve the efficiency of management operations. Integrated frameworks that incorporate distribution data and spread dynamics, coupled with a complete understanding of the factors influencing the management decision of invasive alien species, are required. The main objective of the project is to develop an innovative and integrated decision-making tool for planning and managing alien plant species in three representative regions of the CFR, with different biophysical and management contexts. We will focus our study on the most invasive plant species in the region, mostly species of *Acacia*, *Hakea* and *Pinus*. The suitability of overall management strategies for controlling these species will be assessed according to the ecological threats and economic considerations of alternative management options. The project is expected to provide significant contributions in both theoretical and applied research.

Evaluating the Management of Invasive Alien Plants in the CFR: Identifying Priority Areas for Alien Clearing

Keywords: invasive alien species, management, decision making tool, prioritisation, driving forces-pressure-state-impacts-responses, analytic hierarchy process

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In order to provide robust guidelines for management of invasive alien species in the Cape Floristic Region, we analyze how managers prioritize areas for alien clearing by applying methods that help us to understand complex problems and identify appropriate responses, namely the DPSIR (Driving forces-Pressure-State-Impacts-Responses) framework and the Analytic Hierarchy Process (AHP). These techniques assisted in designing an optimal prioritisation strategy for managing alien species in the CFR that takes account of the complexity of the factors influencing the distribution and abundance of invasive alien plants.

Evaluating the Management of Invasive Alien Plants in the CFR: Impact of Different Management Strategies over Time

Keywords: invasive alien species, management, decision making tool, prioritisation, ecological model, spread, optimisation

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The identification of priority areas for alien management, as discussed in the poster "Identifying priority areas for invasive alien clearing", does not give any indication of the impact of the management actions based on the prioritisation. Nevertheless, an optimal management strategy should deliver the most with the least costs. Consequently, to be able to select an optimal management strategy, one has to analyse not only the immediate effect, but also the future effect of the management strategy.

To accomplish this, we linked the prioritisation strategy with a spatial – temporal explicit model simulating the spread of the target species. This combined spread model will be able to predict the impact of different prioritisation strategies on the spread of the target species.

As the spread of invasive species in a landscape is dependent on several factors, which include properties of the invasive species, properties of the landscape (e.g. topography, vegetation type, weather and climatic conditions) and human activities (e.g. disturbances, land use change, and management), all these factors need to be taken into consideration when building the spread model.

In this poster, I will present the spread model and discuss the applicability of its predictions.

Plastic responses to different habitat types contribute to *Echium plantagineum* invasiveness in the Western Cape, South Africa.

Keywords: Biological invasions, Paterson's curse, phenotypic plasticity, reproductive index, seed size, seed weight

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This paper addresses phenotypic variation among Paterson's Curse (*Echium plantagineum* L.) populations in four different habitat types (tar roads verges, dirt roads verges, abandoned fields and natural areas) in the Western Cape region of South Africa. The species showed significant differences in plant height, seed size and seed weight with varying habitats. The reproductive index (Ri), comprising a ratio of total number of seeds to the height of the plant, demonstrated the plastic behavior of *E. plantagineum* in the various habitats. Results indicate that plastic responses to different habitat types contribute to *E. plantagineum* invasiveness, allowing range expansion and establishment through production of lighter and heavier seeds, respectively.

Phenotypic Plasticity in Wood Anatomical Properties: Relation to plant-water relations of selected woody native and invasive riparian species

Key words: *Acacia mearnsii*, cavitation, Fynbos Biome, wood density

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Climate change is predicted to cause an increase in drought conditions in the Fynbos biome. Adding to this is the threat of woody invasive alien tree species, such as *Acacia mearnsii*, towards plant biodiversity and overall water quality and quantity. A preliminary study suggests that intra-species variation exist in native woody riparian species' vulnerability to drought-induced cavitation. Therefore, some native species may be more adapted to future decreases in streamflow than others. Literature also shows significant negative correlations between vulnerability to cavitation and wood density. Wood density has also been shown to be plastic over different environmental gradients, and may thus be an indication of different plant adaptation strategies towards water usage. Focussing on *A. mearnsii* and selected native species, we ask whether there is functional convergence in wood density traits for invasive versus native species along a

water availability gradient in various Fynbos river systems. The objective is to investigate phenotypic plasticity in wood density as a means to understand the adaptive ability of native and especially invasive riparian species, and their possible future geographic distributions, due to variable streamflow.

Impacts of Alien *Acacia* on Fire Regime and Their Influence on Plant Succession

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Fire and nutrient limitation are integral components of fynbos ecosystems. Fire is a critical disturbance event that is central to nutrient cycling and shaping successional patterns. Following fire, nitrogen-fixing plant species thrive because previous nitrogen stores have been lost through volatilisation. However, there appears to be a trade-off with nitrogen fixation, as late-successional species with specialised phosphorus-uptake mechanisms out-compete nitrogen fixers after approximately 2-4 years. Invasive *Acacia* spp. apparently violate this trade-off: They are able to colonize post-fire, nitrogen-poor environments and thrive past the 2-4 year window. Furthermore, they significantly increase above-ground biomass and can lead to increased fire intensity and increased nitrogen volatilisation in subsequent fires. If unmanaged, this can lead to a self-perpetuating cycle that leads to an entirely *Acacia* dominated landscape. Several empirical studies have addressed the issue of invasive species and post-fire nutrient dynamics, but there have been few theoretical studies to complement them. Modeling approaches have the potential to provide new insights to this problem. My research will be aimed at producing a simplified, compartmental theoretical model that examines the dynamics between indigenous nitrogen-fixing and late-successional plants, as well as invasive nitrogen-fixing *Acacia* spp. I will calibrate model parameters according to my own field research as well as information available in the literature, and through examining population dynamics I will discuss the ecological and evolutionary implications from the model. I seek to use theoretical models to provide insight into why the nitrogen-fixing tradeoff exists, and how invasive Acacias are able to seemingly violate it. This includes identifying crucial parameters involved in nutrient cycling in fynbos vegetation that future empirical studies can address.

Indian House Crow Eradication Project – Cape Town Metropole

Key words: invasive species, eradication and control, awareness

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The Indian House Crow, *Corvus splendens*, is a medium sized crow indigenous to the Indian sub-continent, Burma, Sri Lanka, Malaysia and southern China. Studies suggest that the species has spread over the past 100 years as “stowaways” on ships into coastal towns along the Red sea and down the East African coast, all the way to Durban and even as far south as Cape Town. The first ever report of its presence in South Africa was in 1972, when a flock of 60 birds was observed at Sodwana Bay. The first records of House Crows in the south-western Cape were from Cape Town harbour in the late 1970s. The majority of the Cape Town based House Crow population appears to be centred on the Cape Flats, with scattered populations observed in and around the metropole.

The crows are known to operate in large groups, killing and displacing smaller birds and chicks, as well as domestic pets and small livestock. Their aggressive behaviour has led to them being described as one of the greatest alien dangers to our indigenous bird species. They not only pose a health risk by spreading diseases such as Salmonella, Entamoeba and Giardia by eating rotten food and then washing themselves and defecating in water used by humans, but also cause short circuits and power failures by building nests on powerlines.

In 2003, Nyanga Stadium (Cape Town) was identified as the roosting site with the largest concentration of House Crows. Recent site inspections (conducted in January 2008), confirmed that the highest concentration of this species is still observed around Nyanga stadium. Various control measures for this species include trapping and shooting, however, the best results of House Crow control are obtained through poisoning.

Eradication of Alien Fish at Century City
Keywords: invasive fish, water clarity, rotenone

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Alien invasive fish species, including carp and tilapia, have long been disturbing the aquatic ecosystem at the Century City development. As a result of their destructive activities, these species have contributed to reduced water clarity, and the consequent effect of this being the die off of macrophytic plants and proliferation of algae.

NCC was appointed to implement an eradication project at Century City. The most viable method chosen was the application of the piscicide Rotenone, which only affects gill-breathing animals, and it breaks down very quickly when exposed to light, heat, oxygen and alkaline. Considering the intricate water flow system at Century City, a well planned operation was to take place, including the search and rescue of indigenous species beforehand. A freshwater ecologist was brought on board, to advise on the operation and monitor water quality before and after. An awareness campaign was designed by NCC to inform visitors to Century City of the purpose, objective and methodology of the operation, and the impending stench of tons of dead fish. A well orchestrated operation was implemented, and already an improvement in water clarity is evident.

Toads sharing secrets of dispersal: unraveling how western leopard toads survive in an urban environment

Key words: radio-telemetry, pattern-recognition, home range

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The Western Leopard Toad (*Amietophrynus pantherinus*) carries an IUCN endangered (EN) status due to its small distribution within the winter rainfall region of the Western Cape. The areas this species inhabits are almost completely urbanized; with canalized rivers and channels, major roads and scant foraging areas packed with residential dwellings. This large scale urban development is reported to have led to dwindling populations, and loss and fragmentation of habitat. However, we are lacking any data that support these inferences made based on gross habitat change. Certainly, individual toads may be confined in their foraging areas to urban gardens, or the majority may choose to avoid the perilous nature (pets, pesticides, etc.) of these habitats relying instead on the 'bionet' of green spaces within the city. *A. pantherinus* are often only noticed when breeding during August in permanent water bodies or seasonal wetlands on the Cape Flats. They are explosive breeders and because they move *en masse* to their breeding site within urban areas, many are killed by motorists. Speculations have also been made on what constitutes barriers to toad dispersal, examples including roads, curb-stones, fencing and walls. In order to make effective conservation planning decisions, we need to know what constitutes a real barrier to movement for Western Leopard Toads. Two methods will be employed, namely the use of radio-telemetry to track 20 individual animals (10 males and 10 females) during the breeding seasons from 2008 until 2010, and the use of computer-aided photographic identification of individual animals. The study will be conducted at the Orange Road breeding site in Kirstenhof, Cape Town.

The means of polyploidy by the African tetraploid sand frog *Tomopterna tandyi*, potentially having crossed biome boundaries

Keywords: polyploidy, gene sequencing, instant speciation or hybridisation

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Polyploidy has not been as much investigated in animalia as it has in plants. Polyploidy has more commonly been observed in fish, *Xenopus* and *Hyla* frogs. *Tomopterna tandyi* is currently the only one in the genus, and of very few amphibia, known to have resulted through polyploidy. The means of polyploidy in this species is not known, either being that of allopolyploidy i.e. hybridization between two different species or autopolyploidy i.e. instant speciation. The recommended method of investigation is by means of sequencing both nuclear and mitochondrial genes. This should reveal the paternal and maternal parent species of *Tomopterna tandyi*. Thereafter, one can determine zones of potential hybridization, if this proves to be the case, and further unravel the potential crossing of boundaries by species, and how arid zones could give rise to hybridization or instant speciation – ultimately, the ecology of polyploidization. Poster Abstract:

The Impact of Habitat Destruction on *Heleophryne rosei* population of the Cape Peninsula

Keywords: Ghost Frog Habitat

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Statement of the research problem-What is the impact of the habitat destruction on the *H.rosei* population on the Cape Peninsula?

Background to the research problem- In 2006 a report was done on The Table Mountain ghost Frog *H. rosei* in the Table Mountain breeding sites, which is endemic to an area of less than 10 km² on the Table Mountain (De Villiers, 2006). Although the entire habitat of this species falls within a protected area, this frog is threatened by reservoirs (affecting stream flow), water abstraction, invasive alien vegetation and erosion (Passmore and Carruthers, 1995).

According to De Villiers (2006) the species is currently listed with the IUCN Red Data List, as Critically Endangered. At (Window Gorge) Kirstenbosch National Botanical Garden, a large extent of habitat of more than 160 meters was lost with the construction of a weir in 1988 to increase Kirstenbosch water supply.

Research Methodology

Study sites (Window Gorge and Cecilia Ravine) will be identified and be visited twice a month from March to August, which is when the stream flow is slow during summer and when the stream flow is faster in winter because of the winter rainfalls (De Villiers, 2008).

A Table Mountain Ghost Frog Survey (De Villiers, 2008) data sheet will be used on sites visits, which include the mapping of the breeding areas on the streams with GPS coordinates. Other amphibians sighted on the sites will be identified and recorded as well.

Transects will be placed randomly on each of the study sites, and the population numbers of the tadpoles will be recorded to calculate density and the breeding average of the species from the upper reaches of the stream to the lower reaches of the stream (De Villiers, 2008).

Water samples will be taken in the different streams and analysed for organic matter, pH, nutrients, dissolved oxygen and conductivity. Factors such as slope and drainage will also be taken into account (Picker pers.comm. 2008).

The individual counting of tadpoles will be recorded to calculate density and the breeding average of the species from the upper reaches of the stream to the lower reaches of the stream.

The tadpoles will be measured to estimate the number of newborns within the tadpole population numbers breeding activity.

The average number of alien plant species will be identified next to the streams, and the variables will be compared to determine the impact on water loss or abstraction.

Fragmentation and birds: Do species and feeding guilds response differently to fragmentation in different vegetation types?

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Habitat fragmentation is a major threat to the avian diversity, with size effects having the most influence on avian species richness and diversity. However, other elements of fragmentation, such as edge effects and isolation, also contribute to species and diversity loss. The loss of certain species and guilds, such as insectivorous, granivorous and frugivorous birds, may have detrimental effects on ecosystem processes the identification of indicator species and guilds might prove invaluable for the development of conservation strategies for the fragmented lowlands of the Cape Floristic Region.

This poster will examine whether there are consistent response pattern exhibited by species and guilds between the west and east coast renosterveld bioregions, and whether universal indicator species and/or guilds that can be used as monitoring tools to assess the impact of fragmentation exist. Birds were surveyed in May and June 2007 and 2008, respectively. Single point count observations with visual and audio identification were used to capture bird species richness and diversity in 40 fragments in each of the two regions.

Re-Introduction of Klipspringer (*Oreotragus oreotragus*) into the Table Mountain National Park

Key Words: Klipspringer, Habitat, GIS

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Klipspringers were hunted to extinction on the Cape Peninsula around 1930. The Table Mountain National Park has been working on a re-introduction program following the removal of the Himalayan Tahr. In 1999 & 2000 as well as 2004 a total of 59 klipspringers were released. Monitoring has proven to be difficult due to the mountainous terrain and the failure of various collars. However, preliminary results show that the release of klipspringers has been a success. Most pairs have successfully established and settled their territories and have produced offspring. With the use of GIS, various habitat characteristics for klipspringer habitat selection have been tested. Preliminary results will be highlighted which will be used to build a model to aid in the management of the species as well as to determine additional areas in the park for future re-introductions.

Is the Cape Floristic Region insect poor? Identifying research needs.

Key words: Cape Floristic Region, insect diversity, biodiversity studies

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The patterns responsible for the exceptional diversity of the Cape Floristic Region's plants are reasonably well known. By contrast, patterns of insect diversity in the region, and the processes underlying them, are poorly understood. The focus on the region's exceptionally high floristic diversity has overshadowed its faunal diversity. In consequence, there is a dearth of information on insect species diversity within the CFR, although their functional significance is appreciated. The consensus view is that diversity is low, although several local scale studies of specific host plants and their herbivores suggest that insect richness might be much higher than is generally thought to be the case. However, few groups have been subject to careful surveys, and most comparisons have been qualitative and based on examinations of studies that differ substantially in their methods. Moreover, the determinants or correlates of insect diversity in this region are poorly explored. Only a few, recent studies have explored relationships between the diversity of certain groups and the environment. The paucity of investigations of the determinants of insect diversity in the region is especially concerning because of the prediction that global climate change will have a substantial influence on the region. What the direct and indirect effects of climate change are likely to mean for insects is not clear, largely because the insect fauna is poorly understood and the determinants, or even correlates, of variation in insect diversity in the region are so poorly understood. Here, we identify specific research needs to improve our understanding of the determinants of diversity, which is not only a major goal of ecology, but also important for ensuring its conservation. The promulgation of the South African National Environmental Management: Biodiversity Act has placed a responsibility on government to monitor and conserve biodiversity. Work such as this can go some way to help achieving these goals.

Mite (Acari) diversity in the infructescences of *Protea* species

Key words: arthropods, fynbos, population dynamics

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The Fynbos Biome is not only an important plant species-diversity asset it also has a high economic importance for South-African industries such as beekeeping and eco-tourism. The plant genus *Protea* is one of the defining members of the Fynbos Biome and is the most important component in the cut-flower industry. Mites are important vectors and participants in complex *Protea*-Ophiostomatooid fungal mutualisms. They affect these systems either as disease dispersal agents, as fungivores protecting seeds against fungi or as predators acting as bio-control agents. Mite systematics and ecology in general and in fynbos in particular is understudied. Virtually nothing is known about their interaction with *Protea* species. The present study sets out to investigate the diversity of mites associated with *Protea* species in the Fynbos Biome. The key questions addressed are a) how do environmental and ecological factors influence mite communities within *Protea* spp. infructescences? b) is there any evidence of co-evolution between mites and *Protea*? and finally, c) does the phylogenetic tree of *Protea* correlate with that of the mite genus *Tarsonemus*. Preliminary data indicate significant differences between infructescence volume and degree of openness in *P. repens*, *P. neriifolia* and *P. nitida*. The openness and volume of *P. nitida* at the Gordon's Bay site are significantly different from the other two sites. This study aims to determine the key elements of the fynbos-*Protea*-mite system that forms the basis to guide future studies.

Forage availability across temporal and spatial scales in the Western Cape: The hidden pollination ecosystem service.

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The services of ecological systems are critical to the functioning of the earth's life-support system. Insect pollination is an essential regulating service for commercial crops. The deciduous fruit industry of the Western Cape of South Africa is a significant agricultural sector reliant on pollination by honeybees, *Apis mellifera capensis*. As the demand for pollinators increase, modern commercial crop production is increasingly becoming dependent on managed pollinators (hired from beekeepers) and less on wild pollinators. Pollination ecosystem services are often described as the provisioning of wild pollinators from adjacent natural vegetation and managed pollination services is regarded as unrelated to the ecosystem. This is however not true as managed honeybees are placed on natural vegetation for forage during times of the year when not pollinating crops and no other forage type is available. This overlooked ecosystem service clearly links a much larger portion of pollination to the environment. The type of forage is specifically chosen by the beekeeper to produce good quality honey and sustain the colony until the next season's pollination. Forage is therefore essential for beekeeping and the deciduous fruit industries. Through analysing data from a questionnaire posed to beekeepers, a holistic viewpoint of forage management and the crucial role of natural vegetation is obtained. The poster firstly illustrates how these hives are being managed across a temporal scale during the year. It is clear that for a bottle-neck period in the winter-months, wild flowering plants sustain honeybee colonies. Secondly the spatial management of the hives across the Western Cape is illustrated by means of GIS mapping. Important economic and practical implications is obtained and more clarity on the value of forage as a pollination ecosystem services is achieved.

Fungibility and scalability of ecosystem services: The Fynbos as a case study

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Ecosystem services are the conditions and processes whereby natural ecosystems sustain and fulfil human life. Ecosystem service valuation provides an opportunity to reconcile environmental, social and economic objectives, but it is important to recognise that the economic properties of different ecosystem services vary markedly. The Fynbos provides an excellent case study for understanding how valuation and land-use decision making are affected by two key properties of ecosystem services: fungibility and scalability.

In economics, fungibility means that a good or asset is completely interchangeable with other goods or assets of the same type. Carbon sequestration is a completely fungible ecosystem service: the Earth's climate is indifferent as to where on the planet carbon is emitted or sequestered. The provision of biodiversity values is also a fungible ecosystem service: assuming we can

quantify biodiversity meaningfully, we do not mind where it is preserved. Water supply, on the other hand, is generally a non-fungible ecosystem service, because its value is derived from proximity to human settlements.

Scalability, in the context of ecosystem services, refers to how the total value of an ecosystem service changes as more of the landscape is conserved. This is fundamentally a property of the scale of observation. On regional scales, the value of carbon sequestration scales linearly because regional processes have negligible effects on the global price of carbon. Biodiversity, on the other hand, scales as a power law, following the Arrhenius relationship: the last hectare of an ecosystem destroyed, or the first hectare conserved, is far more valuable than the first destroyed or the last conserved.

In Mountain Fynbos ecosystems, the establishment of alien pine plantations has negative impacts on water supply and biodiversity, but positive impacts on carbon sequestration. A cost-benefit analysis in the Jonkershoek Valley demonstrates that the negative impacts of afforestation probably outweigh the positive impacts, and that afforestation is therefore not justified. However, in Fynbos catchments that are not utilised by humans, the value of water is essentially zero—a direct consequence of its non-fungibility. In these non-catchment areas, we might hope that the value of Fynbos biodiversity alone can offset any potential gains from carbon sequestration, but this argument is difficult to make while large areas of Mountain Fynbos remain, because of the non-linear scalability of biodiversity values.

Intuitively, afforestation of the Fynbos by pines is a terrible thing. In cases such as these, where economic arguments are in direct conflict with our intuition, it is imperative that we strive for a deeper understanding of the science, economics and philosophy of conservation. This will allow us to anticipate and inform the actions of government and private enterprise in the decades to come. The lessons to be learnt are global in application.

Biological Assessment of the Breede Water Management Area using Geomorphology index

Key words: Geomorphology, Tributaries, River health

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Breede water management area is the southern most water management area (WMA) in South Africa, the annual rainfall average from 300 to 1500mm/annum, the greater part of the management area is drained by Breede river and its main tributaries, Riviersonderend, Palmiet and Vlei river. This paper will be describing the geomorphological processes on the Breede Water Management Area. The data has been collected and the analyzed data will link directly to the health of the river systems in the Breede water management area as the data collection was done as part of the River Health Program. The Geomorphology and geomorphologic processes that prevails in a specific area forms an integral part of overall river health as most processes that constitute to effective river functioning are either directly or indirectly influenced or to some degree dictated by it, after interpreting the data obtained from sampling, the result will be analyzed and presented during the fynbos forum and they which will aim to highlight the state of the geomorphology in this unique area and how this links to the health of the major tributaries already mentioned above.

Wetland types of the North-West Sandveld and Saldanha Peninsula

Key words: wetland types, fine-scale conservation planning, wetland inventory.

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One of the exciting outcomes of the C.A.P.E. fine-scale planning project, from a freshwater ecological perspective, is a unique attempt at grouping the wetlands of the planning domains into ecologically meaningful wetland types. There was a clear need for this within the context of the conservation planning process – we needed to set conservation targets for wetland types, in a similar manner to those determined for vegetation types.

However, the usefulness of the wetland types has a much wider application. The prioritisation of wetlands for conservation or rehabilitation, the management of wetlands within transformed (and transforming!) landscapes, and the need to understand the diversity of wetlands within a certain area, must at least start with an inventory of wetland types.

The grouping of wetlands was achieved through combining either the dominant vegetation group - from the South African vegetation map, or the Sandveld and Saldanha fine-scale plan – or a relevant environmental descriptor, with the Level 3 wetland typing of the National Wetlands Inventory Classification System. The results of this grouping and descriptions of the wetland types in the North-West Sandveld and the Saldanha Peninsula are provided, along with a brief discussion of conservation targets for this planning domain.

Forage preference and plant palatability across a grazing gradient in an Alluvium Fynbos-Renosterveld mosaic

Key words: grazing, forage preference, plant palatability, plant nutrient content

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Lowland fynbos and Renosterveld have undergone severe transformations over the past decades. What remains are isolated patches that are often restricted to ecotonal areas that were not suitable for cultivation. In order to conserve what is left, game farming and ecotourism are often promoted. However, for this, an understanding of game management and the impacts of indigenous game on the natural vegetation is necessary. This study therefore investigated variation in plant nutrients and forage preference of large indigenous herbivores across three adjacent conservation areas representing three different grazing intensities (Low (LAU: 0/ha); medium (LAU: 0.003 ha) and high (LAU: 0.005/ha)) over four seasons. Six plant species belonging to different life form categories were selected, five of which were found grazed. The species were: *Tribolium unioleae*, *Hyparrhenia hirta*, *Montinia caryophyllaceae*, *Ischyrolepis capensis*, *Ficinia sp* and *Elytropappus rhinocerotis*. The following plant compounds were analysed for each species; tannin (mg/ml), crude fibre (%), crude protein (%), crude fat (%), moisture (%), carbohydrate (%), and mineral content (%). Forage preference of *T. unioleae*; *M. caryophyllaceae* and *I. capensis* varied between seasons. Nutrient content, and thus plant palatability, varied across grazing gradient. Nutrient content of grazed species differed with grazing intensity, while nutrient content of the ungrazed species did not change across the grazing gradient. Plant palatability was found to be species related, as grazing intensity impacted on plant species nutrient content differently. We could not find that plant palatability decreased with increasing tannin and fibre concentration in the grazed species, other nutrients might thus play a crucial role in the diet selection and forage preference of indigenous herbivores.

Impacts of degradation on critically endangered Oudtshoorn Gannaveld

Key Words: Succulent Karoo, Gannaveld, degradation.

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In the eastern Little Karoo region of the Western Cape Province, ostrich farming has transformed large areas of natural vegetation, especially in the lowlands of the Swartberg/Langeberg intermountain basin. A high proportion of these lowland areas consist of the Gannaveld habitat type. Very little quantitative vegetation data is available from this habitat type. A study quantified the impact of degradation on the critically endangered Oudtshoorn Gannaveld vegetation variant of the Gannaveld habitat type and the results of this study are discussed.

The Fire History of Protected Areas in the Western Cape: GIS as a Management Tool for protected Area Managers

Key words: Fire database, biodiversity, catchment management

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“Intelligent use of fire, together with clearing of invasive trees and shrubs, are the two most important management interventions for managing biodiversity in the Fynbos biome” (Goldammer & de Ronde ed's. 2004).

CapeNature has developed a spatially explicit Fire database, written in MS Access. This database is linked to Arcview through a custom Arc Avenue script and stores the spatial data (polygon vertices) within the database itself. The database is able to generate a shapefile in ArcView 3 of all recorded fires. This shapefile is used to calculate fire frequencies, veld ages and fire return intervals using ArcView 3. The database is also designed to generate fire reports for the managers, thus increasing their productivity and decision making abilities.

Currently we have 2564 fire records in our database, spanning a time period of 82 years (1927-2008). The size of fires ranges from 58528 ha to >1Ha in extent. A total of 2628608 ha have been recorded as burnt in these 82 years. The database also records the fire ignition points, causes, costs to management and a chronological list of events that occur during the fire.

The collection of fire data is an ongoing process that forms part of CapeNature's catchment management responsibility. Our integration of GIS into the field has allowed our Protected Area managers to use GIS as an effective management tool. The fire dataset, together with the Alien invasive plant dataset will form an integral set of tools for managing the Fynbos into the future. The dataset will allow an informed adaptive management approach to be implemented in response to rapidly changing climatic conditions.

The consequences of frequent fires on Strandveld vegetation, Cape Town

Keywords: Strandveld, frequent fires, rejuvenation

Hoarau, M., The Nature Conservation Corporation & Tshwane University of Technology
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Lowland Fynbos is the most poorly conserved component of the Fynbos biome. Only 3% is preserved in nature reserves, and 50% is already transformed into urban or agricultural lands. A large amount of the remaining non-transformed land is invaded by alien plants (Rebelo, 1992). Fires drive the ecological dynamics of Lowland Fynbos at intervals of between 4-45 years, although the range 10-25 years is more commonly observed (Van Wilgen et al. 1992).

This vegetation type is prone to a high frequency of uncontrolled fires which can lead to negative effects on the composition of the vegetation. This study focuses on the rejuvenation of the Strandveld vegetation in a system altered by frequent fires and with the presence of invasive alien plants.

Rock protect succulents from Fynbos fire

Key words: Mesembryanthema, refuge, burn

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The distribution of succulents may be limited by freezing temperatures, infertile soils, competition for light, and exposure to fire. Despite this, succulent Crassulaceae and Mesembryanthemaceae occur at 2000 m a.s.l. on nutrient-poor sandstone in fire-driven ecosystems. Many genera of Mesembryanthemaceae characteristic of Succulent Karoo also occur in Fynbos and Renosterveld, but here these and other succulent plants are largely confined to rocky outcrops. Possible reasons for this distribution are freedom from competition for light by tall shrubs, increased soil fertility associated with organic deposition in rock crevices, or protection from fire. Following a fire in arid Fynbos on the northern slopes of the Swartberg mountain we tested the fire hypothesis by recording densities and sizeclass distributions of *Machiarophyllum cf. albidum* along a gradient of increasing bedrock cover. We found that damage was negatively correlated with rock cover, and that large individuals survived fires better than smaller ones. We suspect that rockiness may be a better predictor of succulents in Fynbos and Renosterveld than soil nutrient status or light intensity.

Effects of climate warming, soil N enrichment and an alien-invasive grass on post-fire recruitment in a fynbos ecosystem

Key words: Global warming, Increased nitrogen, Invasive grasses, Species composition and increased temperature

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Elevated soil nitrogen levels, due to increased use of fertilizers, coupled with global warming and alien invasive species are likely to negatively impact on the recruitment and growth of indigenous species in nutrient impoverished Mediterranean-climate ecosystems following disturbance by fire. We tested this hypothesis by exposing soils containing viable reproductive propagules collected after a late autumn fire from the Cape of Good Hope Nature Reserve to natural and artificially elevated (two-fold increase) soil N levels and to natural and artificially elevated soil temperatures (3°C increase above ambient), consistent with global warming scenarios, in 16 microcosms (4 replicates of each N and temperature combination treatment). A split-

plot design was adopted in which one half of each replicated microcosm contained equivalent numbers of individuals of the invasive grass, *Lolium perenne* ssp. *multiflorum*, sown from seed with the other half of each microcosm containing no *L. multiflorum* individuals. Recruitment, photosynthetic performance and growth of both the indigenous and alien invasive grass species in the different N and temperature treatments were monitored over a 9 month period spanning early winter (June) to late summer (February). Also, soil temperature and volumetric water contents were recorded hourly in each microcosm over this period with Decagon TE sensors interfaced with data loggers. Preliminary results indicate that *L. multiflorum* grew more rapidly and attained reproductive maturity much earlier in the experimentally warmed microcosms with this effect exacerbated under elevated soil nitrogen levels. Recruitment and growth of indigenous species were stimulated in the experimentally warmed chambers but severely inhibited by the presence of the invasive grass. This inhibition was not a consequence of a greater demand for soil water resources by *L. multiflorum* as soil moisture contents were unaffected under ambient temperature conditions by the presence of this species and even significantly increased in its presence in the experimentally warmed microcosms.

Demography of the Kokerboom *Aloe dichotoma*

Keywords: global warming, recruitment,

Tony Rebelo, et al., Threatened Species Research Programme, South African National Biodiversity Institute

Aloe dichotoma has been widely hailed as a prime example of a species threatened by global warming. Here we present 3 decades of monitoring of populations of this species. We propose that the observed trends can be explained by other theories than global warming, and that as plants from a massive recruitment event dating to about 1985 reach over 1m tall during the next decade, a huge new population will become evident. Curiously, the historical Kokerboom Forests have not benefited from the baby boom, which is largely in the plains.

The decline of the Clanwilliam cedar (*Widdringtonia cedarbergensis*) over the last 75 years as revealed by historical photographs

Key words: Clanwilliam cedar, climate change, repeat photography

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There has been a well documented decline in the Clanwilliam cedar (*Widdringtonia cedarbergensis*) population attributed to, amongst other causal factors, disease, wood cutting, fire and climate change. The timing and rate of decline, however, has not been well described over time periods of 50-100 years. Using an analysis of repeat photographs from 15 sites in the northern parts of the Cederberg Mountains we documented the % change in separate populations growing at different altitudes and on different aspects. Results show that many cedar populations were healthy and skewed towards juveniles prior to the 1950s and it was only after this period that large scale mortality occurred. Since the early photographs were taken there has been a rapid decline (average of -2.51% per annum) and no recruitment at any of the sites over the 70 year time frame covered by most of the images. The proportion of trees with sparse foliage cover also increased by 25% suggesting that a slow reduction of photosynthetically-active material has occurred on many of the surviving trees. An analysis of the fire and climate history of the region is presented. Despite conclusive evidence of a rapid and catastrophic decline since the 1950s there is little to choose between the several competing hypotheses which are currently used to explain cedar decline.

Fallow land recovery at Postberg, West Coast National Park

Key words: rehabilitation, strandveld, herbivory

Tineke Kraaij, **South African National Parks, PO Box 176, Sedgefield, 6735**

The Postberg Nature Reserve on the Langebaan Peninsula is a contractual national park managed by the West Coast National Park. Most of the areas at Postberg with relatively nutrient-rich and deeper soils have been transformed for agriculture, although ploughing of these lands ceased 40 years ago. These fallow lands sustain significant numbers of large herbivores. The question of whether herbivory affects the natural recovery of indigenous strandveld vegetation on fallow lands was investigated. Plant species composition and cover were surveyed in and outside of different types of herbivore enclosure. After four years of herbivore exclusion, plant species richness and total plant cover did not differ significantly between open plots and enclosures, or between different levels of enclosure. However, plant growth form composition was influenced by herbivory. Weeds and grasses (alien annual species and pioneers) were less abundant in enclosures than outside, while bulbs and shrubs were more abundant in enclosures, indicating that herbivory slows the process of succession on fallow lands.

Restoration of the Tokai Core Conservation Site: the significance of fire

Keywords: biodiversity, species richness, seed banks

Tony Rebelo, Threatened Species Research Programme, South African National Biodiversity Institute

Tokai plantation was identified in 1999 as one of the core sites for conservation of the flora within the City of Cape Town. Since then this site has been incorporated into the Table Mountain National Park. Initial recommendations on conservation of the primary target Cape Flats Silky-puff *Diastella proteoides*, suggested a horticultural approach. However, an accidental fire in 1997 suggested that seed banks may still persist under the pine plantations. Subsequently this vegetation type has been designated Critically Endangered with a target of 30%, with only 14% remaining and 1% conserved. Consequently, an adjacent area was cleared in late 2005 and burned in April 2006 to explore the restoration of this veld type from plantations. However, the fire was exceptionally cool, and only half the area scheduled for burning was burned. For the remainder of the area, brush was stacked into 9 stacks and burned.

Here we present results 2 years after the fire for the two areas. The significance of fire is unquestionable, both in terms of Fynbos regeneration and alien (annual herbs and grass, *Senecio pterophorus* and pine) control.

Conservation at the urban-fynbos interface requires that the conflict between fire required for Fynbos and fire safety in the urban setting be carefully managed. However, currently Fynbos management and more importantly restoration of Critically Endangered ecosystems is being compromised by the lack of skills in applying fire as a management tool. As long as this key competency is lacking, neither SANParks nor the City of Cape Town will be able to meet their biodiversity commitments. The future of the restoration of Fynbos and Renosterveld within Cape Town and the long-term conservation of Fynbos reserves hinges on this key requirement.

Evidence of environmental education effectiveness

Key words: evidence-based conservation, science communication, state-of-rivers reporting

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Changing conservation related attitudes and behaviour is an intricate process, and contrary to general perceptions, seldom achieved by the production of and exposure to education materials. Statements such as these are however seldom tested and supported by evidence-based conservation activities. Recent studies highlight the importance of childhood learning and experiences and the effect it has on their future attitudes and behaviour.

During 2007 a study was conducted in randomly selected schools in the Buffalo and Hartenbos & Klein Brak catchments to determine how effectively the State-of-Rivers communication materials had been used in the education system. The study focused on learners in grades 1 to 3, and used questionnaires and participatory evaluation techniques to determine the level of understanding of human impacts on rivers. The evaluations were conducted both before learners had seen the materials and after exposure to materials, allowing sufficient time for facilitators to use the materials during classroom activities.

Results from this study indicate that, with the exception of a few schools, the supplied materials were mainly used to keep the learners busy. The learners in the Hartenbos and Klein Brak catchment displayed a slight increase in their understanding of river ecology concepts over time. In rural areas within the Buffalo catchment, 50 % of the schools showed a slight decrease in understanding, while the other 50 % gained significant understanding, resulting in an overall increase in understanding in the catchment. The significant decrease in understanding amongst learners in the Buffalo urban area is attributed mainly to one school.

Ensuring optimum intervention in learners' understanding requires that communication materials are aligned more closely with the schools' curriculum, supported by closer work with the Department of Education to ensure the introduction of fundamental ecosystem learning, and, through better understanding of ecosystems, empowering facilitators to add maximum value in the classroom.

Our Van Der Kempskloof! Our Heritage!

Key words: Van Der Kempskloof grassy-fynbos, Eco-Schools, community conservation

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As part of the Cape Floristic Region Nelson Mandela Bay contains significant fragment of Fynbos Vegetation.

In 2005 a partnership of the Table Mountain Fund (WWF-SA), the Bethelsdorp Development Trust, the Nelson Mandela Bay Municipality, and WESSA_ Eastern Province was formed to protect the fynbos of the Van Der Kemp's Kloof in Bethelsdorp, hence using one of WESSA's aims viz: " Securing the protection and wise use of our natural resources." The partnership developed the Bethelsdorp Fynbos Node through which conservation and environmental education activities are being undertaken involving Bethelsdorp schools and community members in and around the area.

One of the significant events which one of the schools organized was the launch of the Bethelsdorp cultural and art gallery centre where learners from Bethvale show cased and explained to the community members, dignitaries from the Department of Education, Councillors from the local municipality and others about the importance of protecting and looking after the Van Der Kamps Kloof. Community members has recognized that the Van Der Kamps Kloof has a problem of criminal acts and indecent acts that are being performed at the reserve and are now trying to find ways and means of eradicating those acts. Negotiations with local security firms through Bethelsdorp Development Trust are in the pipe line. In September one school from the Eco-schools is to have an awareness campaign around the shopping malls, taxi ranks and stop streets to try and make the community conscious about looking after the Van Der Kamps Kloof.

PERFORMANCE BASED MANAGEMENT SYSTEM IN THE CITY OF CAPE TOWN

Key words: biodiversity planning, strategies, implementation

Julia Wood, Louise Stafford and Adele Pretorius
Head Office, Berkley Road, Maitland, 7405

The Biodiversity Management in the City comprises of all aspects of Biodiversity conservation from the planning to on the ground management (this includes reserve management and alien flora and fauna clearing). The City has approved the Biodiversity Strategy and its implementation. Over the last two years, the Biodiversity Management Branch of the City has being developing a Performance Based management System. This comprehensive system will not only track the state of biodiversity and biodiversity management, but also individuals within the branch. This system is streamlining the branch and will also demonstrate to City how it is doing on biodiversity conservation, how it is adhering to legislation and what benefits are being provided to local communities. The system forms part of the Environmental Resource Management Department's Strategy (Strategy and Planning Directorate) and the City's IDP; as well as other important initiatives such as the Cape Action for People and Environment (CAPE).

URBAN NATURE CONSERVATION: THE BROADER PICTURE

Key works: community upliftment, challenges faced, outcomes for urban reserves

Jerome September & Stacy-Anne Michaels, Edith Stephens, Lansdowne Road, Philippi,

This poster will cover the linkages and challenges faced by reserves poorer communities on the Cape Flats. The topic will be approached from an environmental educational point of view. The aim of each educational program is to show that communities, and their different social groups, make use of urban nature reserves with specific outcomes to be reached. The manner in which the reserves and their education staff approach each program changes with every visiting group.

Some of the greater challenges for education officers with these large diverse groups would be namely manpower, transport and the language barrier and available education staff support. This poster will show that communities and nature are inseparable. They are the future fighters for our natural areas and because the financial situation cannot be changed for either, education towards passionate involvement is the more favourable outcome for both and therefore is the future solution for the sustainability of our natural areas, and the way future generations will become involved. Ownership is developed through love and appreciation.

Flagships of Stewardship Success

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Environmental Stewardship has been running strong since 2002, with unprecedented success. Partnerships have been nurtured between conservation authorities and various types of landowners, such as communities, municipalities or private, commercial farmers to protect and preserve our country's natural heritage. We present four of the Boland's greatest stewardship success stories: The Fynbos, Fruit and Wine Biodiversity Agreement, the Paarl Mountain Contract Nature Reserve, the Elandsberg Contract Nature Reserve and the Van Der Stel Cluster Contract Nature Reserves.

THE GREATER CEDERBERG BIODIVERSITY CORRIDOR: EXPANSION OF PROTECTED AREAS

Key words: ecological corridors, stewardship, partnerships

Lötter, D. , Koch, A. , Burger, J. , Gouza, J. , Rheeder, J.

CapeNature – Greater Cederberg Biodiversity Corridor, P.O Box 26, Porterville, 6810

The Greater Cederberg Biodiversity Corridor (GCBC) is a partnership-based initiative that aims to secure the conservation of globally significant biodiversity in the Greater Cederberg Region, while ensuring benefits to people. It can be conceptualised as an area that includes a mosaic of land uses where people live and work in harmony with the biodiversity conservation guidelines for the landscape. This area stretches from Nieuwoudtville in the north to Groot Winterhoek in the south and from Elandsbaai in the west to the Tankwa Karoo in the east. The idea is to establish corridors of continuous natural habitat across the landscape. Corridors are a new approach to the effective conservation of species and critical habitats. Ecological corridors are also an important tool to adapt to and prepare for the effects of global climate change.

However, as the Greater Cederberg Biodiversity Corridor spans a large area, sub-regions (core corridors) have been identified to facilitate the management and establishment of these corridors. As large portions of important natural habitat are in private hands, the willingness of land owners to support conservation in these corridors will be crucial. Cooperation with landowners' through stewardship is an important link in the process to ensure the security of natural habitats **outside** existing protected areas. The further expansion of existing protected areas was initiated in the Sandveld core corridor and the Cederberg core corridor. To date **5425.4 ha** were secured through formal agreements in the Sandveld of which 3682 ha are endangered Leipoldtville Sand Fynbos under conservation (were secured through formal agreements). The focus is now also on the Olifantsberg core corridor which is strategically a very important link between the Sandveld and Cederberg corridors. To date **17300.2 ha** were secured through formal agreements in the Cederberg core corridor and **2000 ha** in the Olifantsberg core corridor.

The Milnerton Conservation Area: a Little Known Gem 1 Year Later

Keywords: Management, Conservation, Red Data species, Co-operation

Mandy Noffke and Jeremy Keyser , Planning in Balance, PO Box 719, Noordhoek, 7985
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At the Fynbos Forum 2007 A poster providing an overview of the Milnerton Conservation Area, its conservation importance and the management system approach being employed in the area was presented.

Now 1 year later, the poster for 2008 depicts some of the activities and management successes over the past year. These include;

- Gysbok drive counts were conducted revealing a population density that is most likely to be the highest known of these antelope in Africa. A Game Capture and the relocation of excess individuals was carried out to reduce the population density and population pressure.
- A Controlled burning programme commenced with the first block burn being successfully carried out despite being completely surrounded by development.
- Infrastructure improvements and maintenance has also taken place to help foster interest and develop regular conservation minded user groups while at the same time mitigating impacts associated with conservation in urban areas.

The challenges that are faced in the year ahead include control of invasive alien grasses and domestic cats. Maintaining public awareness and continuation of a cooperative relationship between all role players including the City of Cape Towns Biodiversity Management Branch.

Plant Monitoring Day: Outdoor Education and Conservation Action in South Africa's Biodiversity Hotspots

Keywords: Plant Monitoring Day, education, public involvement

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The Cape Floristic Region (CFR) is a designated UNESCO World Heritage Site renowned for its high species richness and endemism. Presently, 20% of CFR plant taxa are rare or threatened with extinction¹. The key to successful conservation lies not only on policy and management but also active public involvement. In this context, the Custodians of Rare and Endangered Wildflowers and the Open University initiated 'Plant Monitoring Day' in 2006, an educational event in mid-spring (September), where students and their teachers and eco-club volunteers monitor core species in their locality. Data collected is also used to show regional trends and supplement classroom science lessons.

2008 marks the national launch of Plant Monitoring Day, with the event taking place at 13 sites across 4 provinces, the Northern Cape, Western Cape, Eastern Cape and Kwazulu-Natal.

¹Victor et al in prep., 2007

Update on the City of Cape Town's Biodiversity Network

Key words: conservation planning, habitat quality

Pat Holmes, Cliff Dorse and Julia Wood, City of Cape Town

During the past year, areas identified from aerial photographs as natural habitat remnants were ground-truthed. They were allocated a habitat quality value if intact, or removed from the remnant layer if transformed. Sites previously overlooked were added to the remnant layer. A C-plan analysis was re-run on this data set, selecting the high ahead of the low quality remnants for each vegetation unit. Species data used in the analysis included Protea Atlas Project, SaSflora and CREW databases. Results are presented as a Biodiversity Network map and statistics on vegetation targets, irreplaceability and availability.

LINKAGES IN THE LANDSCAPE: INTEGRATING ECOLOGICAL CORRIDORS INTO URBAN LANDSCAPES (A CASE STUDY)

Keywords: Linkages, Corridors, Urban

Dale Holder & Francini van Staden (HillLand Associates), GEORGE

Habitat loss and fragmentation have been recognised throughout the world as a key issue facing the conservation of biological diversity (IUCN 1980). Human Activities have changed the environment to such an extent that the dominant landscape patterns are mosaics of human settlements, agriculture and scattered fragments of natural ecosystems. It is therefore of paramount importance for land managers and planners to maintain and restore connectivity of habitats in developed landscapes. This case study will look at practical examples of how this has been done within a developed area on the Garden Route.

Biodiversity Corridors on the Schapenberg

Key Words: biodiversity corridors, conservation

Andreas Groenewald, Heather Epstein and **Dianne Marais**

Schapenberg-Sir Lowry's Conservancy, PO Box 246, Sir Lowry's Pass

The Schapenberg-Sir Lowry's Conservancy, home to 650 – 750 fynbos species, was initiated by the Helderberg Conservation Forum and private landowners in 2000, with the vision to promote awareness and preservation of the natural environment on the Schapenberg hills and adjacent mountain slopes.

One of the main objectives of the Schapenberg Sir Lowry's Conservancy is to protect the indigenous fauna and flora of the region, including the threatened and fragmented renosterveld. This can be achieved by creating biodiversity corridors across the Schapenberg amongst the farming and development areas providing ecosystems for the continued survival of the highly threatened fynbos as well as associated approximately 200 bird species, numerous mammals (Cape Fox, caracal, Cape Hare, cape clawless otter, large and small grey mongoose, large and small spotted genet, grysbok, steenbok, duiker, porcupine, and African Wild cat), reptiles, tortoises and insects etc.

This presentation will describe and illustrate the proposed biodiversity corridors extending from the Hottentot Holland Mountains in the East to the Western most point of the Schapenberg close to Somerset West.

PICTURES OF POSTERS

INTERFACES 2008

Not all posters have had pictures sent in for the programme, but please see the list of all posters below, and in the far column you will see which ones have been submitted, and are in the programme on the next few pages.

No	Sessions, & Poster Titles	Authors	Picture
	Soil, Water & Nutrients		
1	Plant and soil properties on and off <i>heuweltjies</i> in the Succulent Karoo and Fynbos regions of South Africa	Booi, N	YES
2	The role of fog and dew as moisture sources on soil respiration and nutrients recycling in the succulent Karoo biome	Nyaga, J. M.	YES
3	Occult Precipitation And Related Seasonal Variations In Chlorophyl Fluorescence, Leaf Nitrogen, Phosphorous And Water Content Of Different Succulent Karoo Species	Matimati, I. ¹	YES
4	Soil nutrient enrichment by the invading <i>Acacia mellifera</i> in he Molopo Area	Malan, P	YES
	Invasives:		
5	Fungal endophytes: are they a potential mechanism for plant invasiveness?	Den Breeyen, A.	YES
6	Evaluating the Management of Invasive Alien Plants in the CFR: Overview of the project	Roura-Pascual, N ¹	YES
7	Evaluating the Management of Invasive Alien Plants in the CFR: Identifying Priority Areas for Alien Clearing	Roura-Pascual, N ¹	YES
8	Evaluating the Management of Invasive Alien Plants in the CFR: Impact of Different Management Strategies over Time	Krug, R. M. ¹	YES
9	Plastic responses to different habitat types contribute to <i>Echium plantagineum</i> invasiveness in the Western Cape, South Africa	Sharma, G.P.	YES
10	Phenotypic Plasticity in Wood Anatomical Properties: Relation to plant-water relations of selected woody native and invasive riparian species	Crous, C.J.	YES
11	Impacts of Alien <i>Acacia</i> on Fire Regime and Their Influence on Plant Succession	Harvey, W	
	Animals in space and time		
12	Indian House Crow Eradication Project – Cape Town Metropole	Gudlindlu, D.	YES
13	Eradication of Alien Fish at Century City	Miller, J.	YES
14	Toads sharing secrets of dispersal: unraveling how western leopard toads survive in an urban environment	Feldman, F.	YES

15	The means of polyploidy by the African tetraploid sand frog <i>Tomopterna tandyi</i> , potentially having crossed biome boundaries	Jacobs, K.	
16	The Impact of Habitat Destruction on <i>Heleophryne rosei</i> population of the Cape Peninsula	Lumkwana, E.S.	YES
17	Fragmentation and birds: Do species and feeding guilds response differently to fragmentation in different vegetation types?	Kieck, M.B.	YES
18	Re-Introduction of Klipspringer (<i>Oreotragus oreotragus</i>) into the Table Mountain National Park	Marell, E.	
19	Is the Cape Floristic Region insect poor? Identifying research needs	Veldtman, A	YES
20	Mite (Acari) diversity in the infructescences of <i>Protea</i> species	Theron, N	YES
	Ecosystem service identification, characterisation and degradation		
21	Forage availability across temporal and spatial scales in the Western Cape: The hidden pollination ecosystem service.	Rademan, M	
22	Fungibility and scalability of ecosystem services: The Fynbos as a case study	Chisholm, R	
23	Biological Assessment of the Breede Water Management Area using Geomorphology index	Radzilani, P. M. & Williams, G.	
24	Wetland types of the North-West Sandveld and Saldanha Peninsula	Snaddon, K.	YES
25	Forage preference and plant palatability across a grazing gradient in an alluvium Fynbos-Renosterveld mosaic	Makady, E.	YES
26	Impacts of degradation on critically endangered Oudtshoorn Gannaveld	Wheeler, Alan	
	Fire ecology		
27	The Fire History of Protected Areas in the Western Cape: GIS as a Management Tool for protected Area Managers	Purves, A.	
28	The consequences of frequent fires on Strandveld vegetation, Cape Town	Hoarau, M.	YES
29	Rock protects succulents from Fynbos Fire	Dean, W. Richard J.	
	Climate change, mapping and monitoring		
30	Effects of climate warming, soil N enrichment and an alien-invasive grass on post-fire recruitment in a fynbos ecosystem	Ruwanza S. ¹	YES
31	Demography of the Kokerboom <i>Aloe dichotoma</i>	Rebelo, A.G.	
32	The decline of the Clanwilliam cedar (<i>Widdringtonia cedarbergensis</i>) over the last 75 years as revealed by historical photographs	Bonora, D.V.	YES

	Restoration		
33	Fallow land recovery at Postberg, West Coast National Park	Kraaij, T.	YES
34	Restoration of the Tokai Core Conservation Site: the significance of fire	Rebello, A.G.	
	Conservation partnerships & civil society		
35	Evidence of environmental education effectiveness	Strydom, W.F.	
36	Our Van Der Kempskloof! Our Heritage!	Jonas, P.N.	YES
37	Performance Based Management System in the City of Cape Town	Wood, J.	
38	Urban Nature Conservation The Broader Picture	September, J.	
39	Flagships of Stewardship Success	Fourie, H.C. ¹	
40	The Greater Cederberg Biodiversity Corridor : Expansion of Protected Areas	Lotter, D.	YES
41	The Milnerton Conservation Area a Little Known Gem 1 Year Later	Nofke, M.	YES
42	Plant Monitoring Day: Outdoor Education and Conservation Action in South Africa's Biodiversity Hotspots	von Witt, C.	
43	Update on the City of Cape Town's Biodiversity Network	Holmes, P.	
44	Linkages in the Landscape: Integrating Ecological Corridors into Urban Landscapes (A Case Study)	Holder, D	
45	Biodiversity Corridors on the Schapenberg	Groenewald, A ¹	

Paper Abstracts

3-7 August 2008

Interfaces: issues, opportunities, challenges and approaches to creative problem solving within, between and beyond the Fynbos Forum and Arid Zone Ecology Forum communities

Key words: communication, innovation

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“Keep it simple; as simple as possible, but no simpler”. Albert Einstein’s famous quote has inherent appeal, describing an approach to science that has yielded advances in knowledge – using Ockham’s razor; we have advanced understanding by reducing systems to simple parts; asking elegant questions to build theory. But as the Fynbos Forum and Arid Zone Ecology Forum ponder the immensity and complexity of global problems such as climate change, environmental degradation, food security, energy production, all which have very real local impacts, our advances have met with cries that we seem to know more and more about less and less. Cries that we are not producing the answers or the human capacity to handle such challenges, and that the “specialization of sub- sub- sub-disciplines is creating barriers to the flow of information”. Have we, in the process of keeping it simple, oversimplified? Can we look beyond the disciplines, combine forces and invent hybrid solutions to solve these real-world challenges? The word “interfaces” is a union of “inter”, meaning “between” and “facio”, “to make” or “to do”. In linguistics, interfaces 'are individual components' of grammar which do not function in isolation. Thus the rules of one component can depend on or affect those in another component. With this in mind, the Fynbos Forum and the Arid Zone Ecology forum have combined forces in this experimental joint conference, “Interfaces” to explore commonalities and to forge links across biome boundaries. There are many layers to the dialogue, which we hope will strengthen links and spark innovation between people, theory and practice; process and pattern; evolution, ecology and conservation; biological and physical; space and time. In this plenary, I explore the origin and intention of the idea of “interfaces”, using illustrations from my own experience.

ECONOMIC DEVELOPMENT IN SOUTH AFRICA: FACING THE REALITY OF RESOURCE CONSTRAINTS AND POLITICAL SCHIZOPHRENIA

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It is both a challenge and reality that conservationists, using the term in a broad sense, and entrepreneurs seeking business development will have to collaborate if they are to achieve their respective objectives. This is since resource constraints, such as energy, water, and other ecosystem services produced by intact natural capital and biodiversity are increasingly becoming the limiting factor to economic development. In the light

of the above it is in the interest of the entrepreneur, and with it the government forces supporting business development, to work with conservationists to promote and improve resource security by investing in the limiting factor. In the same vein conservationists will have to embrace the fact that we now live in a “full” world and that, in order to preserve and conserve both species and ecosystems and its services in general, economic development and the improvement in the quality of life for all is of paramount importance. Failure to embrace economic development will render conservationists irrelevant with respect to the challenges broader society is currently facing, that at a time when society is in desperate need of the services conservationists can offer.

For conservationists and business developers to advance economic development from their respective vantage points symbiotically require economic policies that would strengthen their respective perspectives. This implies changing a few conflicting, and even schizophrenic, policies. The reasons are clear for all to see. South Africa is in the grip of water and energy insecurity and its biodiversity is constantly under threat. Concurrently large portions of the country’s population are trapped in poverty at unacceptably levels that only business development can and will address. This, in-turn, prompts some decision-makers to try to hasten economic growth – rather than development – with the aim to alleviate poverty with devastating ecological consequences. The challenge therefore remains: promoting economic development without compromising the country’s natural capital base. Conservationists have a meaningful and constructive role to play answering this challenge.

Addressing the issues listed above, this paper will, after providing a theoretical conceptualisation of the problem at hand assess the country’s development profile by considering the extent of poverty and its water and energy intensities and insecurities, followed by the government’s current responses to the challenges. This is followed by a section proposing a series of alternative development options, enriched with some evidence from current case studies. Finally a few concluding remarks are offered in the hope of stimulating debate on the topics highlighted in the paper’s title.

Do market prices reflect the economic potential of grazing land in Namaqualand?

Key words: Stocking rate, economic potential, Karoo

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It has always intrigued me what the market pays for grazing land in Namaqualand – Do market prices reflect the economic potential of the land? I set out answering this question by first determining the carrying capacity of veld in Namaqualand by extrapolating the Elsenberg recommended

stocking rates using (1) interpolated mean annual rainfall and (2) NDVI. Both variables produce similar results and show high correlations ($r^2 > 0.8$) with the expert recommended stocking rates. Only the NDVI model was used to calculate total farm carrying capacity. Total farm carrying capacity gives an indication of the economic return (R/farm or R/ha) on a property should livestock density be held within accepted limits. The “sustainable economic” value of farms was estimated as the size of the loan that could be paid off given the return less 7% profit for the farmer. These estimated farm values were compared to recent farm sales for the region and it is clear that current land prices are in excess of what my simple model predicts I should paying for grazing land. At current interest rates it is not possible to borrow money from a bank, buy a farm and expect to pay off the loan let alone make a profit by farming livestock. This understanding has important implications for understanding rural livelihoods as well as predicting future patterns tenure in the Karoo. More importantly, the difference between the sustainable economic and market value of land would tend to drive landowners to overstock their land in an effort to make a profit.

Fungibility and price elasticity of ecosystem services: The Fynbos as a case study

Key words: ecosystem services, Fynbos

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Ecosystem service valuation is a tool for resolving conflicts between economic and environmental values. Particularly intriguing are cases where trade-offs exist between different ecosystem services such as carbon sequestration, water supply and biodiversity conservation. Two concepts from economics, fungibility and price elasticity, are key to understanding these trade-offs.

Fungibility means that a commodity is completely interchangeable with other commodities of the same type. Carbon sequestration and biodiversity conservation are fungible ecosystem services, because it does not matter where they occur. Water supply, on the other hand, is non-fungible, because its value is derived from proximity to human settlements.

Price elasticity is the change in price of a good or asset as its supply increases. On regional scales, carbon sequestration is an inelastic ecosystem service because the price of carbon is effectively constant. By contrast, biodiversity conservation is highly elastic, because its per-unit value decreases as more is conserved.

In the South African Fynbos, afforestation has potentially positive impacts on carbon sequestration but negative impacts on other ecosystem services. Since the dollar-per-tonne value of carbon sequestration is constant, spatial variability in the value of other ecosystem services determines the outcome of cost-benefit analyses. In water catchments that coincide with human settlements or have high species endemism, it is straightforward to make an economic case against afforestation. In more remote areas, or in areas with low endemism, these arguments become more difficult.

As carbon sequestration to mitigate climate change becomes a global priority, trade-offs between ecosystem services will become more apparent. The concepts of fungibility and price elasticity help us understand how these trade-offs vary spatially. In some areas, these analyses will conflict with our intuition, in which case we must strive for a deeper understanding of the science, economics and philosophy of conservation.

The multifunctional nature of agricultural land: opportunities for conservation?

Keywords: Multifunctional landscapes, lifestyle buyers, characteristics of land

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Rural land possesses many characteristics that bear value to the buyers of such land. Traditionally agricultural land was valued for its productive capacity, implying that its extrinsic value as production factor that provides income was the main determinant of its market value. There is a transition in the use of agricultural land towards a multifunctional environment where alternative uses of land (emphasizing different characteristics) such as for lifestyle, recreation and conservation purposes are evident. Some high net worth buyers of agricultural land from outside the agricultural sector seem to be attracted to the intrinsic value of the land, where non-financial considerations of owning the land are important and buyers are often willing to pay a premium for it. In this multifunctional agricultural landscape, the value of land does not only represent its agricultural potential, but other values as well. The characteristics of agricultural land bought for lifestyle purposes were identified (what makes buyers pay more for a piece of land) in an extensive farming area within the Western Cape, comprising of Beaufort-West, Laingsburg, Touwsriver and the Ceres-Karoo. This area falls within the Nama and Succulent Karoo biomes. The same was done for an intensive farming area, comprising of Stellenbosch and Paarl, which is situated within the fynbos biome. The characteristics valued by buyers differed for each area, but some broad conclusions can be drawn. Buyers' willingness to pay a premium for natural areas or areas with natural scenery indicates the substantial value thereof, while their positive attitudes towards the preservation of land in its natural state create opportunities for conservation agencies to get involved with, for instance, the provision of extension services.

Looking for novel arid area crops for climate change adaptation – what species and approaches have we got to work with?

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The need to develop new enterprises that can benefit the poor, as well as develop new economic sectors (like building up a bio-based economy based on biotechnology and novel attributes of species) is one of the factors driving research to commercialise indigenous species in South Africa. Currently, the CSIR-led programme to investigate indigenous plants, novel active compounds and indigenous knowledge pertaining to the use of medicinally active plants is the most sophisticated attempt to benefit plant biodiversity in South Africa.

However, there are about 2000 other plants in Africa which have sound nutritional properties, drought tolerance and ability to produce a yield under harsh conditions. The nutritional status of Africa is seen as “alarming” from an international perspective. Thus, these plants should be developed for food security reasons, but are not getting the research attention they deserve. The Department of Science and Technology’s Climate Change Technology Needs Assessment (2007) has identified agriculture (along with the water sector and forestry) as being vulnerable in South Africa, and that to cope with climate change, the country will need new crops, new cultivars and new cultivation methods. International documents state that Africa has “five years” to get adaptation measures in place for agriculture, a timeframe that would be impossible to meet for many countries. The challenge is to find a new arid agriculture, based on novel plant species.

However, the development, commercialisation and production of new crops plants is not a straightforward matter, with access and benefit sharing, land issues, and problems with alien and invasive species being complex issues to start with. Then follows the agronomy difficulties and development of cultivars, production and marketing issues, and quality control. These issues will be explored, using Hoodia, rooibos tea and marula as examples, and relating this to what would be needed to develop “a new arid agriculture”.

Plant-pollinator interactions and implications of global change on web structure

Keywords: plant-pollinator interactions, extinction vulnerability, global change

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The current ‘pollination crisis’ as a result of anthropogenic impacts has increased interest in plant-pollinator interactions worldwide. In particular human-induced climate change has become a current threat to the persistence of these systems. Biodiversity includes not only species but the interactions between species, and scientific research can aid in predicting and potentially preventing the breakdown of ecological interactions that could lead to biodiversity loss and species extinctions. In order to predict system responses it is essential to first have a clear understanding of system function. Plant-pollinator webs have typically been described as nested, such that specialist species interact with subsets of species which interact with generalists. This structure may shield species from extinction: if extinction starts with specialists, their loss is unlikely to be

perpetuated through the web because the species to which specialists are linked are generalists that can rely on multiple surrogate species. Other studies have described interaction webs as compartmented, whereby species interactions within a compartment are stronger than outside of the compartment. This web structure demonstrates higher vulnerability to extinction as there is less buffering of species. We aim to determine the structure of a plant-pollinator web in the Cederberg, Western Cape, South Africa. The Cederberg falls within the Cape Floristic region which is a global biodiversity hotspot, and is predicted to suffer increased temperatures and more variable rainfall patterns due to climate change. We observed all plant-pollinator interactions within a one hectare plot. Despite debate concerning whether generalization in pollination systems is the globally accepted evolutionary trend, the Cape flora exhibits a number of remarkable specialized pollination systems, and we predict a compartmented web structure based on the number of specialized pollination systems in the area. We aim to determine the conservation implications of web structure based on modeled pollinator removal and subsequent potential decoupling of interactions.

Biological control – always an ecosystem service?

Key words: Ecosystem services, biocontrol, water provision, crop pests

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Biological control has been used to reduce the impact of alien invasive plants on biodiversity and ecosystem functioning. In South Africa, it has been used to help reduce the extent of invasion of thirsty plants like the Australian *Acacias*, thereby providing an ecosystem service of increasing water supply to catchments. Yet biological control also carries risks, which themselves may constitute an ecological disservice. We investigated whether or not the presence of a biological control agent of *Acacia saligna*, the gall-forming fungus, *Uromycladium tepperianum*, in the citrus-producing area of Citrusdal, South Africa, was providing alternative habitat for the crop pest *Cryptophlebia leucotreta* (False codling moth). We established pheromone-baited traplines out into natural vegetation from the centre of 4 patches each of *A. saligna* only, *A. saligna* and orchard, and orchard only. We also collected 7500 cm³ of gall created by *U. tepperianum* at each site, keeping these in a growing room for two months, to ascertain which invertebrates are using these galls. Three *C. leucotreta* were trapped in alien only sites, 151 in orchard sites, and 83 in alien and orchard sites. After two months, 90 *C. leucotreta* had emerged from galls collected from alien only sites, and 137 from aliens growing near orchards. These observations may be partially explained by farmers' application of pesticide to orchards, in response to pest densities.

Although pheromone traps did not capture as many moths as the numbers emerging from galls would suggest, *C. leucotreta* is clearly using galls as nursery sites, and may be disrupting the favoured method of moth control of sterilized insect release. That said, this information helps conservationists to incentivise farmers to keep their lands free of *A. saligna* to minimise refuges for this crop pest.

Why this place is the greatest interface. Determinants and drivers of vegetation pattern and process in a remarkably diverse region, the Bokkeveld Plateau.

Key words: land use, diversity, conservation

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An area of unparalleled botanical interface, the Bokkeveld Plateau lies at the juncture of the Fynbos and Succulent Karoo biomes. Within an area of 25x25km around Nieuwoudtville, there are ten distinct vegetation types from three biomes. However, equally important to such biogeographic considerations is the great variety and combination of edaphic and climatic gradients present in the area. This unique physical template is described and discussed in terms of the role it plays as a driver of the diversity of the area and in the dynamics of the vegetation. Data demonstrating the exceptional species richness and unique characteristics of the vegetation is presented. The diversity of the area has however also encouraged a wide variety of land-use practices, some of which pose a serious threat to the diversity of the area. Finally I examine the interface between conservation and agriculture and tourism and conclude that while conservation and agriculture can interact strongly as they compete for the same land, tourism plays a peripheral and minor role in influencing land-use decisions in the area and probably cannot be used as a motivation for conservation.

Fynbos midst the Strandveld

Key words: Namaqualand Sand Fynbos, vegetation mapping, patterns of diversity

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Namaqualand Sand Fynbos (NSF) is, by some distance, the driest of all fynbos types (Mucina and Rutherford 2006). Almost certainly relictual from a wetter past, NSF exists largely as isolated islands in a matrix of arid strandveld and succulent karoo vegetation types more typical of the Sandveld of the Namaqualand coastal plain. Due to its isolation and perceived low levels of threat by transformation, not much work has been done in this unit and virtually nothing is known about the true extent of this unit, patterns of diversity or environmental determinants. In spring 2007 two collecting trips were undertaken to survey and map the extent, determine species/vegetation sub-unit composition and take soil samples within this vegetation unit. This will be augmented by at least one fieldtrip in spring 2008. By the end of this study in September 2008 we hope to have a better understanding of the floral determinants of this fascinating vegetation unit. NSF has very few endemic species and is composed mostly of species more typical of sand fynbos south of Elands Bay. As it occurs on the extreme arid margins of fynbos viability, NSF can potentially be of use as an early warning system for predicting how more mesic sand fynbos types will respond to climate change. Most intriguingly what role fire plays in NSF is uncertain as no evidence of recent fire could be found.

Title: Response of Cape lowland vegetation to fragmentation: Clues from plant traits

Key words: Cape lowlands, Fragmentation-response, Plant functional types

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Biodiversity in the Cape lowlands is under severe threat from habitat transformation, especially human-induced habitat fragmentation. Though structurally similar, the three main vegetation types of these lowlands i.e. fynbos, renosterveld and strandveld are floristically different, particularly at the species level. We set out to determine how these vegetation types will respond to habitat fragmentation based on their dominant plant functional response types. To achieve this, we sampled four sites each for three representative vegetation units (Atlantis Sand

Fynbos, Swartland Shale Renosterveld and Langebaan Dune Strandveld), and assigned species according to plants traits selected to reflect their persistence within such a highly fragmented landscape. After subjecting the data to classification tree analysis, we found that the Cape lowlands are characterized by eight main plant functional types (PFTs), four of which are mostly found in fynbos. Two of these PFTs are under serious risk from fragmentation, indicating that Atlantis Sand Fynbos is the vegetation that is most at risk from fragmentation. This finding ties with results from a previous diversity study, though the magnitude of the risk depends on the matrix type and its resistance to movement of species.

Bird Species and Feeding Guild Responses to Habitat Fragmentation

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Habitat fragmentation is a major threat to the biodiversity of many landscapes. A variety of threats, such as size effects, isolation and edge effect, all contribute to the loss of biodiversity, homogenization of diversity and the loss of many sensitive and specialized species. Birds are known to be very sensitive to habitat fragmentation and it has repeatedly been shown that size effects are the main culprit in reducing species richness and diversity. The avifaunal assemblages in 40 fragments in the west coast renosterveld bioregion was surveyed using single point count stations in each fragment in May and June 2007. Sampling intensity was kept constant and bird species and relative abundances were recorded using visual and audio identification. Species richness and diversity was highly correlated with fragment size, isolation only had a small effect. A set of highly sensitive insectivorous species and three feeding guilds were identified as being the main contributors to the loss in species richness and diversity. This study confirmed the known threat of size reductions, and identified two mechanisms that are pivotal to the variation in species richness and diversity in fragments of different sizes. The loss of insectivorous, granivorous and frugivorous birds is expected to have detrimental effects on ecosystem processes, hence the continuous monitoring of these guilds as well as selected species is essential for conservation strategies.

The Mesemb Mapping Project: progress to date.

Key Words : Aizoaceae / Mesembryanthemaceae, mapping, mesembs, Phytogeography, Red listed species.

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Mesembs are almost entirely endemic to southern Africa with only a few species occurring naturally outside this area. Exceptional diversification has produced over 1 700 species within the group to form a diverse component of southern Africa's arid land flora, however many taxa remain unknown having only been collected from the type locality.

Initially, when work on mesembs at the National Herbarium (PRE) commenced it was realized that only a third of described species were represented by a specimen /specimens at (PRE). In order to understand this group thoroughly it was thus necessary to be able to examine good material of its members. It was thus decided to initiate a programme where good specimens would be collected for PRE, filling the distribution gaps that existed. The Mesemb Mapping Project (registered project at SANBI) was initiated in 2001.

Work to date will be discussed.

With some mesemb taxa having a restricted distribution they are seriously endangered due to habitat loss, while a large many are classified as data deficient due to uncertain affinities. Although partly covered in the Red Data List of southern African plants, insufficient knowledge of these mesemb species has limited coverage of this work. Mapping the group has afforded a better understanding of many aspects of mesemb taxa.

Soil variation in and between two heuweltjies in the Oudtshoorn area

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Two heuweltjies were examined in the Oudtshoorn region by digging deep trenches through them to include part of the non-heuweltjie area. This was done just after the area received exceptionally high rainfall during August 2006. The reddish coloured Enon derived transported material forms the parent material of the soil in which two types of hardpans dominate. Heuweltjies are dominated by a calcrete (hardpan carbonate horizon) near the centre and dorbank towards the periphery. Dorbank occurs in the area between heuweltjies. The main objective was to find out about the soil water distribution pattern in and between heuweltjies and at same time observe morphological and physical differences and to chemically characterize selected soil samples. Results showed no stones in heuweltjie up to a depth of 1.5 m, compared to evenly distributed stones in non-heuweltjie area; less soil water in calcrete compared to dorbank layer; more soil water in horizons above the calcrete, than above

dorbank; higher C% in topsoils on than between heuweltjies; very high boron content in all horizons of heuweltjies and a generally higher exchangeable basic cation content in horizons on than between

“Nothing stays the same but if you're willing to play the game it's coming around again”*
Cluster roots and nutrients

Key words: low CEC soil, mass flow, transpiration

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Conventional wisdom on cluster roots states that these determinate clusters of rootlets acquire nutrients (mostly sparingly soluble phosphorus {P}) by chemical extraction of soil volume limited to the root itself. Conventional wisdom also states that P moves in soil chiefly via diffusion and not mass flow. Cluster roots are most well known from the Proteaceae while analogous structures are found in the Fagales, Cucurbitales, Rosales and Fabales of Mediterranean Biomes with soils poor in nutrients. We hypothesize that additional to chemical extraction, cluster roots have access to vastly larger volumes of soil by making use of transpiration-driven mass flow. Our hypothesis was supported by (1) demonstrating significant mass flow of P in low CEC Fynbos soils (Coastal Dune 5%, Calcareous Fynbos 9%, Acid Sand Fynbos 33%), compared to clayey soils (0.8%); (2) mass flow of soluble P from poorly soluble sources: CaHPO_4 (14%), FePO_4 (11%); (3) discovery of *Morella cordifolia* (Myricaceae) cluster roots in various stages of CaCO_3 -rich concretion (root casts) in a Ca-rich, N and P poor aeolian dune sand which formed as a result of transpiration-driven mass flow; and (4) that cluster roots take up not only poorly available N and P, but inorganic N as well, a nutrient chiefly delivered to plants by mass flow. We also confirm and characterize carboxylate exudation (i.e. for chemical extraction of soils) in local Proteaceae and a Fabaceae species. We conclude that cluster roots acquire nutrients not only via chemical extraction but also from a much larger area around the root via transpiration-driven mass flow in low CEC soils. This is something that would only make sense in soils with low CEC where low-mobility nutrients such as P can move by mass flow and where water is available to do this when cluster roots form (Winter).

*Carley Simon (1987)

Do cluster roots of Proteaceae facilitate access to soil organic phosphate?

Key words: cluster root, phosphatase, soil type

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Proteaceae are adapted to the nutrient-poor soils of the Cape Floristic Region (CFR). These soils are generally acidic and low in plant-available phosphorus (P), with a significant proportion of soil P occurring in organic form. Soil P acquisition by Proteaceae is largely facilitated by cluster roots which are composed of densely branched determinate lateral roots and root hairs. Cluster roots are known to exude P-solubilising compounds into the rhizosphere, notably organic acids and phosphatases. It is known that phosphatase hydrolyses organic phosphate esters to produce orthophosphate (Pi), but the extent to which this makes soil organic P available for plant uptake is poorly understood. Phosphatase activities in cluster roots of wild populations of Proteaceae (*Leucadendron foedum*, *Ld. salignum*, *Ld. meridianum*, *Leucospermum praecox*, *Protea obtusifolia*, *P. repens*) were measured in limestone, acid sandstone, alkaline sand and clay sandstone soils. Cluster root phosphatase activity ($\mu\text{M P}_i\text{g}^{-1}\text{min}^{-1}$) differed significantly ($p < 0.001$) between soil types, where average phosphatase activity in limestone soil was 16.25 ± 3.07 ; alkaline sand was 69.52 ± 6.54 ; clay sandstone was 79.36 ± 7.31 ; and acid sandstone was 92.83 ± 16 . Cluster roots isolated from alkaline calcareous soils generally had lower activity than those from acidic soils, including those of *P. repens*, which occurred in all soils. From this it was concluded that the activity of exuded phosphatase makes a significant contribution to plant phosphorus nutrition in certain soils, and is of variable importance according to plant species and soil type.

Soil biodiversity conservation: Ecotoxicology as a tool to investigate the effects of commercially important pesticides on selected soil organisms

Key words: pesticides, earthworms, biomarkers, life cycle effects

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Agrichemicals are widely used in the South African agriculture sector and pesticide pollution from agricultural sources has been identified as one of the major sources of environmental contamination in South Africa. Evidence exists that many non-target animals in and around agricultural areas are affected due to the mobile nature of pesticides and intermittent nature of pesticide application. The extent to which terrestrial non-target animals are affected by exposure to the organophosphates chlorpyrifos and azinphos-methyl was investigated through monitoring selected biomarker responses and life cycle effects under laboratory conditions in the earthworm *Eisenia andrei*. Animals were subjected to an intermittent exposure regime for a period of three months in order to assess the effects of repeated pesticide application on different life cycle parameters. The endpoints that were assessed include mortality, growth, maturation, reproduction, acetylcholinesterase activity and neutral red retention time. The results indicated that for similar exposure regimes, azinphos-methyl was more toxic to *E. andrei* than chlorpyrifos and

detrimentally affected survival, growth, reproduction and biomarker responses. The present study suggests that exposure interval may have a more pronounced effect in inducing a toxic response than exposure concentration, irrespective of the pesticide used. The information presented here aims to improve the understanding of biological impacts of pesticide pollution on the terrestrial environment and can aid in optimising farming practices such as pesticide application, in order to protect no-target organisms in agricultural areas.

Palaeoecology, Fire Management and Vegetation Dynamics in the Cederberg Wilderness Area

Key Words: Palaeoecology, Management, Cederberg

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The Cederberg Wilderness area, 200 km north of Cape Town, has a long history of human occupation, that can be described in terms of four distinct phases; stone age hunter gatherers, pastoralists, European colonial settlement and more recently management as a wilderness area. All of these phases have used fire as a management tool. While pastoralists used fire to stimulate grazing, the current fire management policy is one of rotational burning to decrease fuel loads. Here we use fossil pollen and charcoal analysis from a sediment core collected from a wetland at De Hoek in the Cederberg Wilderness Area to determine the extent to which these differing fire management policies have affected the local vegetation composition, over the past 1000 years. We also used historical narratives and fire records to calibrate our palaeo records. This integrated approach allows current management decisions to be placed in a historical and ecological context, important for interpreting the decline of the endangered Clanwilliam Cedar. An understanding of how the system has responded to past disturbance will help to inform current management and also in predicting how the system may respond to future change such as global warming.

Exploring weather as a driver of large fires

Key Words: large fires, fire danger indices, synoptic climatology

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A fire results from a combination of three important factors; a source of fuel, an ignition point and favourable atmospheric conditions. Recent large fire events are challenging our previous understanding of how these factors interact; especially the assumption that fuel accumulation

controls fire frequency. International studies suggest that weather may be a stronger driver of large fires than fuel. This paper attempts to understand weather as a driver of large fires in the Western Cape through the use of traditional and alternative techniques. Fire danger indices are a traditional weather based tool used worldwide to make decisions with regard to daily fire management. I evaluate three fire danger rating models against fire data from the Western Cape to assess their ability to predict large fires. An alternative technique for analysing weather effects on fire is a synoptic analysis of favourable burning weather. Synoptic climatology can be analysed in the form of self-organising maps known as SOMs. Through the use of SOMs I aim to present a novel method of analysing weather as a driver of large fires. Finally the difference between the two analysis techniques is discussed with respect to their relevance to large fires in the Western Cape

***Firing the interface!* – Fountain grass invasion could change fire regime in the Succulent Karoo and Fynbos interface.**

Key words: fire, fuel loads, *Pennisetum setaceum*, Invasive Alien Plant

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The Nama and Succulent Karoo Biomes with their low rainfall and productivity seldom accumulate sufficient combustible fuel to support fire. Invasive alien grass, *Pennisetum setaceum* (fountain grass) can substantially alter fuel loads and fire regimes which could have significant consequences on this ecosystem's natural resources and function. We tested the hypotheses that; 1) fountain grass at a biomass of >5 t/ha would carry a fire in Succulent Karoo vegetation, 2) such fire would ignite and kill indigenous plants and 3) a burned Succulent Karoo plant community would change, disadvantaging succulent species. We conducted fire experiments at Tierberg Karoo Research Centre in December 2006 and revisited them in September 2007 and March 2008. We selected ten plots in a transect, five treatment plots (5 x 10m) adjacent to five control plots (5 x 10m). After 15 months of follow-up monitoring in the burn plots, only the palatable species (e.g. *Tripteris sinuata*) and bulbs (e.g. *Gazania krebsiana*) had resprouted. Resprouting is an adaptive strategy to cope with herbivory and drought in this system, but resprouters can also survive removal of biomass by fire. Dominant non-sprouting species in this system (e.g. succulents) did not recover after 15 months. We suggest that further build up of fuel as a result of *P. setaceum* invasion in this region will compromise the composition, dynamics and

functioning of this ecosystem. Although fire may be essential in the neighbouring Fynbos (Swartberg – 15 km away) which evolved with long fire intervals driven by flammability of large shrubs, *Pennisetum* invasion may also be a threat by introducing short fire intervals and favour dominance of resprouters. Special attention to the control of this grass should be given to areas where incursions occur into the succulent Karoo, such as at the intersections of roads and rivers and at the Fynbos Karoo interface.

Effect of recurrent fires on subalpine reseeding Proteaceae

Keywords: youth phase, minimum fire interval, Swartberg Mountain Range

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The current fire interval threshold for the Swartberg Mountain Range area is thirteen years. This was based on previous studies that was done on reseeding serotinous species of Proteaceae, such as *Protea lorifolia*, *Protea eximia* and *Protea repens*. *Protea lorifolia* was used to set the threshold of potential concern for fire frequency for the Swartberg Mountain Range. It is now questioned whether this threshold of thirteen years is adequate to accommodate the youth phase of non-sprouting subalpine *Protea* species. The recently completed fire history analysis for the Swartberg Mountain Range shows areas that are subjected to frequent fires. This is of great concern. Frequently-burned areas that contain slow-maturing reseeding protea species need urgent attention. *Protea venusta* and *Leucadendron dregei* are both endangered species that occur in these frequently burned areas. It was therefore necessary to determine the length of the youth phase of both these endangered species to establish a potential new minimum inter-fire period. It was hypothesized that the current minimum fire-interval was too short to accommodate slow-maturing *Protea* species on the Swartberg Mountains. This study intends to answer questions such as: “Is the current minimum fire-interval optimal for slow-maturing reseeding species in the Swartberg Mountains?”, “Is the fire interval long enough to accommodate these species and to build up seed reserves?”, “Is *Protea lorifolia* still the slowest maturing *Protea* species in the Swartberg Mountain area as was found in previous studies? The results of this study will be presented and discussed.

Spreading the word: key elements of success of an awareness-raising programme such as Firewise South Africa

Key words: awareness-raising, fire-awareness programme, fire management

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Roughly 90% of 'unwanted' veld fires are caused by people and their activities. For this reason, veld fire awareness-raising programmes need to target people and communities resident within fire-prone regions. Advocacy, awareness and extension work are indispensable tools for promoting community participation, behaviour change and support for Integrated Fire Management. Firewise SA is a Working on Fire (WoF) initiated partnership, and the first coordinated, large-scale, national fire-awareness programme in South Africa. This paper explores the methodologies and operating principles that enable an awareness-raising programme such as Firewise SA to be implemented at the national scale whilst still addressing local dynamics. Key elements of an awareness-raising campaign include: (i) establishing the main message(s) of the campaign; (ii) determining the key audiences; (iii) designing messages effectively (e.g. content, presentation, branding); (iv) establishing the most appropriate communication strategy for reaching the intended target audience(s), ensuring it is appropriate to each audience; (v) monitoring; and (vi) keeping abreast of the latest developments in Fire Management to be able to determine the type of message conveyed. The manner in which Firewise SA has addressed each aspect above will be outlined, and critical elements of success of the programme will be identified. The transferability of the lessons learnt from implementing a large-scale yet flexible awareness programme will be highlighted, and the paper concludes by considering future steps in fire awareness-raising, in particular the need for more extensive collaboration between key stakeholders and partners in fire prevention and management.

Is the diversity of the Cape flora unique?

Key words: climatic stability, plant diversification, topographic heterogeneity

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The plant diversity of the Cape Floristic Region is regarded as being exceptional in an ecological and evolutionary context. The region supports about double the number of species predicted by models based on water-energy variables for regional floras globally. However, contemporary diversity patterns are profoundly influenced by evolutionary processes contingent upon idiosyncrasies of history and geography. The relatively recent appearance of dated molecular phylogenies, and their optimization in relation to habitat and geography, has provided hitherto unsurpassed opportunities to generate knowledge about the evolution of the Cape flora. Almost all studies invoke climatic deterioration during the Mio-Pliocene as the major trigger of radiations and subsequent speciation of Cape clades. While some do show the importance of edaphic heterogeneity for clade radiation, the evolution of this heterogeneity is not considered. Here we review the literature on the late Cenozoic geomorphic evolution of the Cape in order to assess the extent to which the changing nature of scenery and soils could act as a stimulus for plant diversification. Despite dating uncertainties associated with both the phylogenetic and geomorphic data, it appears that moderate uplift in the early and late Miocene, which significantly increased the topographic heterogeneity of the Cape, was an important driver of plant diversification. In particular, the massive increase in heterogeneity after the late Miocene event probably acted in synergy with rapid climatic deterioration, to produce the extraordinarily rapid diversification recorded for some Cape clades at that time. A comparison of the plant diversity

and palaeoenvironmental patterns of Mediterranean-climate regions provide insights regarding the “remarkable environmental conditions” of the Cape that have generated the high diversification and low extinction rates necessary to produce such a rich flora. These conditions are a gradual increase in topo-edaphic heterogeneity and relative climatic stability during the late Cenozoic.

PLENARY (SAEON)

Comparative Shrub Community Hydraulics in Mediterranean-type Ecosystems

Key words: Comparative Ecophysiology, Drought, Mojave Desert, Succulent Karoo, Water relations

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Arid and semi-arid shrub communities differ in their water use strategies in response to seasonal water deficit and may be differentially susceptible to extreme weather events. Among southern California plant communities, species display community specific suites of xylem and leaf traits consistent with different patterns of water use among communities. Coastal sage scrub species utilize shallow pulses of water, Mojave Desert scrub species rely on deeper water reserves, and chaparral species utilize both shallow and deep moisture reserves. Fynbos species display a similar water use strategy to the vegetative and climatically similar chaparral vegetation community of California as defined by their resistance to water stress induced xylem cavitation (Φ_{50}), their minimum seasonal water status (Φ_{wmin}), efficiency of xylem water transport (K_s), and xylem density, while succulent karoo species utilize a strategy that overlaps with that of the woody shrubs of the Mojave Desert. The convergence of community and species specific strategies between Mediterranean-type climate regions could provide useful predictions for species and communities most likely to be affected by global climate change especially in species, regions, or communities that have been little studied.

The role of water in ecosystem services: flows, exchanges and interdependencies

Keywords: ecosystem services, water fluxes, rainfall, evaporation, storage, flow regulation, water quality

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Even a cursory review of the rapidly growing literature will show that water features prominently among ecosystem services. But it will also find a wide range of ways in which those services are defined and where water is both explicit and implicit. Most classifications recognize regulation

of the flow and quality of water as services. Some also include the quantity of water as a water production service, the Millennium Ecosystem Service recognizes freshwater as a service in a way that implies that the quantity is the service. This is not strictly correct: water is not produced by ecosystems but is derived from rainfall. Ecosystems play a regulatory role because vegetation composition and above and below ground structure are key factors determining how much water is intercepted and transpired. Water differs from many other factors that sustain ecosystem services in providing or supporting them both at the local scale - where the rain falls - and at the larger scale of a river system or river basin – via the remaining water which flows in streams and rivers or beneath the surface to supply other areas. At the local scale water sustains all life and thus all production services. The water flow regulation service and ecosystems are interdependent. Flow regulation depends on water being captured and stored in soils, weathered profiles and rock aquifers and this depends on infiltration into, and percolation through the soil. Vegetation and fauna play a vital role in this function by providing the organic matter and bioturbation which develop the soil structure that regulates the water fluxes and water holding capacity. The flow regulation function is very important because more even flows sustain rivers in the dry season and make more water available for human use from a given water supply schemes. Water quality regulation also depends on interactions between water and the micro-organisms in the soil and exchanges across water-sediment interfaces along rivers which allow the organisms to degrade and remove pollutants and other harmful compounds.

Using traits to predict vegetation response to climate change: An example from the chaparral

Key words: cavitation, chaparral, climate change

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As the climate changes, climate models predict that many regions of the globe are going to become more arid, and the western United States is one such region. In the last decade, southern California has seen the two driest years in recorded history signaling that a drying trend is already occurring. To understand how ecosystems will respond to this climate change, it will be critical to know how the vegetation will respond. One approach to this problem is to measure traits that are indices of water stress tolerance of plants and communities as a means of evaluating their relative sensitivity to drought. In recent years, hydraulic traits, particularly resistance to xylem cavitation, has proven to be an important trait related to water stress tolerance among evergreen aridlands shrubs. In the present study, it is shown the cavitation resistance of stems and roots correlates with survivorship of water stress for evergreen chaparral seedlings in a common garden. During a recent drought in southern California, mortality of adult shrubs was surveyed along a chaparral/desert ecotone. It was found that the highest levels of mortality occurred in the taxa with the greatest levels of cavitation resistance. The results suggest that the utility of using cavitation resistance as an index of water

stress tolerance is contingent on developmental stage. The results also highlight the importance of other water stress tolerance traits such as rooting depth. The results are discussed in the context of life history type and a physiological model of plant mortality.

Patterns of drought sensitivity in the fynbos: Implications under changed climate?

Keywords: drought, climate change, plant ecophysiology

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Climate change scenarios for the southwestern Cape indicate the likelihood of warmer and drier conditions leading to increased periods of drought. Species distribution models indicate these changes could have severe implications for plant distribution in the fynbos. However, there has been little experimental work conducted on fynbos species in order to validate these models. We conducted a field drought experiment to assess the sensitivity of various fynbos growth forms (proteoid, ericoid and restioid) to drought. Rain was excluded from multiple 4m x 4m plots in the Silvermine section of Table Mountain National Park, over a summer. Plant responses to drought were varied and showed clear differences between the various growth forms. As predicted, the deeper-rooted proteoid (*Leucadendron lauroolum*) was least affected by surface soil drought over the summer. In contrast, there were rapid and severe responses to drought in the 3 species of *Erica*. Drought responses in the 2 species of restioids were less than predicted, possibly due to inputs of cloud-derived moisture. These results illustrate how variable the impact of drought may be on different growth forms within the fynbos. Consideration of these patterns might improve our ability to both forecast and detect the effects of climate change on the fynbos.

The influence of soil properties on “non rainfall” atmospheric water input.

Key words: fog, dew, direct water vapour adsorption.

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The South West coast of Africa is characterized by semi-arid and arid Mediterranean climatic conditions. Water scarcity is thus a limit to bio-productivity in these fragile ecosystems. “Non rainfall” atmospheric water (fog, dew, direct water vapour adsorption) is a characteristic of these areas playing a supplementary role and at times being the sole sources of water for organisms. Although much research on “non rainfall” atmospheric water has been conducted on the South West Coast this has focused mainly on fog while dew and water vapour adsorption have had very little attention. This is despite the fact that any additional source of water, positively affects arid ecosystems. The research has also focused on the ecophysiological adaptation of organisms to obtaining this water and its potential as a source of potable drinking water. Quantification of “non rainfall” water in these systems has however, been neglected due to a lack of appropriate instrument technology. This is because the input processes are influenced by the physical and chemical characteristics of the equipment receiving surface which differ from the soil. Such methods give a proxy of the amounts which are useful for comparisons between sites but are unreliable in measuring soil input. Thus “non rainfall” water soil input and the influence of plants and soil properties on this input is unknown. Further work to evaluate the significance of this water input to soil ecology is thus necessary beginning foremost with a direct method of measuring input, microlysimeters. The study aims to quantify “non rainfall” water input from each of the 3 input sources and determine the influence of soil properties and plants on “non rainfall” water input into soil.

Taking what we do to the people who use it

Key words: communication, research application, information transfer

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Despite extraordinary frequency of verbal and visual communication through newspapers, radio, television, books, cellphones and other media, ecological understanding gained through research fails to be applied in planning, assessment, management and daily living. In this talk consider some of the reasons why few research findings are integrated into environmental management and evaluation, and propose alternative ways of

demonstrating research findings and of making users aware of the practical applications of some of the information generated by academics. Barriers to adoption of research findings may include low visibility of information, societal norms and traditions, and lack of information short- or medium-term costs and benefits to the individual or group, and weak implementation of environmental policy and poor intersectorial communication among policy makers. We use examples of environmental mismanagement at household, farm, municipal and regional levels to show that research findings are not informing management actions, and suggest ways in which ecological research findings could possibly be made more accessible and attractive to potential users. Better uptake of research findings might reduce environmental and social costs associated with poor environmental planning and management.

Identifying Key priorities for threatened plant conservation

Key words: priority sites, Threatened plant species, RDB list

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The Red List assessments for all the plant species of South Africa have finally been completed. 3633 species will be listed in the new Red Data Book. Now that we have completed the assessments for all the threatened plants the mammoth task of conserving these species has to commence. By using historical and current spatial distribution data for these species we will do an analysis to identify some of the top priority sites for threatened plant conservation. This will include an assessment of the current conservation status of these sites. We will present the results of this analysis and highlight some of the key conservation interventions that need to take place to ensure the survival of these priority sites.

Lorax: How to estimate the conservation value and recommended action for every site in a region while still incorporating targets, connectivity, and solution sets

Key words: systematic conservation planning, marginal value, reserve design

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A new approach to providing conservation decision support is being tested in the Little Karoo, and is presented here. The framework, hereafter termed Lorax, the objective of identifying the relative conservation value of every place (i.e. 100 m cell, or aggregated to land parcel) in the

region. It will be able to clearly disclose why any place received its particular value, and will look at the cost/benefit ratio of various conservation actions, such as purchase or contract nature reserve. Lorax will use a hierarchical, multicriteria approach. It will allow for the weights of the criteria and objectives to be set by the end-user and/or expert. These can be determined by pairwise comparison, using the Analytic Hierarchy Process. Lorax will use a utility maximization (marginal value) framework to allow issues of regional context, such as reserve adjacency and conservation targets, to be included in the conservation value of a particular place. Connectivity is addressed through a feedback loop using a spin-off of least-cost-path modelling. Lorax is designed using a drag-and-drop, menu-driven, programming interface. This will allow it to be a “living tool,” easily plugging in data updates or additional criteria as time passes. The synthesis of all these innovations has the potential of addressing some of the more pressing challenges facing the field of conservation planning.

Linking research and management to conserve *Critically Endangered* Renosterveld in the Overberg

Keywords: renosterveld, management, stewardship

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The Renosterveld Management & Conservation Project is a 3-year project, sponsored by TMF (WWF) and administered by CapeNature and is aimed at addressing burning and grazing issues in renosterveld in the Overberg. The research aspect comprises two parts: 1) extensive surveys of renosterveld fragments for a select group of plant species and comparing their presence / absence / abundance with management regimes and 2) setting up long-term experimental burning and grazing plots, in order to monitor and compare pre- and post-fire, burned and unburned and grazed and ungrazed vegetation. Linked with the research programme, is a Stewardship project which focuses on targeting priority renosterveld fragments for high-level contracts, in order to secure renosterveld sites for long-term conservation. The progress, successes and failures of this combination of research and practical, hands-on conservation will be discussed. If we are to conserve *Critically Endangered* veld types for future generations to enjoy, we need to find more support for stewardship and associated incentives, otherwise the future of renosterveld and similarly-threatened vegetation types remains highly uncertain.

Mainstreaming C.A.P.E. Fine-scale Biodiversity Planning and Stewardship into CapeNature Business: A means to addressing Climate Change

Key words: Climate Change, Conservation Action Priorities, Fine-scale Biodiversity Planning, Stewardship Plan

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Critical Biodiversity Area Maps, as produced by the C.A.P.E. Fine-scale Biodiversity Planning Project, coupled with the Integrated Biodiversity Layer, as produced by CapeNature, have informed CapeNature's Spatial Stewardship and Conservation Action Priorities Map.

The Conservation Action Priorities Map was then used to inform the Stewardship Business Case and Plan. The Stewardship Business plan will outline a Stewardship scenario for the Western Cape identifying the means and resources required to capture a set of key conservation properties across the province which, amongst others, is believed to adequately mitigate for Climate Change. This process and its possible outcomes will be presented and discussed.

Parks in living landscapes: Moving protected areas beyond the fences

Key words: Protected Areas, Systematic Planning, Climate Change

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Traditionally, the management of protected areas has been focused on, and often limited to, the confines of the fences of formal reserves. Although it has been recognized for a while that the ecological functioning of protected areas if impacted on by processes that may extend far beyond the reserve boundary, in many cases this has had little or no impact on the way parks are managed and no impact on day to day activities. This paper outlines with specific reference to regional conservation programs in the Garden Route (Garden Route Initiative) and Overberg (Agulhas Biodiversity Initiative) how we have deliberately attempted to move into a far more outward looking paradigm in our conservation planning in South African National Parks. A key driver of this process has been an attempt to respond to the pressures of climate change in the context of fragmented (or rapidly fragmenting) landscapes.

The bumpy, dusty road to voluntary conservation

Keywords: biodiversity, voluntary conservation, management effectivity

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We conducted biodiversity value and management effectivity assessments of 50 priority voluntary conservation sites, throughout the Western Cape, to inform the consideration of stewardship status. The sites included municipal and private nature reserves, conservancies, BWI estates, “conservation farmers” and other voluntary conservation sites.

We found that landowners have become disillusioned by formal conservation and the administration thereof, and yet in spite of the ever-increasing challenges they face, they remain committed to conserve the natural landscape. Through our interactions with them, we have gained insight and present a less bumpy road ahead.

Take a walk on the Wild Side: Stewardship of Wild Rooibos as a Climate Change Adaptation Strategy

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Aspalathus linearis, better known as rooibos, naturally occurs in the Fynbos. In the past years rooibos has become an increasingly economically important product for farmers in the Greater Cederberg area. The more marginal rainfall areas of the rooibos production area produce the best quality rooibos tea. However, extreme drought in 2003 - 6 led to high mortality rates of cultivated rooibos of the so-called Nortier Variety – a re-seeding ecotype of rooibos. During the drought survival rates of endemic, re-sprouting “wild” rooibos bushes were far higher. This observation encouraged Indigo, SSN and EMG to explore the stewardship of this particular ecotype as a potential land user adaptation strategy in response to expected climate changes in the area, including later onset of the rainy season and more extreme climatic events.

The paper presents some preliminary results of exploratory seed collection methods, scarification processes and germination trials of the re-sprouting ecotype of *Aspalathus linearis* (wild rooibos) which occurs locally. The trials were conducted in an action research context, involving farmers in the research design and implementation of the seed collection and nursery trials. Data from a nursery trial in the production area will be compared with that from a greenhouse trial conducted in Cape Town. The research process is closely linked to a series of climate change

preparedness workshops, held with farmers every three months to discuss the seasonal weather forecast, weather events of the past three months and how farming techniques could possibly be adjusted to accommodate more extreme climate.

Throwing out the baby with the bathwater? Vulnerability of threatened plant species associated with “ecotypes” of wild rooibos (*Aspalathus linearis*)

Key words: elevation, rainfall, conservation status

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Morphologically distinct ecotypes of wild rooibos (*Aspalathus linearis*) grow naturally in Mountain Fynbos, and near transition zones between Fynbos and Succulent Karoo vegetation types. Wide-spread concerns have been raised regarding the threat that the growing expansion of cultivated rooibos plantations poses to populations in the wild, their habitats and the plant communities in which they grow. With the help and knowledge contributions of local farmers, five ecotypes – bush type (bossie tee), , prostrate type (‘rankiestee’), tree type (boom tee), three erect types (‘regop-tee’), and a willowy type (‘langbeen tee’) - were recorded across 4 distinct community types. Distribution of some of the ecotypes could be predicted by either elevation or rainfall from analysis. Prostrate and upright ecotypes occurred at higher elevations (>400-600 m). Bush ecotypes occurred at lower rainfall sites (<200 mm p.a.) and the willowy ecotype occurred at higher rainfall sites (>500 mm p.a.). Higher rainfall sites were also positively correlated with higher alpha (species) diversities found on either wetter southern sites or the northern site found on the Bokkeveld Plateau. Furthermore, one to three plant species with some threatened status were found growing with or near wild rooibos populations. Bulbs were of the most common plants found with threatened status, e.g. *Babiana ecklonii* (CR), *Babiana klaverensis* (EN) and *Oxalis macra* (EN). Conservation statuses of the 11 sites included in the survey were: none (1), moderate (4) and poor (6). Findings suggest that investigation into specific management and conservation strategies for the different ecotypes is warranted. Moreover, threats to rooibos in the wild inevitably present threats to biodiversity, amongst them plants which already reside under threatened status.

Sustainable conservation and self-sufficient restoration: The Flower Valley Story

Key words: sustainable flower harvesting, invasive species, restoration

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An apparent dichotomy is often erected between conservation and restoration, indicating that they are alternative options. In many parts of the world conservation is either no longer an option because few areas of unaltered habitat remain or it is no longer sufficient since the remaining habitat on its own cannot sustain the biota. Restoration on the other side is often referred to as "sort of gardening with wild species in natural mosaics" which is not sustainable, too expensive, and impractical on a bigger scale. However this dichotomy is a false one, since restoration activities should ideally be placed within a broader context of sustainable land use and conservation. In terms of nature conservation, there is no substitute for preserving good quality habitat and its maintenance and management is number one priority. Restoration has an integral part to play in the development and maintenance of sustainable production systems. The Flower Valley conservation Trust incorporates both approaches combining sustainable conservation and self-sufficient restoration. It was established by Fauna and Flora international (FFI) in 1999 and has since then build a flower export business with a large supply network of farmers in the Agulhas Plain. The aim of the trust is to provide economic incentives to landowners who adhere to a code of conduct linked to a certification system. Three different invaded sites, a Eucalyptus forest, an Acacia thicket and a Kikuyu lawn have been restored at Flower Valley. Besides the aim to reintroduce a fynbos community by outcompeting the alien invaders, our main focus is to promote species which can be used for sustainable harvesting. We herewith intend to make restoration self-sufficient and at the same time encourage landowners to include restoration in their management plans.

Resource manipulation for control of alien invasive grasses in lowland vegetation of the CFR

Key words: Restoration, Invasive species, Resource manipulation, Competitive success and Carbon addition.

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Over 95% of lowland Cape Floristic Region vegetation has been transformed by agriculture and invasive alien species and restoration of ex-arable lands invaded by alien grasses of European and subtropical African origin is vital. Restoration efforts may be aided by the artificial reduction of soil N and P levels which are known to promote the growth of many invasive alien species unlike that of indigenous fynbos species which are adapted to nutrient impoverished soils. Sugar and gypsum additions are proposed methods for immobilizing plant-available N and P levels in soils thereby increasing the competitive success of native species. This premise was tested both under field and greenhouse conditions by applying systemic (roundup) and contact (paraquat) herbicides to reduce the large alien invasive grass biomass and then adding sugar to reduce N and gypsum to reduce P individually and in combination to the soils. Seeds of nine indigenous target species (6 shrub and 3 herbaceous forms) were sown into the soils in late autumn and seedlings of an additional nine target species subsequently introduced in mid winter. Recruitment, physiological performance, soil physical and chemical properties, growth and survival of both target and resident indigenous and alien species were monitored in each treatment over a 12-month period spanning early winter (June) to late autumn (May). Results show that indigenous species grow and survive better in plots where herbicides were applied to remove invasive grasses a result explained by absence of competition. Reduction in N and P affected both invasive and native species growth and survival, a situation that leads us to conclude that microbial activity could be converting nutrients into forms unusable by plants since soil moisture did not significantly affect plant growth. Results suggest that the addition of sugar and gypsum as a tool in the restoration of native species in lowland Cape Floristic Region provides no significant benefit to natives over a one-year period.

Restoration interventions on post-mining landscapes in Namaqualand

Key words: ecosystem restoration, diamond mining, Namaqualand coastal plains

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Since the 1920's mining has been transforming the landscape on the northern half of the West Coast of South Africa, eclipsing all other forms of land degradation. Previous practices of restoration in this region are mostly derived from agricultural or horticultural, rather than ecological principles. To date, these efforts have had varied success, often leading to low species diversity and ecological integrity, being expensive and sometimes impractical. Four years of field, greenhouse and laboratory research have been conducted by the Namaqualand Restoration Initiative,

from which novel cost-effective restoration interventions were developed. Foremost among these are Restoration Packs, which contain a seed mix of 16-20 of the dominant perennial species (from six families), and represent the principle functional types that create the 'structure' of natural ecosystems in lowland Namaqualand. The ratio of seeds in each pack is derived primarily from germination rates, seedling and juvenile survival rates of each species, which were informed by a number of additional studies. Restoration Packs are specifically designed to increase the establishment success of the seeds used in restoration, since seeds are expensive to collect. Packs are planted in groups and in soil depressions, which mimic the patch-dynamics that operate in these semi-arid systems. As wind is the largest impediment to restoration success, an open cardboard box is planted into the ground to provide shelter for seedlings, and seeds are sown inside the cardboard box. Seedlings inside boxes have significantly higher survival rates than those emerging around transplanted adult shrubs or in the open. The effectiveness of adding soil treatments such as nutrients, water-holding polymer gels, kelp, gravel and organic mulches to the restoration packs to increase seedling survival rates is also discussed. Our focus was on restoring the plant community and physical structure, and we provide evidence that other components of the ecosystem recover concurrently with vascular plants.

Four years of the Namaqualand Restoration Initiative – Is there hope for a post-mining landscape on the west coast?

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The Namaqualand Restoration Initiative (NRI) is in its fourth and final year. An overview of the ecological experiments and studies that have been conducted in order to develop novel ecological restoration methods is presented in a separate talk. Here we present an overview of the projects that have been conducted in parallel to enhance the active implementation of restoration by the mining industry, and by businesses within Namaqualand. Although complex and technical, the range of possible restoration interventions has been packaged into a process that can be costed, implemented, verified and paid for, by means of a simple model. Intense advocacy of the business, as well as the legal and biodiversity imperatives for restoration, led to a commitment from one mining operator to help in developing local businesses, and to contract the businesses to implement restoration for the mine. A comprehensive process to find and develop owner-managers of an ecological restoration

business in Namaqualand was undertaken in 2007. A rigorous process of selecting and training a pool of workers was also undertaken, culminating in an intensive training week for about 50 people from five Namaqualand communities. A business entirely run by Namaqualanders, with three owner-managers, employing 15 workers is now operational, and implements restoration to NRI specifications. The training and development of further businesses is continuing in 2008. A system for monitoring and evaluating ecological recovery has been developed that can be used by non-specialists, yet measures the most important aspects of ecological and biodiversity integrity. Finally, a comprehensive and practical guide to all aspects of ecological restoration in lowland Namaqualand is being published and will be available in 2009. New minds will hopefully improve on these methods, but to argue that it is not possible to restore these areas has become difficult.

Kouga Riparian Rehabilitation Project

Key words: best management practices

Fourie, Saskia :Rhodes Restoration Research Group, Department of Environmental Science, Rhodes University, Box 94, Grahamstown, 6140

One of the major threats to freshwater ecosystems is the invasion of the riparian zone by woody species invasive plants, which replace indigenous vegetation and alter ecosystem functioning. These plants are not only a serious threat to biodiversity, but also to water resources. It is estimated that alien invasives use about 7% of the Mean Annual Runoff (MAR) per year; intensify flooding and fires; cause erosion and siltation of dams and estuaries, result in poor water quality.

Natural recovery of riparian systems, after clearing of alien invasive species, is often limited. In riparian systems which have been long and heavily invaded indigenous vegetation does not become re-established without active intervention in the form of rehabilitation. Without intervention these riparian zones are therefore prone to reinvasion and/or further degradation, and their critical functions are impaired or lost.

In a pilot partnership project between WWF, Working for Water and Working for Wetlands, The Kouga riparian rehabilitation project aims to develop protocols and guidelines to enable a return to ecosystem functionality in riparian systems that have been rendered dysfunctional through alien invasions.

Using measures of water flow and quality, soil stability, suppression of alien regrowth, recovery of biodiversity and the analyses of costs and benefits, the project will develop Best Management Practices for the rehabilitation of riparian zones. It is envisaged that through communicating

the need for this type of intervention and building support for the outcomes of the pilot project will stimulate a riparian rehabilitation programme that will contribute towards restoring ecological functionality to other river systems in South Africa.

Growing Plants and People: Working for Woodlands Restoration Nursery

Key words: propagation, restoration

Wilman, Victoria :Working for Woodlands, Gamtoos Irrigation Board, P.O. Box 237, Patensie, 6335

The Working for Woodlands Restoration Nursery, based at the Kouga Dam in the Eastern Cape, was originally set up to propagate plants for the Subtropical Thicket Project. Since then, it has been expanded to fulfil the plant material needs of a suit of restoration projects within the Eastern Cape Restoration Programme, including the WWF Riparian Restoration project in the Kouga catchment. The Nursery is central to the restoration objectives of these projects and its aims are to fulfil their plant needs, while gaining botanical and horticultural knowledge that can be utilised by partner projects and other organisations. There is a strong focus on establishing protocols and guidelines for future projects. The Nursery facilitates and implements nursery trials to investigate rehabilitation methods and to solve problems encountered during the rehabilitation process. Another hugely important aspect of this project is concerned with the growing and building of people. The Nursery is an ideal environment for the development of small businesses, and it uses training and mentorship to build the capacity of poverty relief contractors and their teams in the field of horticulture, and restoration.

Optimising cost-efficiency in restoring natural capital

Key words: restoration costs, implementation

McConnachie, Matthew: Rhodes Restoration Research Group, Department of Environmental Science, Rhodes University, Box 94, Grahamstown, 6140

The high price of ecological restoration coupled with a scarcity of funds poses a problem for the mainstreaming of this conservation practice. The paper adopts an interdisciplinary approach to bridge the gap between research and implementation in attempting to find solutions to this problem. Using the case of the Fynbos Riparian Restoration Project, the paper first predicts the relative costs of different management techniques. Using a spatially explicit approach it then searches for the optimal strategy to drive these costs down.

A fluvial geomorphological perspective on the river rehabilitation of *Acacia mearnsii* infested rivers in the Kouga region, Eastern Cape, South Africa

Key words: river geomorphology, rehabilitation

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The negative environmental effects that alien invasive vegetation exhibit on an ecosystem are well known. In the case of *Acacia mearnsii* which has invaded large tracts of riparian zone within the study area, it has the tendency to form monospecific stands that reduce biodiversity while also inducing channel modification.

Geomorphological processes and characteristics relating to the rehabilitation of the riparian zones of two rivers (Heuningnes and Baviaans) in the Kouga region of the Eastern Cape were studied. The primary aim of the research is to understand and record the morphological effects of *Acacia mearnsii* on the stream channels of the Baviaans and Heuningnes Rivers and to understand the ultimate long-term goals of rehabilitation of these rivers from a geomorphological viewpoint. This allows for a three-way description/comparison of an uncleared river system, a recently cleared river system and a more 'natural' reference site. The initial geomorphological impacts of alien vegetation clearing within the Baviaans were monitored. A study such as this reflects the importance of the riparian zone as it provides natural habitat for various types of aquatic and terrestrial flora and fauna.

Results to date indicate invaded channel reaches as being widened and with a much higher width-depth ratio. Invaded channel reaches also clearly exhibit a higher rate of bank undercuts and debris dams within the channel. Reference reaches exhibit a dense variety of fynbos vegetation cover compared to invaded reaches with a lack of understory cover under the *Acacia mearnsii* canopy.

Influence of *Acacia mearnsii* invasion on soil properties in the Kouga Mountains, Eastern Cape, South Africa

Key words: soils, invasion, recovery

van der Waal, Bennie :Department of Geography, Rhodes University, Box 94, Grahamstown, 6140

The invasion of Australian Black Wattle trees (*Acacia mearnsii*) in the Kouga catchment, South Africa, has various negative impacts on the ecosystem. Reduced species richness, increased water use, increased nutrients and increased N cycling rates are all negative impacts associated with *Acacia* invasions.

The native fynbos vegetation has adapted to the acidic nutrient poor soils and mediterranean climate of the Kouga Mountains. These sandy soils are leached from nutrients due to the relatively high rainfall (mean annual precipitation of 600 mm). Fynbos is being out competed by the *Acacia mearnsii*. *Acacia mearnsii* fixes nitrogen thereby enriching the soil it grows in. The invaded sections of the valley bottoms and lower hill slopes are characterized by an almost complete monoculture of *Acacia mearnsii*, with the occasional fynbos species still growing.

The Department: Water and Forestry (DWAF) sponsored Working for Water programme started clearing in these mountains in 1998. Where these infestations have been cleared, sites have remained bare for long periods after clearing, indicating that soil properties are not favorable for propagule re-establishment of indigenous vegetation.

The aim of this study is to assess how *Acacia mearnsii* clearing affects fynbos recovery through its impact on soils. This will be done by looking at chemical and physical properties of the soils and relate these to the potential or suitability for germination and seedling establishment of fynbos. Erosion measurements will be used to assess the influence of altered vegetation cover on soil erosion.

Bouncing ideas about resilience in urban ecosystems.

Davis, George : Urban Conservation Programme, SANBI, Private Bag X7, Claremont 7735.

Urban growth and globalisation are two linked phenomena that dominate our 21st century horizon. As our world gets smaller and consumerist impact on it grows, so it would seem that human connections with the biosphere becomes more fragmented and remote. Increasingly we rely on vicarious accounts of how our actions are influencing ecological processes at scales from local to global, and inconvenient truths are easily packed away in conveniently stored two-disk sets. For these reasons, a constant flow of compelling information, generated by good science,

broad vision and clear understanding, are more important than ever as prerequisites for working towards environmental sustainability. And, to align it with the increasingly virtual world that we live in, compelling story-telling is an added critical ingredient.

Drawing on a conceptual framework known as Resilience Theory, this presentation will explore aspects of the urban landscape as a people dominated social-ecological system.. Using Cape Town and its well-established biodiversity network as a partial case-study, it will attempt to identify and describe points of system instability, and link them to social and environmental drivers. With a perspective on biodiversity and the ecosystem services that it generates, it will refer to issues of access and equity, and the role of these in system resilience. These are thoughts arising from on-going collaboration between a Cape Town based research, group and Stockholm University's *Stockholm Resilience Centre*, which is coordinating the development of parallel perspectives in a suite of similarly interested urban ecology initiatives around the world.

Halting the loss of irreplaceable Biodiversity in Cape Town Challenges in Implementation

Key words: biodiversity loss, conservation planning, biodiversity network implementation

Dorse, Cliff , Julia Wood and Pat Holmes,
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The presentation highlights the precarious situation that Cape Town is in. 11 (50%) of the 21 nationally critically endangered vegetation types are found within the boundaries of the City of Cape Town. In addition to this, 6 of the 19 vegetation types found in the City are endemic and 319 plant species are classified as threatened with 13 having been declared Extinct. Sound conservation planning is hoping to halt this biodiversity loss without impeding on the critical development objectives of the City. It is hoped that a defined biodiversity network will direct the future growth of the City away from irreplaceable biodiversity. The real challenge, however, lies in the protecting and ecological management of the sites identified in the biodiversity network. Projects and plans for the implementation of the network are presented.

Conserving urban biodiversity through global lesson-sharing between local governments

Key words: urban biodiversity, local governments, conservation

Patrickson, Shela **and Andre Mader**

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Urban biodiversity is an often overlooked but crucial component of biodiversity conservation worldwide. Local governments have a leading role to play in the management of urban biodiversity, and in strengthening the links between social, ecological and economic issues. By coordinating the input of 21 local governments from around the world, Local Action for Biodiversity (LAB) is exploring ways of improving biodiversity management at the local level.

Biodiversity and Property Rates: A Tale of Three Municipalities

Key words: Biodiversity & Fiscal Reform

Cumming, Tracey : Botanical Society, Conservation Unit, Cape Town

The Botanical Society's Biodiversity & Fiscal Project is developing a range of fiscal instruments to help support land owners who are engaged in biodiversity conservation. Among these instruments are property rates based tools that may be implemented by municipalities to support sound land management on priority biodiversity land within their jurisdiction. Although it is still early days, a handful of municipalities have started down the path of developing and implementing rates policies for biodiversity. In understanding the process and outcomes each of these municipalities are experiencing, very different tales are emerging. This discussion presents three case studies of municipalities affecting rates policies for biodiversity. The aim of these case studies is to highlight key similarities which may serve as 'lessons learnt', but also to illustrate major differences, in an attempt outline challenges and the need for adaptation when engaging with, and within, municipalities.

Securing a small urban protected area through intensive management and stakeholder involvement

Key words: management intervention, implementation, long term viability

Retief, Koos: Rietvlei Nature Reserve, Grey Avenue, Tableview

The long term viability of small urban protected areas is increasingly affected by factors such as fragmentation, invasion, genetic pollution, and anthropogenic disturbances. The 20 hectare conservation area in the centre of the Milnerton Race Course now relies on goal-oriented management interventions and sustained stakeholder involvement to ensure its future existence as a valuable refuge for sand plain fynbos. Stakeholder participation is facilitated through an environmental management system which is implemented by an environmental monitoring committee. Recent management interventions include the implementation of a prescribed burning programme coupled with a small game management plan to maintain a natural fire regime and browsing influence. This report documents the key management interventions to date and reviews the future requirements for the safeguarding of this conservation area in a densely populated urban context.

C.A.P.E. Invasive Alien Species Project: a matter of sustainability

Key words: integration, buy-in, resource allocation

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In recognition of the problems facing Invasive Alien Species (IAS) management in the CFR, the Global Environmental Facility (GEF) has approved a grant to the C.A.P.E. Programme to develop a Strategy for IAS Management in the Greater CFR. Other projects under the CAPE Invasive Alien Species (IAS) are: *Refurbishment of the research facilities* of the Agricultural Research Council's Plant Protection Research Institute (ARC-PPRI); *SAIAB Research Contract* to address the impacts of Small Mouth Bass on riverine ecosystems; *CIB Research projects viz* (1) The development of a systematic conservation planning tool to aid managers in decision-making, planning and prioritization in terms of Invasive Alien Plant (IAP) clearing operations; (2) The development of a national Risk Assessment Protocol (RAP) for the importation of reptiles and amphibians into South Africa; (3) Determination of the geographic origin of the recent range expansion of the painted reed frog *Hyperolius marmoratus* in the Western Cape; *An Invasive Alien Fish Project* to determine the best method for the removal of Invasive Alien Fish, with the overall goal being the rehabilitation of the cleared river. An EIA is underway to determine the best method to remove Invasive Alien Fish. Without critical elements such as the integration of research results into management decision-making, integration between invasive alien plant and fire management, high level buy in and commitment from relevant role-players, strategic alignment and prioritization, adequate resource allocation and appropriate institutional arrangements to implement the IAS strategy, winning the battle against IAS will remain a pipedream.

Framing the whole of conservation management practice_

Key words: management approaches, principles and focus on shifting management plans to put people in the centre

Peter, Zwai: Cape Flats Nature, SANBI, Edith Stephens wetland Park, Lansdowne Rd, Philippi, Cape Town

The Cape Flats Nature partnership between the City of Cape Town, SANBI, TMF and BotSoc recently completed its four year CEPF-funded project, conducting an external evaluation to mark this milestone, and the evaluation validated the partnership's strategy of working at site and institutional level: "*Cape Flats Nature's greatest asset is its ability to engage with an experimental approach and learn from real practice.*"

The evaluation also challenged the Cape Flats Nature partnership to develop abilities to frame and articulate an integrated approach to urban conservation management practice including basic site management, biodiversity management and social development. In this presentation, we share our strategy for continuing to experiment with alternative approaches to integrate biodiversity management and social development practice at site-level within the City and other institutions, working within a framework of "experiment" and "catalyse" rather replicate and roll-out.

The partnership is now implementing the phase two with further seed funding from the City of Cape Town and the Table Mountain Fund, working at two additional sites and with the City's Biodiversity Management Branch as a whole, to deepen and spread integrated biodiversity management and social development practice. We will continue to learn about what it takes to build the whole of conservation management practice, in order to secure the sustainable management of the City's Biodiversity Network in a people-centred way that builds local leadership and benefits surrounding communities, particularly those where incomes are low and living conditions poor.

Distribution of the invasive Argentine ant in South Africa 100 years after its introduction

Keywords: alien invasive species, range expansion, bioclimatic models

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The globally invasive Argentine ant (*Linepithema humile*) is well known to be closely associated with human-modified habitats in its introduced range. However, little attention has been paid to distinguishing between natural and human-modified habitats when interpreting patterns in the observed and predicted regional distribution of the species. Here we examine in detail the range expansion and distribution of the Argentine ant in South Africa, one hundred years after its introduction. We use mismatches between published species distribution model predictions and the

observed distribution to generate hypotheses on factors facilitating and limiting range expansion by the species in the region. Following the first records of the Argentine ant in South Africa in 1901, the majority extent of its current range was reached within 50 years. Minimum estimates of the rate of radial spread of the species in South Africa are within the range of jump-dispersal spread rates recorded for the species globally. The agreement between the observed and predicted distribution of the species was generally poor, a likely consequence of widespread human-mediated microclimate modification (especially increased moisture availability) and the comparative paucity and narrow range of presence records for the species in natural areas. In addition, in the northern and eastern subtropical areas of South Africa (unoccupied but predicted to be suitable), the Argentine ant may be out-competed by other well known invader and aggressive tramp species. Understanding such determinants of the distribution of the Argentine ant in both natural and human-modified habitats is important for predicting its future range dynamics under ongoing habitat alteration and climate change.

Some preliminary particulars of porcupine patch-useGPS telemetry data of an ecosystem engineer in Renosterveld fragments, Nieuwoudtville.

Key words: landscape ecology, geophytes, home range

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The activity patterns of several porcupines fitted with GPS collars on the Hantam National Botanical Gardens (formerly Glenlyon farm) have been monitored for several months. We use this data to examine the distance and density distribution of porcupine location fixes relative to their burrows. The results indicate that porcupines do not use the landscape randomly but rather focus their activities on certain localities within their broader home ranges. We then develop a spatial distribution function which we use to generate a model of the intensity of porcupine activity at the landscape level. Finally we consider the ecological implications of the results in context of the unique nature of this ecosystem.

SEASONAL CHANGES IN HABITAT USE OF THE KALAHARI TENT TORTOISE *PSAMMOBATES OCULIFER*

Key words: vegetation cover, refuge density, burrow

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Psammobates oculifer occurs in arid areas throughout the Kalahari and adjoining regions. As part of a study to assess how *P. oculifer* survives in arid environments, we radio-tracked 12 male and 13 female tortoises over a 13-month period in 2006/2007, at Benfontein Farm near Kimberley. The study area consisted of two sites (East & West) located on orange-red, Kalahari aeolian sands overlaying calcrete. The East site had a thick layer of grass, mainly *Schmidtia pappophoroides*, whereas the West site was comprised of tussock grasses (particularly *Stipagrostis uniplumis* and *S. obtusa*), small shrubs (*Pentzia* spp.) and bare patches. We monitored seasonal changes in vegetation cover and structure in 10 plots of 5 m² each – five plots per site. On relocation of a tortoise, we recorded habitat characteristics, including refuge type and density (proportion of tortoise obscured), as well as tortoise behaviour (e.g., resting in cover). Plots in the East site had less vegetation cover than those in the West site and the greatest decrease in vegetation cover took place in the dry season (winter and spring). Tortoises in the East site selected denser refuges than tortoises in the West site. Generally, males selected denser refuges than females did, perhaps because males were substantially smaller than females. The small male size probably influenced their thermoregulatory requirements and may have increased their vulnerability to predators. In summer, inactive tortoises were found most often in dense refuges that provided 100% cover, whereas they selected refuges with lower densities (50-75% cover) in the other seasons. The change in refuge selection reflects in part the tortoises' preference for small mammal burrows in summer to escape potentially lethal mid-day temperatures. The tortoises rarely used burrows in the other seasons, despite being exposed to sub-zero temperatures in winter.

The spatial ecology of the chacma baboons (*Papio h. Ursinus*) of the Cape Peninsula, South Africa

Key words: Chacma baboons, spatial ecology, resource selection

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High levels of conflict between humans and baboons (*Papio h. ursinus*) have resulted in the Cape Peninsula baboon population being classified as critically endangered. The efficacy of the management and conservation efforts of this population is greatly curtailed by an almost complete lack of data upon which to base management decisions. Reliable datasets are needed if successful long-term solutions to the problem are to be effected and until such time efforts will be largely reactionary and serve only to address short term crises as they emerge within the Peninsula. This research aims to enhance the knowledge of the spatial ecology of the chacma baboons of the Cape Peninsula by improving the understanding of their current spatial patterns, and by predicting their responses to future habitat change. To this end, the research comprises three phases. The first is a compositional analysis of the landscape attributes of the area available to the Peninsula baboons. The second is the collection of an empirical dataset of the seasonal and annual spatial and behavioural patterns of Peninsula troops. Geographic information systems (GIS) are used to analyse this dataset, providing quantitatively described visual outputs of population and troop level patterns. Resource selection functions are used to compare these patterns of area use with the attributes of the available area to determine population and troop level

resource selectivity. Thirdly, the patterns of resource selectivity are used to model the probable spatial and temporal responses of baboon troops to the planned (e.g., alien vegetation removal; indigenous vegetation burning strategies) and unplanned (e.g., wildfires) habitat change in the Peninsula. The research will direct troop management practices, inform urban land development and guide undeveloped landscape alteration so as to assist in improving the conservation status of the Cape Peninsula baboons.

Socio-economic and ecological correlates of leopard-stock farmer conflict in the Baviaanskloof Mega-Reserve.

Key words: attitudes, leopard-stock conflict, ecotourism

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The leopard, *Panthera pardus*, is particularly threatened outside conservation areas in South Africa. This has been attributed to a reduction in natural habitat, decreasing natural prey populations, and commercial exploitation such as trophy hunting. More importantly, persecution by stock farmers has the greatest effect on the decline in leopard numbers (Woodroffe, 2001). The leopard population in the Cape Floristic Mountains, and adjacent areas, which includes the Baviaanskloof Mega-Reserve (BMR), has undergone a substantial decrease in range and numbers in the past 200 years, resulting in a highly fragmented population. In conservation terms, this highly reduced and fragmented population is regarded as being extremely insecure, and is regarded as being vulnerable by the National Environmental Management, Biodiversity Act of 2004. There is a need to investigate the nature and extent of leopard-stock farmer interactions to provide the foundation for an effective leopard conservation plan. We surveyed landowner attitudes towards leopards, stock losses and management practices in and around the BMR. The attitudes of landowners towards leopards vary from positive to negative, with 65% of landowners having a positive attitude towards leopards. Landowners in areas with less developed ecotourism tend to be more negative (33% positive) towards leopards compared with areas with well developed tourism (88% positive). This may reflect the perception of the tourism value of leopards. Management practices in terms of stock losses due to leopards also vary. 21% of landowners retract their domestic stock and 57% retract their pregnant ewes from areas bordering conservation areas in order to curb stock losses, largely due to leopards. The presence of predators may therefore influence stock impacts on vegetation. Hence, the development of ecotourism, along with stock depredation-minimizing techniques will improve the attitudes of landowners towards leopards and may facilitate conservation of large predators and their habitat.

THE UTILITY OF CAMERA TRAPS FOR DETERMINING PREY PREFERENCE OF LEOPARDS (*PANTHERA PARDUS*) IN THE CEDERBERG MOUNTAINS, SOUTH AFRICA

Key words: *Panthera pardus*, diet, prey preference

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The Cederberg Mountains (200 000 ha) provide an important refuge for leopard (*Panthera pardus*) in the Cape Floristic Region, and serve as the last remaining apex predator in this region. Despite their adaptability in terms of habitat and prey species, leopards in this area have been reduced to small, apparently inbred populations which are vulnerable to extinction. This is largely thought to be due to a loss of prey species, loss of habitat and persecution by humans to protect livestock (Martins & Martins 2006). Therefore, successful management of the Cape Leopard relies heavily upon sufficient knowledge about their feeding habits, as well as prey availability in the Cederberg Mountains. We used camera trap surveys to determine prey availability in the area, while scat analysis (based largely on hair scale analysis) was used to determine diet. Potential available prey included wild ungulates (24 %), domestic animals (17.8 %), carnivores (20.4 %), small mammals (23.8 %), baboons (8.2 %), birds (5.5 %) and reptiles (0.3 %) with a bias towards larger species. Scat samples revealed that their diet consists predominantly of small to medium sized mammals, with domestic animals making up only a small proportion (0.8 %) of this. Most species, such as rock hyraxes, lagomorphs, mongooses and other small carnivores were taken in accordance with their availability. Leopards showed a preference towards antelope; specifically klipspringers (*Oreotragus oreotragus*) and tended to avoid feeding on domestic animals. As the camera traps were unable to survey smaller species such as Cricetidae, Muridae and Soricidae that are known to occur in the diet, this resulted in an overestimated preference towards these mammals. This therefore limits the value of camera trap data as an estimate of leopard prey availability. The data do however lend themselves to measuring the availability of medium to large sized mammals, which make up the bulk of leopard diet.

Working with civil society across Biomes

Key words: Civil society, Monitoring, Threatened plant species

Ebrahim, I and Von Witt, C

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The CREW programme aims to involve Civil Society groups in monitoring and conserving threatened plants in South Africa. The programme started in the CFR and now we work nationally in all the priority ecosystems for conservation as identified by the National Spatial Biodiversity Assessment (NSBA). We have found that working in different Biomes requires different strategies for engaging volunteers. Availability of resources like botanical expertise, spatial data, Herbariums and botanical literature is also quite different. In this paper we will highlight some of the lessons learnt and key challenges in engaging civil society in monitoring threatened plants across the Fynbos and Succulent Karoo biomes.

Elevating Biodiversity Value: Do we have effective Marketing Strategies?

Keywords: Strategy, Value

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The plight of biodiversity conservation depends on the buy in of the South African Society. The recognition of value of the South African society depends on the appeal of the biodiversity conservation to the average South African. The business community's mechanisms to achieve changing the perceptions of society in order to sell value are the development and growth of Marketing and Communications. In the Conservation sector, Marketing and Communication is still in its infancy in its ability to sell the value of biodiversity. This talk presents an opportunistic look at the use of current Marketing strategies and the gaps that we still have not explored to change perception of the majority of our society to recognise the value of biodiversity.

The Climate Action Partnership adapting to and mitigating for Climate change

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Climate change is not simply an environmental challenge it is the greatest political, social and economic challenge the world has ever faced. It is predicted that South Africa will be one of the countries worst impacted by climate change. The country can expect average temperature increases between 1 and 3°C by the mid-21st century, accompanied by an up to 30% reduction in rainfall, an increased incidence of droughts, floods and intense storms, and up to a 1m rise in sea level. The social, economic and environmental impacts of these changes in South Africa's climate could be immense. Decreasing agricultural, forestry, livestock and fish stock yields could greatly threaten food and job security, while the

collapse of South Africa's unique ecosystems could mean extinction for many of the country's magnificent plant and animal species and threaten the lives of those vulnerable, marginal communities who are directly dependent on natural resources for their survival.

In recognition of this imminent threat, six of South Africa's largest conservation NGO's, Conservation International's Southern Africa Hotspots Programme, Wildlands Conservation Trust, Wildlife Environment Society of South Africa, Wilderness Foundation, The Botanical Society of South Africa and the Endangered Wildlife Trust, have come together to form the Climate Action Partnership (CAP). CAP aims to assist in mitigating climate change and to adapt South Africa to its effects.

In the past year the Climate Action Partnership has begun to raise public awareness around climate change issues through the media and through the Live Earth Johannesburg concert in 2007, we have developed a user-friendly carbon footprint calculator tailored to the South African situation, and have begun engaging with South African businesses and with government on climate change and biodiversity issues. This presentation aims to present CAP and explain what CAP has achieved so far, including the launch of the CAP calculator. It will also expand on the way forward that CAP is taking with regard to its objectives including the promotion and implementation of standards such as the CCB standards for Climate change and biodiversity conservation projects in South Africa and how these standards work. These standards are required to ensure that we have a set of credible voluntary offsets in which people can invest, whilst not only reducing global emissions but also benefitting people and the environment.

Environmental Education at the False Bay Ecology Park: *"The good, the bad and the beautiful"*

Ogilvie, Mark: Zeekoevlei Nature Reserve, CAPE TOWN

The False Bay Ecology Park is a multi purpose open space area on the south western corner of the Cape Flats. It consists of Rondevlei & Zeekoevlei nature Reserve, the Cape Flats Waste Water Treatment Works and the False Bay Landfill Site.

This presentation explores the work of the Cape Town Environmental Education Trust and its partnership with the City of Cape Town in providing a relevant environmental education experience to surrounding communities in challenging social conditions.

Underlined is some of the ethos that makes for successful educational programmes under trying conditions and an attempt to answer that question that vexes all environmental educators: "*how do we measure our success?*".

Evidence of people's awareness of and attitude towards river conservation in the Buffalo and Hartenbos & Klein Brak catchments

Key words: human impacts, ecosystem benefits, human behaviour

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The past two decades has seen an increased emphasis on the need for scientifically credible environmental information to support decision-making and to increase public awareness, on a world-wide scale. To date, there is a lack of evidence demonstrating that available environmental information is sufficiently used in decision-making. Political and economical decisions as well as human development needs appear to overshadow environmental evidence and biodiversity conservation needs.

Through the quantitative analysis of 1144 questionnaire responses, this study documented people's awareness of general water issues in South Africa and attitudes towards river conservation. ANOVA and Spearman correlations interrogated the relationships between the dependent variables, attitude and awareness and independent demographic attributes such as geographic locality, social and economic issues, home ownership, gender and age. The study also ascertained respondents' understanding of the diversity of benefits that healthy rivers provide, and examined the respondents' understanding of various negative impacts on rivers and the availability of river information that is easy to comprehend.

The study revealed a slight but significant correlation between respondents' attitude and awareness and their education levels, as well as their understanding of benefits that can be derived from healthy rivers. Simultaneously, there was a negative correlation between respondents' attitude and awareness and their understanding of negative human impacts on rivers. The correlation between respondents' attitude and age, and their awareness and age was insignificant. As expected, there was a strong positive relationship between respondents' attitude and their willingness to participate in a follow up survey. Those respondents with the highest awareness scores indicated that they did not wish to either receive information or participate in a follow up survey. The majority of the respondents expressed a need for more information about rivers in general.

The Adopt-a-river project with Eerste River as a pilot study area

Adopt-a-river, Eerste River, biomonitoring

Ketse, Nosiphiwo: Cape Nature, Private Bag X5014, Stellenbosch, 7599

The Adopt-a-river project was initiated when the parliament enquired about the state of our rivers, i.e. whether they were healthy and fit for use. The goal of this initiative is to create awareness among the citizens of South Africa of the need to care for our scarce water resources. The main aim of the Adopt-a-river initiative is to create an understanding among all water users, particularly the previously marginalized communities, of the concepts of Integrated Water Resource Management (IWRM) and to encourage them to become actively involved in the protection and management of these water resources, providing them with the necessary skills, understanding and passion to monitor the ecological health of

nearby river systems. The Eerste River has been identified as a pilot study area. This river system has, over the years, been subjected to numerous human interferences. It can be argued that urban rivers are the most negatively impacted resulting in the loss of ecosystem functioning. Factors that can contribute to the degradation of river systems in general are canalization, urban development, introduced alien invasive flora and fauna, modification of the banks and channel and point source pollution through sewage works, factories, urban runoff and dumping. The project is implemented through the River Health Programme.

Oral presentation: New freshwater fish taxa in the Cape Floristic Region: Management challenges

Key words: indigenous fishes, alien fishes, habitat degradation, capacity constraints

Impson, Dean **and Ernst Swartz**

Western Cape Nature Conservation Board, Private Bag X5014, Stellenbosch, 7600
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Recent genetic and morphological work has confirmed that the Cape Floristic Region is home to a substantially greater indigenous freshwater fish biodiversity than is currently recognized. The redbfin and Cape Galaxias groups are showing the greatest diversity. Several new redbfins exist and are in the process of being described. The Cape Galaxias is not a single species, but a species complex with as many as 10 taxa present. Most of the new taxa are endemic to the CFR, and the majority will likely be listed as threatened. The key threats are invasive alien fishes and habitat degradation. These threats and capacity shortages at CapeNature in river and fish management are major obstacles to the conservation of newly recognized taxa.

The dispersal of the Argentine ant (*Linepithema humile*) in the Kogelberg Biosphere reserve.

Key words: invasion, contributing factors, control of species

Cooper, James: Kogelberg Nature Reserve, off the R44

Distribution of *L. humile*, its relationship with indigenous ant species and factors associated with its invasion are currently being studied at Kogelberg Biosphere Reserve. Tuna baits were placed at all the disturbed areas (human impact areas) within the reserve, 5 main areas have been

identified as containing populations of *L.humile* and will be used as the sites. For the study tuna baits will be placed at 10m intervals along three 100m line transects radiating away from the disturbed area and observed every 30 minutes for the presence of *L.humile* in order to determine the extent of the invasion at each site. Sampling of all the ant species found at each site will be done by placing pitfall traps along 80m perpendicular bisecting transects. Traps will be left for seven days which will incorporate a wide variety of environmental conditions and allow for sampling of nocturnal and diurnal species. Each trap will be labelled according to the site and distance from the original transect. All the species captured during the study will be identified at the Iziko Cape Town Museum, data will be recorded and conclusions made. This is useful baseline data which can be used to control human impact areas and the spread of *L.humile*.

A Seasonal Comparison of the Ecological Activities of Bat Species found at Rondevlei Nature Reserve.

Spence, Kelly :Rondevlei Nature Reserve, City of Cape Town.

Rondevlei Nature Reserve (RNR) is situated in the south western corner of the Cape Flats. It is unknown which species of bats are found at RNR. It is also unknown where the bats are roosting, what their seasonal activities are with regards to foraging and the availability of insects and what the effect weather conditions have on their behaviour.

My objectives for this project are to first and foremost determine the bat species found at RNR. I would also like to find out where the bats are roosting; whether they are roosting in the surrounding residential area or are roosting within the reserve. To determine if the weather and the phase of the moon effects when bats emerge, the times that the bats exit and enter the roost, and to record the species of insects and the number available each night, I will be spending two weeks every night during April and August studying the bats at their roosting site. I will then be able to compare data between the warmer and cooler months.

To carry out this research I will begin by searching the reserve buildings for droppings and oily marks on the walls and floors. I will hand out fliers to the local residents asking them to contact me if they have bats roosting in their house or garden. The houses that respond to the fliers will then be visited. I will select a study site according to suitability for bat watching. After that, I will spend two weeks observing the bats, recording the weather conditions, phase of the moon and emergent times. To catch insects I will set up a light trap comprising of a bucket, funnel, ring light and battery. To determine the species of bats, I will set up mist nets at four different sites in and around RNR.

I believe this research will prove valuable as I will discover the bats roosting sites in and around RNR and determine which species of bat/s are found there. I will be able to add significant information to ongoing studies of bats conducted by Prof. David Jacobs at the University of Cape Town. I will be able to add new species to RNR's mammal list. Data will be recorded regarding the specifics of why bats come out to forage on

certain nights and not on others and determine those factors that influence their activity. Valuable information will be added to data relating to bat ecology in South Africa.

A Genetic Analysis of the Cape Galaxia (*Galaxias zebratus*) Populations in the South Western region of the Cape Flats

Atmore, Sarah : Strandfontein Birding Area, Zeekoevlei, CAPE TOWN

There are many populations of the Cape galaxia (*Galaxias zebratus*) in the rivers and streams of South Africa. Research done has shown high levels of genetic variations between these populations to the extent of a possible species complex being present. Of the 15 populations that have already been analysed, only two are from the Cape Flats. It is therefore necessary to conduct further genetic research on Cape Flats populations of the Cape galaxia. If a species complex is found it will be necessary to map the distribution of the different species in order for conservation efforts to be effective. The results from the genetic analysis will also be used to obtain a better idea of the relationships between the different populations of the Cape galaxia, *Galaxias zebratus*.

This research project aims to add to previous research done on the Cape galaxia by doing genetic analysis of populations that have not previously been analysed, to get more information on the relationships between different populations of the Cape galaxia on the Cape Flats, to determine whether or not there is a species complex in the Cape galaxia on the Cape Flats and in the events that a species complex is found, to map the different species.

The researcher will visit four study sites on the Cape Flats, namely Rondevlei Nature Reserve, Zeekoevlei Nature Reserve, Kenilworth Racecourse Conservation Area and The Diep River. 15-28 specimens will be collected from each study site. These will be caught using a fine-mesh hand-net and by doing fish treks. 5-8 specimens per site will then be placed into 95% ethanol and will be used in the DNA analysis. 10-20 of the specimens will be placed into formalin and will be used to study their morphology. These specimens will then be sent to Dr Ernst Swart of the South African Institute for Aquatic Biodiversity who will do the DNA extraction and analysis.

This research project will add to the already existing information on the Cape galaxia. This will give conservators, researchers and scientists a more detailed picture of this species and aid them in the genetic mapping of the species. This research project will possibly end with the recognition of a species complex. If a species complex is recognised, and the resulting species are mapped, it will help conservators to focus conservation efforts to areas where there is the greatest need for them and thus help to conserve a species. Ultimately it will help to conserve The City of Cape Town's biodiversity.

A comparative study on the small mammal population in different ages of Boland Granite Fynbos on Helderberg Nature Reserve

Key words: fynbos, mammals, fire management plan

Uys, Jaco :Helderberg Nature reserve, Verster Avenue, Somerset West

Species variation and population size are compared in the different post fire ages of Boland Granite Fynbos in the Helderberg Nature Reserve. This is a high risk area with regards to wild fires and this study is a baseline study on small mammals in the Reserve. The research site consists of Boland Granite Fynbos that is divided into three different ages and is thus divided into three blocks. A small mammal survey is done in each block in the beginning and the middle of each month using Sherman, pitfall and funnel traps and data will be prepared to determine species variation. Population size will be calculated using the capture, mark, release and recapture method. Fur clipping will be used to mark captured specimens. The data collected will help to develop a new scientific based fire management plan and a NEMA Protected Area Act compliant Reserve Management Plan.

Cats and Dogs: An age-old solution to an age-old problem...

Key words: leopard, farmer-predator conflict, Anatolian Shepherd Dogs

Potter, Leigh :The Cape Leopard Trust, Private Bag X21, Oudtshoorn, 6620

The Cape leopard *Panthera pardus* fills the role of apex predator within the Western Cape. Leopard populations are increasingly at risk as a result of habitat loss and persecution. With more and more land being converted to agriculture, leopards are provided with easy prey in the form of livestock, which in turn can lead to farmer-predator conflict. The Cape Leopard Trust recently established a leopard conservation project within the Gouritz Corridor to determine the status of leopard populations and to work with landowners towards more predator friendly farming methodology. Preliminary results from a pilot camera trap study are presented, showing leopard presence within the corridor in relation to privately owned land. The use of Anatolian Shepherd Dogs as a means to protecting livestock is also discussed.

Building botanical capacity in the CFR

Key words: Capacity building, Botany, Inter-institutional Collaboration

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Due to attrition, various policies, lack of adequate mentorship and a lack of marketing, the young graduates entering the field-botanist fraternity tend to be few and, regrettably, fleeting. The so-called “Rupert Model” (Baard 2007) is an innovative partnership between Cape Nature and SANBI, funded by WWF’s Table Mountain Fund. It seeks to address the shortage of new botanists entering the field by basing the candidate with the CREW program. This ensures that copious field work, team work and landowner interaction is mandatory and also exposes the lucky recipient to learn the ropes with access to the Compton Herbarium and the staff, who become *de facto* mentors. Judicious use of this model, and the accompanying lessons learnt, could be useful in expanding capacity in many areas in our sector.

The project: INTELEZI *Nature conservation project*

Key words: Demonstrating best practice project model for community empowerment, communities speaking to each other and resolving their own communal challenges

Kula, Senza: Ilitha Lomso Environmental Youth Organisation, Harare, Khayelitsha, Cape Town

Some few years ago various stakeholders met to discuss about the need to engage with the community of eNkanini, an informal settlement situated along Burden Powel Drive in the west coast. In 2005 an interventions was done through door to door, which was short lived due to lack of resources. Two years after, Ilitha Lomso, in partnership with Cape Flats Nature and the City of Cape Town and with the mandate of MDCA took advantage of the lesson of the previous engagements and resumed with the project known as INTELEZI *Nature conservation project*.

The project has recently finished a roll out of door to door campaign where more than 400 households in eNkanini were interviewed and provided 10 litre buckets with educational t-shirts and rulers; this was done by 15 volunteer activists whom were initially recruited, trained and deployed to the area. Based on this a Data of about 100 questionnaires capturing people’s views about eNkanini and the Maccassar Dunes Nature Reserve has been compiled and a preliminary report was presented in a number of communal platforms.

Following this is an overall public meeting planned for June 07, 2008 where we intend to invite all parties affected. This would be done as means to facilitate a common understanding of the issues relating to eNkanini and Maccassar Dunes and collectively gather a sense of an added value on processes that already exist.

Building Capacity for Decision-Making in the Eastern Cape

Key words: training programme, land use planning, biodiversity

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In 2007, an innovative capacity building programme was run in the Eastern Cape. The project trained 150 people from government, municipalities, NGOs and the private sector in using the products of a provincial systematic conservation plan in their day-to-day land use planning and decision-making. The Eastern Cape Biodiversity Conservation Plan identified critical biodiversity areas and formulated land use guidelines. The capacity building programme took the plan a step further, providing hands-on, practical training through a user-friendly software package, supporting the plan with tools for everyday use. Participants were provided with electronic maps, data, software, a manual, help files, posters, an explanation of the products and the technical report.

The project was managed jointly by DWAF, DEDEA and SANBI. The consulting team included Phil Desmet, Derek Berliner, Ayanda Sigwela, Mike Coleman, and Chris Berens. To further build institutional capacity, key staff of government departments (Sonwabile Menyelwa and Churchill Mkwalo of DWAF and Noluthando Bam of DEDEA) were trained as trainers through the programme. The presentation gives an account of the capacity building programme.

Learners helping management while being trained in hands-on GIS operation education

Key words: GIS, GPS, hands-on EE

Burger, Elzanne: (Environmental Education Officer), Friends of the Helderberg Nature Reserve, PO BOX 2075, Somerset West, 7129

During 2007 the City of Cape Town and partners implemented the Youth, GIS and Urban Nature Education Programme on two of its nature reserves. It focused on the Geography learning area for grade 10, which identified GIS as a focus area. This new programme offers fantastic opportunities for implementation across a number of learning areas. It involves high school learners in a meaningful education programme, where their project work will assist nature conservators in their day to day duties.

2008 saw the extension of this programme to the Helderberg Nature Reserve and implemented under the auspices of the Friends of the Helderberg Nature Reserve. Four high schools were identified and participated in what.

The lower section of the reserve was developed years ago with many crisscrossing trails, for improved viewing of fauna and flora. These trails have created management problems such as increased maintenance and a financial burden, loss in biodiversity.

Closing many of these pathways will create an opportunity for the development of new, ecologically sound and tourist friendly pathways.

To suite the needs of this reserve, the GIS programme was adapted into a monitoring exercise recording the condition and significance of certain trails in the nature reserve.

The programme is divided into three challenges which the learners have to complete. Learners walk a given set of trails, filling in a preset monitoring sheet, marking off trail irregularities along their set of trails. Learners then design a thematic trail to accommodate a particular group of visitors and create a map of their thematic trail using GIS technology.

On completion of their monitoring exercise the groups monitoring sheets which captured all the trail irregularities were presented to reserve management, which would use the information when planning their APO.

This presentation will share the lessons learnt and successes achieved to date.

Stewardship: Breaking ground in the Boland!

Key words: community, partnerships, management

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Three Stewardship Extension Officers operating in the Boland and West Boland Business Units of CapeNature will give feedback on the successes achieved in their respective areas; namely Upper Breede River Valley, Limietberg and Kogelberg.

The presentation will focus on how innovative partnerships have contributed to securing critically endangered sites for conservation, community Stewardship in the Upper Breede and Kogelberg areas and management interventions that have been implemented to improve the condition of these hotspots.

The presentation aims to show Stewardship progress, but will also highlight some of the challenges of implementing Stewardship in the future.

'That was then...this is now': The impact of disturbances across space and time on fynbos and karoo environments

Key words: environmental history, land use, repeat photography

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The fynbos and karoo landscapes we see today are as much a product of evolutionary history as they are an artifact of human influence. Distinguishing between climatic and anthropogenic impacts is often difficult although a careful analysis of the extent and timing of different disturbances helps to do this. In this contribution I provide a brief review of the disturbance literature and develop a typology of disturbances relevant to the western part of southern Africa. Then I describe the potential role of major disturbances such as drought, cultivation, grazing and fire in structuring fynbos and karoo environments. Palaeoecological studies, historical climate data, archival documents and census records are used to reconstruct past environments and to document changes in the timing and extent of different land use practices in the region. The results of a recent palaeoclimatic synthesis suggest that the winter rainfall region was vastly expanded during the LGM. An analysis of the historical climate data indicates a spatially complex pattern of changing rainfall and temperature. There is little evidence of a general increase in the incidence of drought in the region over the last 100 years although some areas and time periods stand out. The impact of cultivation and urbanization has been both continuous and devastating for lowland fynbos environments but has declined significantly in the arid zone over the last 30 years. Indigenous herbivores were particularly widespread in the eastern part of the Nama-karoo during the early colonial period but were replaced by domestic herbivores which peaked in number in the middle of the 20th century. Finally, the impact of changing fire regimes and climate in the Cedarberg over the last 100 years and its impact on *Widdringtonia cedarbergensis* is discussed. Repeat photographs of fynbos and karoo environments are used throughout to illustrate important issues and mark critical time periods.

Thresholds and Resilience in the Palaeorecord

Keywords: complexity, disturbance, transition

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The complex and dynamic nature of ecosystems is now well recognised in the ecological literature. Concepts of resilience – the ability of ecosystems to absorb disturbance – and thresholds – the points of transition at which ecosystems rapidly change from one quasi-stable state to another – have emerged as important theoretical constructs that provide a framework for interpreting heterogeneity over space and time. Periods of building and conservation of system processes are punctuated by collapse, reorganisation, innovation and rapid growth. In utilising this framework of adaptive cycles in interpreting ecosystem change, ecologists are often hampered by the lack of long-term data from before, during and after a period of dramatic re-organisation, as occurs when an ecological or environmental threshold has been crossed. As a result, recovery from disturbance is studied over relatively short time periods, without knowledge of ecosystem function before the disturbance event, and it is extremely difficult to judge how closely, and how rapidly, ecosystems return to their former structure and function. A vast and underexploited resource for exploring ecosystem resilience and thresholds can be found in the palaeo-literature, which provides records of environmental change and catastrophic disturbance, as well as a continuous record of vegetation composition which spans periods of disturbance and ecosystem reorganisation. Here, we review examples of fossil pollen, charcoal and other environmental proxies that show how ecosystems reorganise and respond to catastrophic disturbance, and reorganise as new ecosystem properties emerge. We show examples of rapid reorganisation in response to gradual change, when an ecological or environmental threshold is crossed, and consider how processes and feedbacks affect ecosystem organisation at different spatial and temporal scales. In addition, we address the debate over whether thresholds and resilience can be usefully applied in managing ecosystems, by linking thresholds in the palaeorecord with management goals.

Effects of sheep farming on plant dispersal in Southern Kalahari Duneveld

Key words: long-distance dispersal, piospheres, savanna

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The Southern Kalahari Duneveld does not have any natural permanent fresh water sources, and consequently the presence of large herbivores had originally been more or less limited to the rainy season until commercial farmers established the first dams and boreholes about 100 years ago. The year-round presence of sheep and their concentration around artificial watering points in the duneveld is likely to have caused the changes in species composition and functional trait spectra including dispersal related traits that were observed in comparison with older vegetation surveys of the area. Although the prevalent cause of these changes is likely to be plants' variation in defoliation sensitivity, changes in seed dispersal are also potentially significant. Sheep and native antelopes show significant differences regarding both total dispersal potentials and dispersed species. This would be particularly consequential as animal dispersal is and has probably always been of generally high importance in this system with abiotic vectors being rarely available (water) or not ideally suited to the local requirement that seeds should be as large as possible enhancing establishing success rates in the nutrient poor, mobile environment (wind). Accordingly, experimentally determined long-distance dispersal potentials for many presently common plants were generally high and strongly correlated not only with the availability of dispersal vectors, but also with nutrient levels and stability in the different habitats and plant grazing sensitivities. In conclusion, we make the prediction that even if sheep herds were managed to more closely imitate natural herbivore actions, the plant communities are likely to keep changing away from original conditions and not revert to their pre-farming composition.

Livestock mobility on the commons of Namaqualand

Keywords: Livestock mobility, Communal farming, Leliefontein communal area

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Traditional pastoralists have coped with unreliable rainfall in the past through their local knowledge and adaptive management strategies that include herd mobility. Over the last two centuries pastoralist movements have been much restricted though land privatisation and other policies. Their traditional coping mechanisms became ineffective since they had to continuously graze the same pastures. In this study, we examined the current mobility patterns of about 250 herds using the 192 000 ha of the Leliefontein communal rangeland in Namaqualand.

Data were collected through semi-structured interviews with livestock keepers from ten villages in the Leliefontein communal area. All stockposts used in from January 1997 to December 2006 by all the herds in the study area were visited and their locations recorded with a GPS. All the watering points used by herds were also mapped and their conditions noted.

During the ten year period under study, farmers have moved their stockposts up to 33 times although 68 herds never moved. Farmers move their stockposts over short distances (70 to 18 259 m) within the commons boundaries associated with each village or longer distances up to 40 km between villages. Stockpost locations within village boundaries (n=1458) are dictated by the locations of good grazing areas, functional livestock watering points and the village itself. Livestock keepers also move their herds away from croplands during the growing season. Inter-village movements (n=210) are due to cold conditions in the upland areas during winter, veld rest or social factors. Eleven farmers also moved permanently onto the new land reform farms adjacent to the Leliefontein communal area whereas 18 farmers moved temporarily to the farms. Eight farmers moved temporarily onto private farms and two farmers moved onto other commonages.

These findings show that livestock keepers have adapted their traditional mobility patterns and continue to use mobility as a management strategy to make optimal use of available resources.

The impact of grazing along an environmental gradient in the Kamiesberg, South Africa

Key words: rangelands, plant communities, conservation

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The Kamiesberg Mountain range, which is situated within the arid Succulent Karoo biome, South Africa, is internationally-recognised for its high conservation value and forms the study site for this project. The Kamiesberg is straddled by the Leliefontein communal area, which has been stocked for many years at twice the rate of the adjacent private rangelands. This study examined the impacts of this sustained heavy grazing on the plant communities across the mountain range. The impact of heavy grazing on plant growth forms and on standing perennial biomass demonstrated significant shifts in plant composition with losses in cover and biomass of palatable perennial woody shrubs and an increase in

herbaceous cover, mostly annuals, on the communal rangeland. A plant functional type analysis indicated that more xeric vegetation types intrude into more mesic areas on heavily-grazed communal rangelands. These findings all point to a degraded system on the communal rangelands where vegetation dynamics are closely tied to rainfall, rendering farmers more vulnerable to drought and to possible future climate change 'shocks'. While density-dependent effects are evident in this study, the equilibrium and non-equilibrium paradigm does not provide an adequate theoretical framework. The conclusions highlight the need to reduce grazing pressure on communal rangelands so that associated conservation and livelihood concerns can be addressed. In this regard, the importance of strong institutions to manage interventions, and the need for more cooperative work between scientific and social communities is critical.

Grazing Guidelines for Karoo veld types within the Namaqualand District Municipality

Keywords: grazing guidelines, rangeland management, knowledge gaps

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The Namaqua District Municipality (NDM) located in the north-west of South Africa, covers parts of both the Succulent and Nama Karoo biomes. How land managers and decision makers go about managing the NDM's rangelands today will play a definitive role in determining its future ability to function productively, maintain livelihoods and sustains its biodiversity in the face of global climate change. A considerable amount of natural science information is available today for the Succulent and Nama Karoo Biomes that could inform and transform current rangeland management systems towards more sustainable land use strategies within these biomes. Here we reviewed the scientific information available (including theses and papers to reports and semi-popular articles) from both biomes that relates to the NDM and analysed the information according to research theme and location. The information was then summarised in the structure of a map, in order to identify areas and vegetation types for which knowledge has been generated, and to highlight the areas and vegetation types that represent gaps in our collective knowledge. Our next step (currently underway) is producing a spatially contextualised document that will summarize existing recommended livestock management practices for the two Karoo biomes with the main objective to promote sustainable resource use and biodiversity conservation. This document will introduce the NDM's vegetation types, fauna, past and present land uses and the current understanding of veld functioning and rangeland management practices. The greater body of the document will be devoted to guiding land users

through modern rangeland management best practice. Topics that will be explored will include guidelines for rangeland animal management, grazing systems, shelter types, predator control, rare animals, supplementary feeding, alien vegetation control, road infrastructure, restoration practices, medicinal plants, the use of other rangeland resources, and monitoring and record keeping. The document aims to act as an easy to comprehend practical tool for land managers in the region.

Compiling a Monitoring & Evaluation Framework for the C.A.P.E. programme: Some lessons learned

Key words: Monitoring & Evaluation, Biodiversity conservation, Adaptive Management

Damons, Monique: Petersen, Caroline and Britton, Paul. C.A.P.E. CCU, SANBI

The Cape Action for People and the Environment (C.A.P.E.) is a partnership of government departments and civil society organisations supported by funding from the BCSD which aims to protect the rich biological heritage of the Cape Floristic Region (CFR). C.A.P.E formed in 2000 seeks to unleash the economic potential of land and marine resources through focused investment in development of key resources, while conserving biodiversity and ensuring that all people benefit.

How effective has this ambitious programme been? To help answer this, consultants were appointed in 2006 to compile a Monitoring and Evaluation (M & E) system for C.A.P.E. The compilation of the system followed an extensive and very consultative process and after two years and two consultants the first draft was released for comment in May 2008.

Many valuable lessons were learned about M & E during the consultation process and the measurement of biodiversity and socioeconomic achievements proved difficult.

This paper will highlight some of the lessons learned and give some guidelines for similar projects.

SAEON: Understanding Global Environmental Change in the Fynbos Biome

Keywords: Drivers of global change, monitoring, data management

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SAEON aims to understand global environmental change through ensuring long-term continuity in environmental observation and in managing an information network for environmental data archiving. It aims to provide a platform for networking, coordinating and developing partnerships around global change monitoring, research and interpretation. Environmental science education and awareness raising in environmental change will complement these activities.

The SAEON Fynbos node is currently developing a science strategy which aspires ultimately to inform sustainable development policy and practice in the Cape Floristic Region. Fynbos is a system with several unique characteristics, including extremely low nutrient soils, which preclude accurate extrapolation of the impacts of global change from other systems. The drivers of global change, among others, climate change, atmospheric carbon and nitrogen fertilisation, land use, invasive alien species and disturbance regimes such as fire, are likely to be interacting in ways that drive fynbos along new trajectories of change. Three main thrusts present themselves for examining global change. Firstly, looking back at old data and analyzing these for patterns of change may inform us how global change has already impacted the fynbos biome. SAEON, with SANParks cooperation, has made a start on this by ensuring that Hugh Taylor's 1966 vegetation plots in the Cape Peninsula are georeferenced. Secondly, ensuring that environmental data continue to be monitored. SAEON is supporting the CSIR to monitor primary catchment runoff and weather variable at Jonkershoek, some of these data haling back to 1936. Thirdly, in establishing and monitoring manipulative experiments that can tease apart the impacts of multiple drivers and speed up our understanding of these changes.

SAEON invites members of the Fynbos community to contribute to the development of the science strategy, in identifying key questions around global change, in developing ways of achieving deeper understanding and in securing environmental data.

Water quality assessment in the Breede WMA: SASS 5 biomonitoring

Key words: Biotope, macro-invertebrates, River Health Programme

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Seasonal SASS 5 bio-assessments were conducted at 50 selected sites within the Breede River Water Management Area (WMA) from March 2007 to June 2008. These assessments form part of the National River Health Programme (RHP) and was conducted to ascertain the overall ecological condition and health of the aquatic ecosystem. SASS 5 assessments are one of the biological indices used to determine ecological health and it concerns macro-invertebrates which have been identified as good indicators of recent localized river conditions. The selected sites represent both reference (near pristine) and impacted sites along the Breede River, the Riviersonderend River and several of their tributaries. SASS 5 data were analysed and consequently, the presence and/or absence of invertebrate families at a given site provides a good indication of the condition, ecological health and water quality of the site.

Re-survey and analysis of permanent Cape Peninsula vegetation plots

Key words: fynbos, fire, monitoring

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The fires in January 2000 burnt more than 8 000 hectares of pristine and alien invaded areas around the Cape Peninsula. These fires were considered unusually intense, particularly in alien invaded areas. With the financial support of the Working for Water Programme, 52, 600 m² permanently marked plots of both pristine fynbos and alien invaded areas were sampled in 2001. These plots represented a range in fire severities across the area burnt in 2000. The findings of the study, compiled as a report (Euston-Brown et al., 2002), contributed towards an understanding of how fire severity influenced the post-fire vegetation recovery of fynbos and how this was exacerbated by the presence of standing, or felled, but not removed, alien vegetation. The main aim of this study was to resurvey the sites used in the Euston-Brown et al (2002) study and to explore the impacts of severe fires, drought and alien plants on the post-fire succession of fynbos communities as well as the interaction between these key drivers. The original survey was performed in vegetation younger than 2 years where most plants would have been seedlings. In the five years since the first survey the vegetation would have matured and individuals would have died due to shading or other forms of competition within and between fynbos and alien species. Results of the resurvey will be discussed with a particular focus on the succession of fynbos vegetation and different alien clearing treatments.

Land cover changes in the northern Sandveld: Implications for conservation

Key words: remote sensing, Landsat, change detection, land cover changes

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Environmental threats such as agriculture, climate change, invasive species and urban growth are the major causes of habitat transformation in the Cape Floristic Region. Intensive potato farming using the central pivot irrigation systems has caused massive habitat change in the Northern Sandveld. The region is part of the Greater Cederberg Biodiversity Corridor Initiative (GCBC), implemented by CapeNature, which aims to conserve the biodiversity of the region through sustainable resource utilisation. The main aim of this project was to detect land cover changes in the region using remote sensing techniques. Landsat 5 TM and Landsat & ETM+ imagery for 2000, 2000, 2002, 2004, 2006 and 2007 were used to detect change in land cover due to human activity in the Northern Sandveld. Supervised image classification for the above images was done using the maximum likelihood image classifier. Post-classification change detection techniques were used to detect the change in the satellite imagery between these dates. GEOMOD was used to quantify the degree of change due to human activities. The central pivot irrigation method was one of the main drivers of change because of its high turnover. Outcomes of GEOMOD simulation of future land cover scenarios contribute to the development of a conservation plan for the Northern Sandveld.

USING REMOTE SENSING AND EXPERT KNOWLEDGE TO MAP LANDSCAPE-LEVEL LAND DEGRADATION IN THE ARID GRASSLANDS OF BUSHMANLAND – SOUTH AFRICA

Keywords: Dryland degradation, overgrazing, semi arid rangelands, MODIS, NDVI, phenometrics

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In this study we investigated the use of MODIS NDVI, known as a proxy for vegetation productivity, to quantify land degradation based on spatial and temporal scales. Dryland areas normally have high inter annual rainfall variation. As rainfall is a key factor in determining vegetation

growth, changes due to anthropogenic pressures are difficult to quantify. A correlation between cumulative rainfall and averaged MODIS NDVI scenes was performed to determine the best rainfall interval that explains the NDVI variation. The 6 months time interval was found to have the highest correlation to NDVI (0.86), which best explains the NDVI variation within vegetation units. ANOVA test per vegetation response phase were carried out to establish the phenological variable which best detects change in the vegetation cover. The $NDVI_{min}$, $NDVI_{max}$ and $NDVI_{\Sigma}$ variables were found to best explain phenological profile between the three vegetation units. Taking into account rainfall, vegetation units and phenology two spatial and temporal approaches were developed which used NDVI to quantify land degradation. The spatial scale approach, based on the dry phase only, used the benchmark method to establish thresholds for any changes in veld condition. The temporal scale approach used the residual method based on seven year averaged NDVI. Regression and mean analysis were carried out based on the residual values for each sample point. Overall, despite a lack of appropriate ground-truthing data, the two derived methods have implications to spatially and temporally quantify land degradation in arid and semi-arid environments. Further refinement of the methodology is necessary, including ground-truthing for validation purposes. The methodology showed promise for monitoring and for mapping grazing carrying capacity.

Abbreviations: MODIS = Moderate Resolution Imaging Spectroradiometer; NDVI = Normal Difference Vegetation Index.

The Management Effectiveness Tracking Tool (METT): A very simple yet highly effective management tool.

Key words: Monitoring & Evaluation, Management Effectiveness, Adaptive Management

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The Management Effectiveness Tracking Tool (METT) originally designed by WWF and the World Bank has been adapted for application in the Cape Floral Kingdom. The METT was adapted for the City of Cape Town and subsequently it has been further adapted to the needs of managers in the CFR by way of a series of workshops with different conservation authorities. The METT has proved to be a very simple and easy to apply, yet highly effective management tool.

The paper will give an introduction to the adapted METT and set out the way forward for application in the Cape Floral Kingdom and other biomes.