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ACKNOWLEDGEMENTS

FYNBOS FORUM

31 July- 3 August 2017

We wish to acknowledge with many thanks the following for their assistance this year!

1. Everyone who participates- you are the forum!

2. The Table Mountain fund for sponsoring the Fynbos Forum Innovation Scholarships and the Fynbos Forum book

3. All keynote speakers, oral and poster presenters, workshop facilitators, and leaders of field trips for arranging such an interesting programme this year

4. Charles Stuart, who's tireless and relentless efforts helped The Fynbos Forum become a registered Non Profit Company

COMMITTEE MEMBERS 2016 – 2017

Chair:	Ms Tessa Oliver
Committee:	Dr Nicky Allsopp
	Ms Carly Cowell
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FYNBOS FORUM MISSION

The Fynbos Forum is an affiliation of researchers, planners, managers, landowners and a range of other stakeholders 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.

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PREVIOUS FYNBOS FORA

FYNBOS FORUM PROJECT

1977	Various dates at UCT & Stellenbosch University- founding of the Fynbos Biome Project	
1978	Various dates and various venues	
1979	Stellenbosch	29 January
1980	Stellenbosch	20 - 30 July
1981	UCT	29 - 30 June & 1 July
1982	UCT	11 June
1983	UCT	28 June
1984	Stellenbosch	26 June
1985	Stellenbosch	29 - 30 July
1986	UCT	26 - 27 June
1987	Saasveld, George	23 - 25 June
1988	Avalon Hotel, Montagu	27 - 29 July

FYNBOS FORUM *(name change)*

1989	ClanWilliam	18 - 20 July
1990	Stellenbosch - University of Stellenbosch, Die Ark	1 - 2 October
1991	Bredasdorp - Potberg	11 - 13 August
1992	Cape Town	
1993	Drosdy Museum, Swellendam	16 - 17 March
1994	Bien Donné, Stellenbosch	13 - 15 July
1995	Mispah Youth Centre, Grabouw	5 - 6 December
1996	The Nekkies Dist. Worcester	17 - 18 July
1997	Genadendal	16 - 18 July
1998	Die Herberg, Waenhuiskrans, Arniston	22 - 24 April
1999	Rein's Nature Reserve, Albertinia	22 - 23 September
2000	Ganzekraal Holiday Resort & Conference Centre	7 - 9 June
2001	Calitzdorp Spa	1 - 3 August
2002	Goudini, Rawsonville	14 - 16 August
2003	Hartenbos Resort, Hartenbos, Dist. Mossel Bay	5 - 8 August
2004	Club Mykonos, Langebaan	10 - 13 August
2005	Pine Lodge, Port Elizabeth	1 - 5 August
2006	Goudini Spa, Rawsonville, Dist. Worcester	9 - 11August
2007	Club Mykonos, Langebaan	1 - 3 August
2008	Oudtshoorn – known as Interfaces, a joint forum with Arid Zones Ecology Forum, 3-7 August	
2009	The Sports Centre, Bredasdorp	4 – 7 August
2010	NG Church Centre, Citrusdal	3 – 6 August
2011	Community Hall, Still Bay	31 May – 3 June
2012	Cape St Francis	17 – 19 July
2013	Kirstenbosch Botanic Garden, Cape Town	7 – 10 October
2014	Premier Hotel, Knysna	4 – 7 August
2015	NG Church Hall, Montagu	3 – 6 August
2016	Pine Lodge, Port Elizabeth	25 - 28 July

Fynbos Forum 2017
Programme Overview

Time	Monday 4th August 2014
09h00	CASABIO Workshop 1
12h30	Lunch for Workshop 1 participants
13h30	Workshop 1 continued
17h30	Registration for delegates
18h30	Opening of Fynbos Forum
19h00	DINNER
	Tuesday 5th August
7h30	Late registration
8h20	Welcome & Keynote address
9h00	Session 1: Diversity & Coexistence: Past present future
10h15	TEA
10h45	Session 2: Aliens
13h00	LUNCH
14h00	Session 3: Fire
15h30	TEA and POSTERS
16h15	Session 3: Pathogens
17h15	Caroline Gelderblom- Fynbos Forum- the way forward
17h45	Fynbos Forum AGM
19h00	DINNER

	Wednesday 6th August
08h00	**Late registration**
08h30	**Session 4: Ecological Restoration**
10h30	**TEA**
11h00	**Session 5: Sustainable use and cultivation**
12h25	**Session 6: Climate Change**
13h00	**Fieldtrip Briefing and lunch pickup**
13h00	
19h00	**DINNER and DISCO**
	Thursday 7th August
07h30	**Late registration**
08h30	**Pam Booth: The Knysna Fire**
	Session 7: Planning and Management
10h30	**TEA**
11h00	**Session 7: Planning and Management continued**
13h00	**LUNCH**
14h00	**Session 8: Citizen Science**
15h45	**Prize giving**
	Travel home safely!

Fynbos Forum 2017
Programme

Time	Monday 31 July 2017
9h00	**Workshop by CASABIO** Road and Rail Reserve Workshop: Project SATRN and Roadside Diversity Day – creating and monitoring the world's longest and most species rich reserve
17h30	**Registration**
18h30	**Welcome address**
19h00	**DINNER**
	Tuesday 1 August 2017
7h30	**Late registration**
8h20	**Welcome & Opening: Tessa Oliver**
8h30	**Keynote address- Richard Cowling**
9h00	**Session 1: Diversity & Coexistence: Past present future** *Kristen Nolting*: Functional Trait Divergence and Eco-physiological Convergence in *Protea* Species in the Cape Floristic Region, South Africa - 15 *Lara Kaiser*: Cross-generation interactions between overstorey and understorey plants in Fynbos - 6 *Genevieve Theron*: Testing pollinator-mediated floral evolution of *Ferraria* (Iridaceae) - 15 *Marike Louw*: Listen up! Eavesdropping on a Cape Peninsula Endemic -15 *Melandri Rafferty*: Drought-tolerance in wild and cultivated Aspalathus Linearis in the Suid Bokkeveld, South Africa – 15
10h15	**TEA**
10h45	**Session 2: Aliens** *Tineke Kraaij*: Seed bank and growth comparisons of native (*Virgilia divaricata*) and invasive alien (*Acacia mearnsii* and *A. Melanoxylon*) plants: implications for conservation - 15 *Mlungele Nsikani*: Acacia saligna's soil legacy effects: what do they do and for how long? - 15 *Alistair Galloway*: The impact of pine plantations on fynbos above-ground vegetation and seed soil bank composition - 15 *Roderick Juba*: Assessing ecological impacts of alien clearing methods along WC riparian zones, implications for ecosystem recovery - 15 *Kelby English*: Potential factors influencing the establishment success of *Dicomada rufa*, a biological control agent for *Hakea sericea* in SA. -6 *Candice Lyons*: Update to biocontrol endeavours against Hakea sericea in the Western Cape– Aphanasium australe and Dicomada rufa. -15 *Thembelihle Mlokoti*: Mortality of the leaf-mining moth, *Aristaea thalassias* (Lepidoptera: Myrtaceae), a biological control agent of *Leptospermum laevigatum* - 15

	Jan-Hendrik Keet: Assessing the impacts of invasive legumes on soil conditions and microbial community composition in a biodiversity hotspot. -15 *David Gwynne-Evans*: Invasives of Newlands Forest - 6 *Staci Warrington*: Testing major plant-microbial mutualism hypotheses in invasion ecology: a case study using Australian acacias and rhizobia – 6
13h00	**LUNCH**
14h00	**Session3: Fire** *Jasper Slingsby*: Postfire regeneration in the Cape Floristic Region - 15 *Glenn Moncrieff*: Trait controls on post-fire recovery in the fynbos biome - 15 *Hannah Simon*: Unpacking a pixel: drivers of seasonality in vegetation greenness in fynbos - 6 *Nyasha Magadzire*: Role of fire in the distribution of vegetation in a Mediterranean-type ecosystem - 15 *Nasiphi Ntshanga*: Assessing the threat of landscape transformation and habitat fragmentation for ecosystems in the Fynbos Biome of South Africa - 15 *Lena Alice Schmidt*: An experimental study of plant-pollinator interactions along a post-fire succession gradient -6
15h30	**TEA & posters**
16h15	**Session 4: Pathogens** *Joey Hulbert*: Indigenous plant pathogens and their contributions to plant community diversity - 15 *Nicolas Louw*: A diminishing silver lining in the Cape Floristic Region : re-evaluating the decline of *Leucadendron argenteum* - 15 *Nombuso Ngubane*: Long-distance dispersal characterises the population structure of *Protea*-associated fungi - 15 *Mashudu Nndanduleni*: Can fire be used in a garden to cleanse the disease in the flowerbed? - 15
17h15	***Caroline Gelderblom*: Fynbos Forum- the way forward**
17h45	**Fynbos Forum AGM**
19h00	**DINNER**
	Wednesday
8h00	**Late registration**
8h30	**Session 5: Ecological Restoration** *Stephen Cousins*: Testing for fire-dependency in critically endangered renosterveld shrublands and soil seed banks in the Swartland, South Africa - 15 *Zoe Poulsen*: Conserving Living Landscapes: Investigating impacts of livestock grazing and assessing rangeland restoration potential in

	Overberg renosterveld - 6 *Stuart Hall*: Implications for management of lowland fynbos ecosystems resulting from restoration experiments in Cape Flats Sand Fynbos - 15 *Johann van Biljon*: Lessons learnt in implementing the Berg and Breede River Riparian Rehabilitation Programme (DEADP) - 15 *Dean Impson*: Moving forward with rotenone projects: rapid removal of non-native fishes from two farm dams and strong recovery of threatened fishes in a priority river for fish conservation - 15 *Wessel Vermeulen*: Planning for the rehabilitation of plantation "exit" areas in the Garden Route National Park - 6 *Thabang Sibiya*: Long-term monitoring of the recovery of fynbos in clearfelled pine plantations in the Garden Route, Western Cape - 6 *Petro Botha*: Taking urban conversation by the horns-the four legged approach. - 6 *Johann van Biljon*: An ecological approach to landscaping - 6 *Stephanie Midgley*: Using restoration of ecological infrastructure as an approach to climate change adaptation and mitigation for agriculture in the Fynbos Biome - 15 *Bongani Mnisi*: THE IINGCUNGCU PROJECT: Restoring nectar feeding birds, building biodiversity leadership. - 6
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11h00	**Session 6: Sustainable use and cultivation** *Martina Treurnicht*: Spatial variation in sensitivity of serotinous Proteaceae to wildflower harvesting inferred from large-scale demographic data in the Cape Floristic Region – 15 *Hildegard Crous*: *Disa barbata* and other terrestrial orchids of the Fynbos Biome - surprises and experiences - 15 *Timothy Macqueen*: Re-opening the case for wild Frankenflora: testing Protea species for hybidization using DNA and HRM analysis - 15 *Nicholas Galuszynski*: How can farmers help in conserving the evolutionary potential of Honeybush (Cyclopia spp)? - 15
12h25	**Session 7: Climate Change** *Edmund February*: Collapse of an iconic conifer: Long-term changes in the demography of Widdringtonia cedarbergensis using repeat photography -15 *Andrew Turner*: Climate, fire and frogs: a sign of things to come? - 6 *Tanisha Williams*: Predicting Plant Responses to Climate Change in a Biodiversity Hotspot - 15
13h00	**PACKED LUNCH**
	Fieldtrips
19h00	**DINNER AND DISCO**
	Thursday
8h00	**Late registration and Tea**
8h30	***Pam Booth*- The Knysna Fires**

9h00	**Session 8: Planning and Management** *Alana Duffell-Canham*: The 2017 Western Cape Biodiversity Spatial Plan - 15 *Julia Wood*: The doughnut of protected areas management in the city of Cape Town - 6 *Kerry Maree*: TMFs contribution towards implementing the Western Cape Protected Area Expansion -15 *Odette Curtis*: Gains and Losses in the Renosterveld: are we winning or losing? - 15 *Clive McDowell*: Lowland Natural Corridors in Greater Cape Town: the M3 Road Verge, Constantia as a Case Study - 15 *Fezile Mathenjwa*: Thinking ahead: making sure we have an insurance policy for our threatened plant species - 15
10h30	**TEA**
11h00	**Planning and Management continued** *Rupert Koopman*: *Marasmodes* : a Canary in the donut - 15 *Ismail Ebrahim*: Hands off! Identifying critical habitat sites for threatened plant species - 15 *Dale Wright*: Bird-friendly: Habitat Management Guidelines for the endemic birds of the Fynbos Biome - 15 *Louis Van Wyk*: Living alongside meso-predators on an eco-sensitive estate - 6 *Felicia Magutywa*: Effects of various Wastewater Effluent Discharge on Environmental and Biological Conditions of the Vygekraal and Kuils Rivers downstream of Athlone and Zandvliet WWTWs respectively. - 15 *Joshua Gericke*: Estuary mouth breaching as an emergency control measure for Prymnesium parvum: A Zandvlei case study - 6 *David Le Maitre*: Protecting the Strategic Water Source Areas of the Fynbos Biome for water security under climate change - 15 *Maya Beukes*: PRESENCE: Using knowledge to build a living landscape - 15 *Julia Wood*: Biodiversity planning forum - 6
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14h00	**Session 9: Citizen Science** *Sophia Turner*: How the Ant taught Scholars about Science – a story by Iimbovane Outreach Project - 15 *Georgina van Biljon*: Environmental education opportunities in aftercare facilities in the Cape Winelands. - 6 *Michael Henshall*: Cape leopards and human-wildlife conflict *Randall Josephs*: Citizen scientist at work: Collecting long-term monitoring data. - 15 *Joey Hulbert*: Revealing hidden threats to fynbos biodiversity with citizen science - 15 *Louise Matschke*: Changing lives through nature- Reconnecting people to nature; the CEET creche to career model explained - 15 *David Gwynne-Evans*: CASABIO - The potential of citizen science - 15 *Boitshekwane Kgantsi*: Table Mountain Fund (TMF) Small Grant Programme - 15
15h45	**Prize giving**

Posters:

- *Keir Lynch*: Watercourse Restoration in the Rûens Renosterveld
- *Andrea Von Gunten*: The Muizenberg East Conservation Cluster: Using camera traps as a tool for wildlife monitoring on fragmented habitats within an urban environment
- *Luke Gallant*: iSpot UPGRADE 2017
- *Fabrice Turikumwe*: Hippopotamus (Hippopotamus amphibuis) introduction into the Rietvlei section of Table Bay Nature reserve: How many can be accommodated?
- *Angelique Van den Berg*: Calculating relative abundance of Cape Grysbok using camera traps and drive counts at Table Bay Nature Reserve, Milnerton Racecourse Section.
- *Lief Theron*: Will there be enough water? The effects of climate change on the Western Cape's water supply
- *Hadley-John Lyners*: The Cape Leopard Trust Environmental Educational Project
- *Julia Wood*: Conservation targets in the City of Cape Town
- *Nomama Mei*: Fynbos vegetation is naturally adapted to fire and requires regular burning for its persistence.
- *JP Groenewald*: Invertebrate diversity of Haarwegskloof Renosterveld Reserve
- *Natanya Dreyer*: FROM SCIENTIFIC TO SIMPLE: Bridging the communication gap between the natural and social sciences
- *Ntombikayise Lolwane*: The site occupancy and species richness of medium to large sized mammal species in the Steenbras Nature Reserve
- *Sally Reece*: The extent and condition of the remaining remnants of Lourensford Alluvium Fynbos
- *Ntombikayise Leago Lolwane*: The site occupancy and species richness of medium to large sized mammal species in the Steenbras Nature Reserve

WORKSHOP

CASABIO: Road and Rail Reserve Workshop

David Gwynne-Evans (CEO of CASABIO.org)

Introduction

For over 30 years there has been increasing levels of roadside "maintenance" taking place leading to an unprecedented loss of biodiversity in corridors that are frequently last bastions of local vegetation. Implementation has become increasingly sophisticated and coordinated across nearly all roads and includes bulldozing, grading, brushcutting and herbiciding of roadside vegetation.

Much has changed in the intervening years regarding our understanding of biodiversity and the important role it plays in providing ecosystem services. The National Environmental Management: Protected Areas Act (57 of 2003) was signed into effect. In 2004 the entire Cape Floral Region was declared a World Heritage Site on account of its diversity, density and number of endemic plant species. In 2007 a UNESCO report was published on the threats of climate change to biodiversity within the CFR which recognized that biodiversity is threatened by shrinking bioclimatic habitats due to warming and changes in precipitation. Indeed, this year has been the year of Level 4 drought in the Cape Town area and unprecedented fires in the Knysna area fueled by dry brush due to a lack of rain.

In 2005 the Delaware Department of Transportation published their roadside vegetation concept and planning manual. This was developed to reduce maintenance effort while enhancing visual appeal, but laid out many important principles including addressing visual and safety concerns. In 2006, Esler and Milton published their paper on best practice in road, power line and rail reserves. This important document gave an excellent overview of the topic as well as providing solutions and management plans. In 2016, Collinson and Patterson-Abrolat of EWT addressed the issue of wildlife and roads, entitled "The Road Ahead".

We are now at a critical junction, with many programmes rolled out across the country that compromise the integrity of our roadside vegetation to the detriment of road users, plant and animal life. We have an opportunity to present an alternative management scheme that respects biodiversity while providing useful jobs. This includes the creation of the longest and most species rich reserve in the world that combines road, rail and electrical reserves: Project SATRN.

Abstracts

Keynote address:

A coastal adaptation in the Cape flora: does it exist?

Key words: coastal vegetation; plant evolution; Pleistocene, environmental change

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The Pleistocene physiographic dynamics of the evolutionary theatre that is the Cape south coast are relatively well understood, and ongoing research will continue to enrich our understanding of these phenomena. The question I pose here is: how did these dynamics influence the phytogeography, evolution and diversity of the biota of the calcareous coastal substrata of the Cape south coast? While our focus is on terrestrial vascular plants, the approach we outline here is equally applicable to other groups of organisms. Ultimately, this study is about highlighting an outstanding model system for explicitly testing plant evolutionary questions. The coastal environment – both now and in the Pleistocene - has a clear and powerful array of differential physiographic determinants, namely: persistently strong, salt-laden winds year-round, absence of frost, relatively heavy mammalian herbivory and trampling, continuous and disruptive fragmentation in response to rapid sea level fluctuations, and alkaline soils. These selective forces, we hypothesise, are responsible for a coastal adaptation, manifested by a unique set of biological traits. On the basis of the differences in selective regime between the ancient, montane and youthful, coastal habitats, one can make a series of predictions about trait response at the macroevolutionary (between closely related species) and microevolutionary (within species) scales. Expected shifts from the ancient to the young states include a lowering of plant stature, densification of canopy structure, increased palatability and shoot density, frost intolerance, and calcicole physiology. The identification of a suite of traits that have evolved independently in Cape lineages with coastal distributions will be a particularly novel contribution to our understanding of the evolution of the megadiverse Cape flora.

Session1: Diversity & Coexistence

Functional Trait Divergence and Eco-physiological Convergence in *Protea* Species in the Cape Floristic Region, South Africa

Key words: Functional traits, Eco-physiology, Co-existence

Kristen Nolting[1*] and Kent Holsinger[1]
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In the face of global climate change and continued habitat fragmentation, one of the biggest challenges for scientists and land managers today is to better understand the processes shaping the distribution of plants and animals across local and global scales. Specifically, we want to know why

species occur where they do given interactions with their abiotic and biotic environment, and how they persist locally in diverse communities given that they must compete for shared and often limited resources. A promising way to investigate these questions is to evaluate species distributions and species coexistence relative to the traits individuals possess. Traits often provide the link between an organism and its environment. Co-occurring species must be similar in traits that enable persistence in a given environment, but must differ in others allowing them to partition resources and reduce impacts of competition. Often studies of trait differences among species, however, do not directly evaluate the relationships between functional traits, eco-physiological performance, and fitness in given environments. We investigated differences in both functional traits (e.g. leaf mass per area) and eco-physiological performance (e.g. maximum photosynthetic rates), and their impacts on indirect measures of fitness, of several species of *Protea* co-occurring across several sites in the Cape Floristic Region. While we find that species do indeed differ in many functional traits indicating the role of niche partitioning in maintaining species diversity and coexistence, species have largely converged in eco-physiological performance traits. The similarity in performance is the result of species-specific differences in the relationships between functional traits and eco-physiological traits. It may be that the best predictors of eco-physiological performance are multivariate measures of plant functional traits, indicating that while species are adapted in many ways to live in the same types of environments, they are achieving this function using different combinations of traits.

Cross-generation interactions between overstorey and understorey plants in Fynbos

Keywords: Community structure, Fynbos, Proteaceae, Competition

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Fynbos communities are shaped by competitive interactions between different plant functional types, orchestrated by the fire regime. Overstorey shrubs (mostly nonsprouters) may eventually outcompete understorey plants (mostly resprouters) during long fire intervals. However, this understorey can regrow rapidly post-fire, and may exert strong competition on the seedlings of overstorey species. Hence, we expect competitive interactions between over- and understorey species to depend on time since fire. However, we still know little about the strength of these interactions. This project aims to understand how overstorey and understorey influence the spatial distribution of each other respectively across generations.
To quantify interactions between over- and understorey plants, five sites of recently burned Fynbos are surveyed, resulting in 2000 plots of $1m^2$. The location of each plot is recorded using a DGPS device. In each plot, seedlings of *Proteaceae* overstorey are counted and identified to species level. In addition, the cover of three categories of understorey plants (Restios, grasses and others) is estimated, each attributed into currently resprouting or currently non- resprouting. From a previous project (ProteaBird), we know the precise spatial location of all overstorey plants before the last fire.
First, the obtained data will be used to infer how the unterstorey affects the post-fire dispersal and seedling recruitment of overstorey *Proteaceae*. In addition, the effect of pre-fire overstorey plant distribution on post-fire understorey location will be investigated. A better understanding of overstorey-understorey interactions in

Fynbos should help us to predict how Fynbos communities will respond to shorter fire intervals, as expected under climate change.

Testing pollinator-mediated floral evolution of *Ferraria* (Iridaceae)

GL Theron, JJ Le Roux, SD Johnson, B Anderson

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Plants which depend on animal-mediated reproduction must employ some form of attractant and/or reward to ensure successful pollen export (Faegri and Van der Pijl 1979). Attractants such as colour and scent act as advertisement for the rewards offered, signalling their presence to the visitor and ensuring repeated visits (Raguso 2004; Johnson 2006; Schiestl et al. 2010; Shuttleworth and Johnson 2010; Van der Niet and Johnson 2013). Evolutionary shifts in traits associated with floral advertisement may result from quantitative or qualitative changes in the community composition of floral visitors across the landscape (Huber et al. 2005; Ellis and Johnson 2009; Waser et al. 2010; Newman et al. 2012) and possibly lead to pre-zygotic reproductive isolation (Stebbins 1970; Johnson 2006). Selection may drive the evolution of floral form to converge or be constrained by the preferences of the pollinating group which presents the highest fitness contribution (Faegri and Van der Pijl 1979; Daly and Smith 2000; Fenster et al. 2004; Schiestl et al. 2010; Rosas-Guerrero et al. 2014; Woodcock and Larson 2014). The African iris genus, *Ferraria* is ideal for exploring the evolution and diversification of the relationship between pollinators and floral attraction cues. *Ferraria* is a relatively small and under studied genus with remarkable variability in scent and colour (Goldblatt et al. 2009; Goldblatt and Manning 2011). This substantial floral variation is matched by substantial number of distinct functional pollination groups within this genus. Only a morphological phylogeny is published for Ferraria, which is problematic when based on floral traits, as these traits may be under strong convergent selection by pollinators. I will present a well-resolved phylogeny of the genus based on three chloroplast genes (Small et al. 1998; Shaw et al. 2005). Using analyses to infer phylogenetic signal I will elucidate the patterns of evolution of *Ferraria* in relation to pollinator shifts, scent composition and colour.

Listen up! Eavesdropping on a Cape Peninsula Endemic

Key Words: acoustic spatial capture-recapture, non-invasive sampling, calling population density

MARIKE LOUW[1], RES ALTWEGG [2], ANDREW TURNER[3], JASPER SLINGSBY[4], BEN STEVENSON[5], DAVID BORCHERS[6] & JOHN MEASEY [1]
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The Cape Peninsula Moss Frog, *Arthroleptella lightfooti,* is a visually cryptic species that is endemic to the Cape peninsula and is considered Near Threatened by the IUCN; the greatest threats being invasive woody vegetation and too frequent or intense fire. Traditional capture-recapture techniques are difficult to employ in studying visually cryptic species. Acoustic spatial capture-recapture (aSCR) provides a non-invasive means to study vocalizing animals and is used to obtain quantitative , repeatable estimates of calling animal densities. We used aSCR to obtain density estimates of calling *A. lightfooti* across their entire distribution on the Cape peninsula. Acoustic arrays of six microphones and a recorder were set up at sites (n=39) across the distribution range of *A. lightfooti* from August to October 2016 and the recordings were analysed using the R package "ascr". We present the first calling density distribution across the entire range of any frog. Calling density distributions of the frogs are heterogeneous across the Cape Peninsula, with some sites having high densities of frogs calling (1512.2±114.9 calling frogs per hectare), and other sites having low densities (61.8±6.3 calling frogs per hectare). This technique can be of conservation importance as it can aid in investigating the major threats to *A. lightfooti* and other calling taxa in addition to determining factors that are most influential in affecting calling population densities. Acoustic spatial capture-recapture can therefore provide valuable input for the management of natural areas on the Cape peninsula.

Drought-tolerance in wild and cultivated *Aspalathus linearis* in the Suid Bokkeveld, South Africa

Key words: Rooibos, Hydraulic conductance, Xylem cavitation, Drought-stress

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The north-western region of the Western Cape forms part of the Fynbos biome and is home to the indigenous, *A. linearis* (rooibos). Rooibos cultivation is restricted to a small geographic area and climate change poses a threat to wild plants and their dependent communities, as well as the sustainability of the rooibos industry. Climate-mediated impacts on rooibos are mostly substantiated by anecdotal evidence from small-scale farmers and local communities and have not been adequately addressed. The aim is to examine the different physiological responses, by means of xylem hydraulic conductivity, to drought stress of wild resprouter and cultivated reseeder *A. linearis* plants in the Suid Bokkeveld. Physiological adaptation strategies (resistance or risk to xylem cavitation) were measured in both wild and cultivated rooibos sampled at three farms (Melkkraal, Blomfontein, and Landskloof) in the Suid Bokkeveld. Wild rooibos sampled at Landskloof showed the greatest resistance to xylem cavitation with both Melkkraal and Blomfontein's wild samples losing their hydraulic conductance at a much faster rate than that of Landskloof. The cultivated rooibos samples at Landskloof showed the least resistance to xylem cavitation whereas the cultivated rooibos sampled at Melkkraal and Blomfontein lost their hydraulic conductance much slower than that seen at Landskloof farm. These results show that even though a plant may show high resistance to cavitation, it does not mean that plant can withstand water deficits. The reverse is also true; a plant may be able to withstand water deficits and be more drought tolerant, but it does not mean the plant can resist xylem cavitation.

Session 2: Aliens

Seed bank and growth comparisons of native (*Virgilia divaricata*) and invasive alien (*Acacia mearnsii* and *A. melanoxylon*) plants: implications for conservation

Keywords: competition, cultural control, invasive alien plant management, growth rates, seed banks

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Invasive alien plants with long-lived dormant seed banks and fast growth rates are difficult to manage. We investigated soil seed banks (densities, their vertical distribution, and viability), and growth rates (of seedlings and saplings) of two invasive trees, *Acacia mearnsii* and *A. melanoxylon*, and *Virgilia divaricata*, an indigenous analogue in South Africa, to determine whether the latter could outcompete the Acacias if managed for. We assessed seed bank densities underneath the canopies of mature trees; seedling growth from planted seeds; and growth and competition in naturally regenerated stands. Seed bank densities differed significantly among species (highest in *A. mearnsii* and lowest in *A. melanoxylon*) but not among depth classes. Viability did not differ among species or depth classes. As seedlings, *V. divaricata* outgrew *A. mearnsii* in height, but the opposite occurred in the sapling stage. Sapling growth of all species was uninfluenced by biomass of surrounding competitors (largely comprising *A. mearnsii*). Our findings suggest that *A. mearnsii*'s success is primarily attributable to its large seed banks, and secondly to rapid sapling growth. However, superior growth performance of *V. divaricata* seedlings and no suppression of sapling growth by competitors show promise for its use in integrated management of the Acacias.

Acacia saligna's soil legacy effects: what do they do and for how long?

Mlungele M. Nsikani

To reduce the negative impacts of invasive plants, management interventions such as control or eradication are usually necessary. It is often assumed that the impacts of invasive plants will diminish immediately after such interventions. However, in some cases the invader can have legacy effects in the soil that might persist for long periods and facilitate the establishment of sub-dominant invaders, thereby preventing the natural restoration of the managed areas. Therefore, to achieve the re-establishment of a functional native ecosystem it is important to understand for how long such legacies can persist in the soil and their effect on native species. We explore this issue, using Acacia saligna invasions in the lowland fynbos as case study. Soil samples were collected in invaded, non-invaded and cleared sites (representing two, six and ten years after clearing) and analysed for pH, carbon, nitrogen, available phosphorus, ammonium, nitrate, and electrical conductivity. Furthermore, Protea repens was grown in soils collected from non-invaded and cleared sites under controlled conditions. Ehrharta calycina was grown in half the trays to test the response of P. repens to sub-dominant invaders. Acacia saligna invasion alters overall soil characteristics and these are not restored to natural conditions after clearing. Acacia saligna clearing elevates soil nitrate levels and these can remain higher than in invaded (1.55 – 6.67 mg/kg) and noninvaded (2.16 – 4.35 mg/kg)

sites up to ten years after clearing. Germinations and growth of P. repens is not affected by the differences in soil characteristics between non-invaded and cleared sites. However, P. repens growth is reduced by sub-dominant invaders. Strategies to manage areas previously invaded by A. saligna should take into account the removal of invader litter and sub-dominant invaders.

The impact of pine plantations on fynbos above-ground vegetation and soil seed bank composition

Keywords: Above-ground vegetation; Fynbos; Pine plantation; Recovery potential; Restoration; Soil seed bank

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Pine plantations and pine invasions have numerous impacts on native ecosystems in the fynbos biome of South Africa. The severity of these impacts greatly determines the extent of potential ecosystem recovery after the pines are felled. The recovery potential of fynbos after felling of pine plantations of varying longevity and the subsequent application of ecological burns was investigated in the Helderberg Nature Reserve, Western Cape Province, South Africa. Above-ground vegetation, soil seed bank and abiotic variables were sampled across three treatments (reference fynbos, 30 year old pine and 50 year old pine) using 1 m2 quadrats placed along 50 m line transects. The soil seed bank samples were smoke treated and then monitored in a greenhouse to determine the soil seed bank species and growth form composition. Areas previously under 30 year old pine plantations had high native species and growth form richness and similar plant density to the reference fynbos areas. Conversely, areas previously under 50 year old pine plantations had significantly lower native species, growth form richness and density than the reference fynbos and were dominated by alien species. Therefore, areas previously under 30 year old pine plantations have higher recovery potential following pine removal than 50 year old plantations, owing to the depleted native soil seed bank in the latter. Consequently, active restoration may be needed to re-introduce the missing long-lived growth forms and to prevent soil erosion. Pine plantation and invasion management in the fynbos biome should aim to fell pines before the native seed bank is depleted to maintain the recovery potential of fynbos and prevent the need for active restoration.

Assessing ecological impacts of alien clearing methods along Western Cape riparian zones, implications for ecosystem recovery

Roderick Juba

Working for Water has come a long way in addressing woody alien invasive plants in terrestrial and riparian ecosystems in South Africa. However, use of herbicides, fire and removal of biomass may have some

consequences for ecosystem functioning. This study discusses 1) the impact of slash-and-burn of alien biomass and the use of herbicides to control tree growth and regeneration on soil microbial diversity, 2) the impact of slash and burn of alien biomass on soil physical and chemical properties, and 3) the biomass and nutrient content of selected alien species along Western Cape riparian zones. Application of herbicides to cut stumps decreased soil pH significantly at levels typically applied in the field, and stronger declines are seen with increasing concentrations. In addition, soil nitrogen levels increased significantly with the application of glyphosate. Soil microbial populations were not affected significantly. Soil pH changed following burning of slash piles in riparian soils and did not return to pre-fire levels even up to one year after the fire. Soil cations increased immediately after fire, but returned to pre-fire levels after one year. Soil available N was significantly higher months later where *Acacia* mearnsii slash was burned. All the sites indicated a microbial community shift after the effect of fire, as well as indirectly due to altered soil properties such as pH and soil phosphorus. These alterations in physicochemical and microbial dynamics may also influence regeneration and survival of seedlings on the scars.The alternative to biomass management though burning in the form of stacks on site is removal of whole wood or chips that are removed to local or international destinations. Several allometric models were developed that can be used to determine which nutrients are exported and in what quantities, and different models were derived for free-standing trees and trees in dense stands.

Potential factors influencing the establishment success of *Dicomada rufa*, a biological control agent for *Hakea sericea* in South Africa.

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Hakea sericea Shrad. & J.C.Wendl. (Proteacea) (silky hakea) is one of the most prominent and successful plant invaders of the South African fynbos biome. Native to Australia it was brought into South Africa over 100 years ago, and in the 1970s was the first biological control programme researched by a full team of South Africans. One of the most recent biological control agents used against *H. sericea* is *Dicomada rufa* Blackburn (Coleoptera: Curculionidae), a flowerbud-feeding weevil first released in 2006. However, since its release, the weevil has only established at southern Cape sites and not Western Cape sites. The reasons for the discrepancy at sites remain unknown; however, unsuitable environmental conditions are suspected to prevent the weevil's establishment in the Western Cape. In order to investigate this possibility, critical thermal limits and lethal temperature limits of *D. rufa* adults will be determined along with temperature ranges at sites across both regions. The data will be used to determine whether or not environmental factors are indeed preventing establishment of *D. rufa* in the Western Cape.

Update to biocontrol endeavours against *Hakea sericea* in the Western Cape, South Africa - *Aphanasium australe* and *Dicomada rufa*

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Biocontrol of *Hakea sericea* began in the late 1960's. Since then, five insects species, and one pathogen have been used for the purposes of managing expansion of this category 1 invasive

species. Two of the most recent insect introductions are the flower-bud feeding weevil, *Dicomada rufa*, and the stem-boring beetle, *Aphanasium australe*. Potentially, the most damaging insect agent is *Aphanasium australe*; however, this agent has a two-year lifecycle and established populations are very prone to fire events. There are three focal study sites investigating the impact of this species on *Hakea sericea* across the Western Cape, and one study site on *Hakea gibbosa* in the Elim region. Only at one of the three *H. sericea* sites, has *Aphanasium australe* shown a steady increase in population size, as well as a clearly defined local distribution spread, since its release in mid-2000. The second site has shown no increase in larval activity in the past 5 years, but there has also been no decline in the number of infected trees, suggesting the presence of a stable population at this site. At the third site however, since the drought of 2016 and 2017, the stem-borer has all but disappeared. The impacts of *D. rufa*, introduced in 2006, have not yet been quantified, but current efforts to this end are underway. Currently, this species has failed to establish at most 'local' Western Cape sites, although it flourishes in the southern Cape (e.g. George) region. Here, I discuss potential impacts of these two agents, possible reasons as to why they succeed in some locations and not others, and what the best management strategy for *H. sericea* and *H. gibbosa* might be in the near future.

Mortality of the leaf-mining moth, *Aristaea thalassias* (Gaertn.) F. Muell (Lepidoptera: Myrtaceae), a biological control agent of *Leptospermum laevigatum*

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A leaf-mining moth, *Aristaea (Parectopa) thalassias* is a biological control agent of invasive *Leptospermum laevigatum*, commonly known as Australian myrtle, in South Africa. The impact of *A. thalasisas* on *L. laevigatum* is currently categorised as negligible. Much of the biology of this species is still unknown and very little has been published about it to date. However, it is commonly assumed that the moth experiences high levels of mortality in the field, contributing to its low efficacy as a biocontrol agent. The aim of this study was to quantify the level of mortality of this species, determine which life stage is most prone to mortality and any seasonality patterns in mortality levels. A study was conducted between July 2015 and May 2017 at Stanford in the Western Cape. Leaves with visible signs of larvae (mines) and pupae were collected from randomly selected trees in the field and dissected in the laboratory. The numbers of dead and live larvae and pupae were recorded, together with the presence of parasitoids. Percentage mortality was high in all of the life stages, but highest in the rolled-leaf prepupal and pupal phase. Mortality attributed to parasitism was only as high as 30% in February 2017, and as low as 0% in July 2015, suggesting low overall mortality attributed to parasitism. Causes of mortality were not readily determinable but predation and desiccation might be contributing factors.

Assessing the impacts of invasive legumes on soil conditions and microbial community composition in a biodiversity hotspot

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Soil microbial communities fulfil important roles in ecosystem functioning such as the decomposition of organic matter and the cycling of nutrients. As invasive alien plants become dominant components in the communities they invade, they modify these biotic and abiotic components of soils. High densities of invasive plants are often correlated with higher organic inputs and decomposition rates, with subsequent increases in soil mineralization, nitrification and high carbon content. Invasive nitrogen-fixing legumes, such as Australian acacias, can further modify soil nitrogen accumulation and transformation rates. Here, comparing pairs of acacia-invaded and uninvaded sites, in close proximity to each other in the Core Cape Subregion, a global biodiversity hotspot of South Africa, we aimed to investigate whether the presence of dense invasive acacia populations induce changes in soil chemistry, seasonal soil microbial community function (enzyme activity) and soil microbial community composition. We found that soil microbiomes of different uninvaded sites are distinct but show evidence for compositional convergence between different acacia-invaded sites. Our enzyme activity analyses indicated significant seasonal differences within sites, but these differences were not consistent between invaded and uninvaded sites per season. Specifically, we find some evidence that acacias increase activity of enzymes involved in phosphate metabolism, but decrease the activity of urease (nitrogen metabolism). Interestingly, carbon cycling as measured by β-glucosidase activity was least affected by the presence of acacias. Overall, our data suggest that invasive acacias have the capacity to significantly alter soil functioning and microbial community composition, albeit variable between sites and seasons.

CASABIO – Pushing the limits of documenting extralimitals

Key words: Citizen science, Newlands Forest, Invasive species, *Psidium cattleianum*

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A frequently overlooked category of invasive plant species is the extralimitals - plants that are indigenous but have their origins in an area separate from the current area of expansion. In this case, the CASABIO citizen science platform has been used to document invasive species of alien forests, particularly that of *Psidium cattlieanum*, the cherry guava.
We show that we were able to gather orders of magnitude more data on invasive plants than existing platforms. With more than 150 species we have also identified considerably more invasive species than previously published . We show the extent of recent population explosions of some invasive exotics, but also similar patterns of expansion displayed by extralimital species. We conclude by raising important philosophical and practical questions about managing an invasion of this nature and magnitude.

Testing major plant-microbial mutualism hypotheses in invasion ecology: a case study using Australian acacias and rhizobia

Key words: Invasions, Australian acacias, Mutualisms, Provenance

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Invasive species often have detrimental impacts on native biodiversity and community structure. Within the Western Cape, Australian acacias have become some of the most important invasive plant species. In many instances, they have formed monotypic stands, entirely replacing the native vegetation in the area. Since acacias are legumes, it is thought that their mutualistic relationship with nitrogen-fixing bacteria, known as rhizobia, may facilitate their establishment in nutrient poor areas, such as those typical of Fynbos vegetation. However, the provenance (area of origin) of rhizobia may have an impact on the effectiveness of the mutualism in providing the acacias with an advantage. In order to test this, a common garden experiment using four *Acacia* species and species-specific rhizobia from three countries (Australia, New Zealand and South Africa) was performed to assess the impact of rhizobial provenance on plant performance. Physiological data, including growth kinetics and isotope data, were collected and analysed separately for each species. Results differ between the species, but there is a trend towards those plants inoculated with Australian bacteria having higher growth performance. This indicates that the provenance of the bacteria in the mutualism may play a role in the successful establishment of invasive Australian acacias.

Session3: Fire

Postfire regeneration in the Cape Floristic Region

Key words: climate change, fire, invasive species, remote sensing, plant functional traits

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The rate and magnitude of fynbos vegetation regeneration after fire affects a range of ecosystem processes and functions including carbon storage, hydrology, geomorphology/geochemistry, habitat for other organisms (from microbes to megafauna), and various aspects of the fire regime including intensity and minimum return interval. Unfortunately, global change impacts are shifting the functional composition of fynbos ecosystems, likely affecting postfire regeneration trajectories, with knock-on

effects on ecosystem function. Here I present research on postfire regeneration trajectories observed using satellite remote sensing; exploring the influence of the functional composition of vegetation on recovery rates and the potential to develop this into a monitoring system.

Trait controls on post-fire recovery in the fynbos biome

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Understanding whether traits may mitigate or exacerbate changes due to climatic change is an issue of particular importance given observed climate-driven changes in the functional composition of fynbos communities. Using satellite-derived vegetation observations, vegetation survey and species trait data, we modeled post-fire ecosystem recovery as a function of stand age, topography, climate and species traits, and explore the sensitivity of post-fire recovery trajectories to changes in trait composition. We found that resprouting, growth rates and plant height are particularly important for determining post-fire recovery in addition to climatic variables. Shifting community trait composition will result in changes to postfire recovery trajectories perhaps as strong as those occurring in response to climatic change. The interaction of changes in community trait composition with changing climate and invasive alien species could create ecological contingencies with unknown consequences.

Unpacking a pixel: drivers of seasonality in vegetation greenness in fynbos

Key words: remote sensing, drought, plant functional types

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Globally, there is considerable interest in the impact of drought on plant diversity. Remotely-sensed data obtained from low-resolution satellites (e.g. LandSat, MODIS) show strong seasonal variability in NDVI (vegetation greenness) in the fynbos, which is presumably a signal of vegetation response to fluctuating water availability. However, the spatial resolution of many of these satellites is too low to deduce which components of the vegetation are driving this seasonality. Ground-controlled

Unmanned Aerial Vehicles (UAVs or "drones") can be mounted with multispectral cameras and flown just metres from the ground, producing NDVI data at a high enough resolution to distinguish between different plants. Here, I present research that employs these novel techniques to "unpack" the information gathered from LandSat and MODIS, ultimately hoping to identify which plant functional types are responsible for the apparent seasonal swings in NDVI in the fynbos, and whether this is a good indicator of their resistance or resilience to drought.

Role of fire in the distribution of vegetation in a Mediterranean-type ecosystem

Key words: fire regime, fynbos, multinomial logistic regression, probabilistic vegetation model

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Fire is a key determinant of vegetation composition, structure and distribution in Mediterranean type-ecosystems (MTEs), facilitating the recruitment and persistence of majority of the plant species found in these systems. The predicted shift towards a warmer and drier climate in MTEs is anticipated to induce dramatic alterations in fire activity throughout these regions. The combined effect of changes in both climate and fire regimes will ultimately lead to the disruption of existing vegetation distributions as well as ecosystem functions, and may result in the development of novel plant assemblages with unknown implications. As such, an in-depth understanding of vegetation-environment interactions in MTEs, and more importantly how vegetation will respond to changes in both climate and fire regimes, will be critical for mitigating and/or adapting to biodiversity loss. However, most vegetation models employed to provide insights into vegetation distributions and guide biodiversity management overlook the role of disturbance regimes such as fire in determining vegetation distributions, while the probability of alternative vegetation types existing under the same location and set of environmental conditions is overlooked. Here, we aim to measure the contribution of fire as a predictor of the current distribution of fynbos vegetation relative to climate and soil, and provide a probabilistic perspective of the distribution of fynbos vegetation types. We use multinomial logistic regression to develop a probabilistic vegetation model of the distribution of 70 fynbos vegetation types; with climate, soil and fire parameters selected as predictor variables.

Assessing the threat of landscape transformation and habitat fragmentation for ecosystems in the Fynbos Biome of South Africa

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Global biodiversity has decreased drastically, mainly due to habitat destruction, to such an extent that biodiversity loss is considered a global change driver in its own right. Habitat destruction has mainly been due to the transformation of natural environments to human land uses such agriculture and urbanization. Beyond the direct and immediate impacts of habitat loss, landscape transformation generally leads to habitat fragmentation, which brings further ills for biodiversity. Habitat fragmentation refers to the breaking apart of habitat into smaller, isolated fragments, imbedded in a human modified matrix, with greater exposure to the matrix, along the fragment edge. These changes in the landscape pattern can lead to the loss of native vegetation, deteriorating ecosystem function and disrupted ecosystem disturbance regime.
The extent of habitat transformation and fragmentation of Fynbos vegetation types has only been quantified based on earlier limited data and fragmentation in the region is probably underestimated. Several studies have attempted to understand the biological responses of Fynbos taxa to habitat fragmentation, but overall very little is known about the actual extent of habitat fragmentation, or the ecological responses to fragmentation within the ecosystems in the region. The International Union for Conservation of Nature Red List of Ecosystems (IUCNRLE) is a tool aimed at identifying ecosystems that are losing biodiversity, ecosystem functionality and/ or ecosystem services. The status of ecosystems (i.e. threatened, vulnerable etc.) is assessed based on the extent of their distribution, environmental degradation and the disruption of biotic processes within the ecosystems. The aim of this paper is to quantify the extent of habitat loss and degree of fragmentation of the vegetation types of the Fynbos biome, specifically applying the IUCNRLE guidelines to assess the extent to which landscape transformation and habitat fragmentation threaten the Fynbos ecosystems.

An experimental study of plant-pollinator interactions along a post-fire succession gradient

Key words: plant-pollinator networks, Protea, post-fire succession

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Wildfires occur naturally within fynbos ecosystems and are vital for initiating regeneration cycles of plant communities. However, the frequency of wildfire events has recently increased. Although

fynbos communities have long been exposed to fire, the effects of more rapid fire cycles on the plant and animal communities remain unclear. During succession following fire events, floral resources of different plant species develop at different rates and represent a steep gradient in resource availability. This is important because insect pollinators respond to the availability and distribution of floral resources within plant communities, and their abundance and foraging behaviour drive pollination functions for plants. Spatial variation among Protea communities of different post-fire ages will be analysed to determine how this influences species and functional diversity of insect pollinators, as well as the interaction diversity of pollination networks. Further, it will be analysed how the attractiveness of inflorescences to different-sized pollinators varies across Protea species with different inflorescence size. To this end, in total 12 inflorescences of four different Protea species will be presented at 30 sites along a successional post-fire gradient (0-25 years of age) and visiting insect pollinators on these inflorescences will be recorded. This data will be used to test how plant and insect traits interact in their effects on the colonisation ability of different pollinator species.

Session 4: Pathogens

Indigenous plant pathogens and their contributions to plant community diversity

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Plant pathogens are an understudied class or organisms in the Cape Floral Kingdom. Understanding their role in the patterns and processes of plant communities is essential for conservation in changing environments. Many examples that demonstrate their importance in determining plant community structure and diversity exist internationally, but many questions remain regarding their roles in the fynbos biome. Cape Citizen Science is an initiative to reveal the diversity and distribution of *Phytophthora* species. Preliminary results indicate that more than five *Phytophthora* species are present within the fynbos biome. Their roles in this environment remain unclear, but the results indicate that further research is needed to strengthen the conservation of the endemic plants within this biodiversity hotspot.

A diminishing silver lining in the Cape Floristic Region: re-evaluating the decline of *Leucadendron argenteum*

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Leucadendron argenteum, commonly known as the silver tree, is endemic to the Table Mountain National Park (TMNP). Its natural range is restricted by the expansion of the city of Cape Town, naturalized exotic trees, altered fire regimes and possibly a suit of invasive and indigenous plant pathogens. A major factor contributing to the decline of *Leucadendron argenteum* has been attributed to the fungus-like microorganism *Phytophthora cinnamomi,* which causes sudden dieback due to root

and crown rot of the trees. However, the last study of these interactions was conducted in 1973, a time when the taxonomy and the ecology of the pathogen and host in the changing environment were not well understood. The main aim of this project was to re-evaluate the association between *Phytophthora* and *Leucadendron argenteum* mortality in TMNP by identifying the species present and examining the factors that may contribute to disease expression. We hypothesize that the decline and death of *L. argenteum* is primarily attributed to *Phytophthora cinnamomi* or related indigenous or exotic taxa and the morality rate and occurrence of pathogens will be a function of the level of disturbance. To test this hypothesis we established 10m plots at ten randomly selected sites in TMNP and collected a total of 40 rhizosphere samples. We expect this study will help guide future conservation management efforts of this iconic tree species and reveal a gap in our knowledge regarding the microscopic threats to endemic flora in TMNP.

Long-distance dispersal characterises the population structure of *Protea*-associated fungi

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Protea inflorescences and infructescences support a wide range of microorganisms including ophiostomatoid fungi. These fungi are characterised by morphologies that allow for spore dispersal via arthropods such as mites and insects. The focus of the current project was to uncover the population genetic structure of selected *Sporothrix* species (species in the *Sporothrix splendens* clade) in order to infer dispersal patterns and levels of sexual reproduction. This was done by investigating the population structure of *S. africana*, *S. protearum* and *S. splendens*. The population structure of *S. splendens* was determined for isolates collected from across the distribution range of its *Protea repens* host in the Core Cape Subregion. Thereafter the population structure of *S. africana* and *S. protearum* (both associated with grassland and savanna proteas of South Africa) was also determined and compared to the distribution of their hosts. Population genetic structure for all taxa were assessed using a fast evolving anonymous marker (m128) and the slower evolving β-tubulin marker. Genetic diversity (haplotype and nucleotide diversity), population differentiation, rates of migration, isolation by distance and the relationship between haplotypes were calculated for both markers. The population structure of *S. africana*, *S. protearum* and *S. splendens* were not structured according to geography and, in the case of the former two, neither were they structured according to host identity. These *Sporothrix* species showed high genetic diversity, rates of gene flow and no signal for isolation by distance. This study highlight the importance of sexual reproduction and the role played by birds in shaping populations of *Sporothrix* within *Protea*. In addition, two undescribed species were discovered (*Sporothrix smangaliso* and *S. nsini prov. nom*) providing additional evidence for multiple invasions of this unique niche by *Sporothrix*.

Can fire be used in a garden to cleanse the disease in the flowerbed?

Key words: Phytophthora, Proteaceae, Fire, Disease, Kirstenbosch

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Armillaria and *Phytophthora* root rot have been identified as major concerns with the former being found on all diseased of Proteas in Kirstenbosch Garden. In addition to this there are numerous other pathogens affecting Proteaceae including Anthracnose, blight, leaf-drop, leaf spots, scab, and stem cankers diseases. The project was focused on the reduction of the pathogens using the fire. Plants were cut down to make fuel and branches were collected within the garden and laid on the flowerbeds. Two beds were burned under a cool environment within an expertise team of the Volunteers from Wildfire Services led by Peter, Jon-Jon and Matt and Kirstenosch Estates Team. The same species are planted in each bed and the survival/mortality was recorded. The un-burnt control bed was compared with the fire treated beds. One bed was rotivated and planted; and the other bed nor rotivated and was planted. The third bed, control, was planted without turning the soil. The data of survival plants, seeded and resprouted plants were collected and the recorded. A number of species seeded, *Wahlenbergia capensis,Skiatophytum tripolium, Phylica pubescens, Euryops virgineus,* and some resprouted, *Leucadendron spissifolium* and *Protea cynaroides*. We will have the final data in three years.

Session 5: Ecological Restoration

Testing for fire-dependency in critically endangered renosterveld shrublands and soil seed banks in the Swartland, South Africa

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Renosterveld one of the three major shrubland types that occur in the Cape Floristic Region. It is characterised by a mix of shrubs and grasses, and the most diverse assemblage of geophytes globally. Less than 10% of lowland renosterveld remains due to land transformation for agriculture, resulting in a highly threatened and fragmented system. While the fire ecology of fynbos is well-studied, the degree to which renosterveld shrublands are fire-dependent is unclear. This study tested whether the germination of renosterveld soil seed banks is fire-stimulated, and assessed the influence of fire on the diversity of the corresponding standing vegetation. Soil seed bank samples from north- and south-facing slopes were smoke-treated and germinated in a greenhouse for six months. Burned standing vegetation was surveyed 16 months post-fire, as was unburned vegetation (>15 years since previous fire) on the same slopes. Species richness and density of the seed banks were compared between slopes and within slopes between smoke-treated and untreated samples. Burned and unburned standing vegetation were compared within and between slopes in terms of species richness, abundance and aerial cover. Compositional similarity of the soil seed banks and standing vegetation was also assessed. The seed banks were dominated by annuals and graminoids. Smoke treatment had no effect, except for significantly higher species richness and seedling density in perennial shrubs from the south-facing slope. The seed banks on the south-facing slope displayed significantly higher species richness and seedling density than those on the north-

facing slope. Burned standing vegetation exhibited higher diversity than the unburned vegetation. Annuals and graminoids displayed higher species richness and aerial cover in the burned vegetation. The north-facing slope contained less than half the number of species/m^2 compared to the south-facing slope. The seed banks and standing vegetation showed a fair degree of overlap in species composition. Elevated germination in perennial shrubs in the smoke-treated soil seed bank samples, and increased diversity of the standing vegetation post-fire suggests the renosterveld in this study shows the elements of a fire-driven system. Furthermore, certain species only recruited in the burned vegetation suggesting dependence on fire-related cues for germination. Aspect had a major influence on plant community composition with the mesic south-facing slope being more diverse than the xeric north-facing slope. In contrast to fynbos, the seed banks and standing vegetation were relatively similar, likely due to a paucity of serotinous shrubs in renosterveld.

Conserving Living Landscapes: Investigating impacts of livestock grazing and assessing rangeland restoration potential in Overberg renosterveld

Keywords: Grazing, Overberg Renosterveld, Soil Seed Banks

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Renosterveld vegetation is one of the world's most species diverse Mediterranean type shrublands and forms part of the Fynbos Biome in South Africa's Cape Floristic Region (CFR). It is particularly known for its extraordinary diversity of geophytes. In the Overberg region there are four different renosterveld types, all of which are classified as being Critically Endangered and are considered to be "100% irreplacable" owing to transformation for agriculture. Only 4-6% of its former extent remains. Continuous heavy grazing by domestic livestock and mismanagement are also significant threats. This research will provide valuable baseline data on responses of renosterveld vegetation to varying degrees of livestock grazing. It also aims to develop a protocol and conceptual model to use ecological thresholds and alternate stable states theory in order to evaluate restoration potential of overgrazed renosterveld and furthermore prioritise sites for restoration interventions. It This will be done using a combination of baseline vegetation surveys using Modified Whittaker Plots, soil seed bank studies and fenced grazing exclosures. Preliminary results suggest that species diversity is overall higher at sites with medium grazing load and lower at sites with low and high grazing intensity. Heavily grazed sites often had a significant component of non-native ruderal and grass species. Plant productivity of keystone Overberg renosterveld species such as *Aspalathus nigra, Asparagus capensis* and *Themeda triandra* was significantly decreased with increased grazing impact. Sheep have been found to graze less selectively than cattle and have a far greater negative impact on the veld. Findings highlight the importance of effective management of domestic livestock grazing in conserving renosterveld vegetation in the Overberg.

Implications for management of lowland fynbos ecosystems resulting from restoration experiments in Cape Flats Sand Fynbos

Key words: conservation management, lowland fynbos restoration, invasive alien species

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Restoration Ecology and Invasion Biology are synergistic fields, but there is a gap between knowledge and practical implementation within these fields. This is being solved through collaborations between scientists and management practitioners. A study at Blaauwberg Nature Reserve is helping to expand our knowledge of how to effectively manage alien invaded lowland fynbos for restoring degraded habitat. This information is made accessible to managers involved in making and implementing decisions on management. Work in the field involved assessing the effectiveness of burning after initial alien clearing, and follow-up field sowing trials involving sowing pre-treated seed to facilitate better fynbos recovery. Field surveys were conducted up to two years after initial clearing, but recovery rates were simulated and extrapolated to predict long-term vegetation recovery trajectories under different restoration treatments up to 30 years after initial clearing. These simulated data were compared against field data to determine whether successful short-term recovery is likely to be sustained. This study involves collaborations between different organisations including Stellenbosch University, City of Cape Town, SANBI, Millennium Seed Bank, CIBIO and Working for Water. A workshop was organised in November 2016 to provide a platform for knowledge exchange between this study and other restoration work being done in the region, and some common key points emerged, which combined with this study are discussed with relevance to best practice for management.

Lessons learnt in implementing the Berg and Breede River Riparian Rehabilitation Programme (DEADP).

Key words: Rehabilitation, Riparian, Berg River

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The Berg and Breede River Riparian Rehabilitation Programme was developed by the Department of Environmental Affairs and Development Planning (DEADP) to assist in fulfilling the Berg River Improvement Plan (BRIP). It is currently in its 6th year and is headed by Jason Mingo. Intaba Environmental Services has been the service provider since May 2016 (a 3 year contract) and we have currently propagated and planted a total of 190 000 plants in over 12 formal sites in the Berg & Breede River Riparian's. Sites vary in size, soil type, water & irrigation availability and each have their own set of challenges! We intend to share our lessons learnt so far with regards to practical implementation of this program. We will be focusing our discussion on plant selection, plant propagation and site management.

Moving forward with rotenone projects: rapid removal of non-native fishes from two farm dams and strong recovery of threatened fishes in a priority river for fish conservation

Key words: Rotenone, rehabilitation, fish conservation

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The Cape Fynbos region is a hotspot for freshwater fish conservation in South Africa. Of its 21 currently described native species; 19 are endemic, 8 of which are Endangered or Critically Endangered. The prime threat to these fishes are predatory non-native fishes of which the black basses (*Micropterus* spp) have had the most severe impact. Non-native fishes can also impair water quality, with species like carp (*Cyprinus carpio*) causing elevated turbidity levels in dams. CapeNature has embarked on a programme to test the value of the piscicide rotenone as a conservation and rehabilitation tool for inland waters with the support of DEA's Natural Resources Management Programmes. The use of the piscicide has been supported by comprehensive monitoring and research led by the South African Institute for Aquatic Biodiversity and funded by the Water Research Commission of South Africa. CapeNature tested rotenone in the Cederberg's Rondegat River in 2012 and 2013, which resulted in the complete removal of smallmouth bass *Micropterus dolomieu* from 4km of river and strong recovery of threatened native fish species. In addition, earlier this year, two privately owned farm dams were treated with rotenone - at Kromrivier farm in the Cederberg (26 January 2017) and Kranskloof farm near Nieuwoudtville (29 March 2017). The treatments were successful in removing non-native bluegill sunfish *Lepomis macrochirus* from a weed filled dam at Kromrivier farm and carp from the turbid Kranskloof dam. The dam treatments were observed by post-graduate students from several South African Universities (Rhodes, UWC, Stellenbosch, Venda, Fort Hare), who also participated in monitoring and collecting dead fish.

Planning for the rehabilitation of plantation "exit" areas in the Garden Route National Park

Key words: fynbos restoration, invader plants, fire management, erosion

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The Garden Route National Park was formally established in 2009, consolidating the Wilderness and Knysna lakes areas, the Tsitsikamma marine protected area and State Forest land, comprising of forest and mountain fynbos, into one large protected area. An additional 18 000 ha, mostly of commercial plantation, were earmarked to be clearfelled and incorporated into the park over a period of 10 years. Of this, about 10 000 ha have already been transferred to South African National Parks (SANParks). Incorporating these areas into the park would add to the biodiversity conserved in the

park, contribute to park consolidation, enhance the maintenance of natural ecological processes, simplify management and open up additional opportunities for ecotourism ventures. However, incorporating the clearfelled areas into the management of the park, requires a sound planning process to decide on long-term management objectives to guide management prescriptions. To this effect all "geo-units" (clusters of clearfelled plantation compartments) are assessed on transfer to SANParks. This involves determining the natural climax vegetation for different areas (based on habitat and location in the landscape), assessing vegetation cover and the presence of Species of Special Concern, and the identification of sites of cultural-historical value. Road networks are also assessed, and unwanted roads and the need for rehabilitation, identified. Management activities of particular importance, are invader plant control, fire management and erosion control. The clearfelling of plantations for rehabilitation to fynbos or forest also provides research opportunities in this field. A long-term monitoring programme has been initiated to assess the recovery of fynbos in terms of composition, structure and functionality over time, and identify the need for management intervention.

Long-term monitoring of the recovery of fynbos in clearfelled pine plantations in the Garden Route, Western Cape.

Key words: clearfelled pine plantations, ecological restoration, fynbos rehabilitation,

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Ecological restoration has become an important part of biodiversity conservation because of its potential to reverse land degradation, improve the resilience of an ecosystem and maintaining important ecological services. There are, however, uncertainties regarding best practice and what defines successful restoration. As this differs with ecosystems, assessing the recovery of plant communities, is a critical component to the success of restoration efforts. Hence, the study aims to monitor the progress of fynbos recovery in terms of vegetation structure, species composition and functional diversity in clearfelled pine plantation areas in the Garden Route National Park. Semi-permanent plots, to allow for re-measurement, would be established at sites of different ages after clearfelling, and data on vegetation structure and species composition recorded. To assess functionality, guild structure would be determined by assigning species to categories with regard to growth form, dispersal mode, seed storage, etc. As part of long-term monitoring, invertebrate, rodent and bird assemblages would also be assessed. Because of the large extent of these areas, a passive restoration approach is followed. Monitoring, though, will prompt management interventions by flagging aberrant sites. Knowledge would be generated with regards management interventions that facilitate the successful restoration of fynbos in the Garden Route. The plot layout would therefore also allow for experimental burning, exposing some of the plots to fire during the later phases of the project.

Taking urban conservation by the horns – the four legged approach. Keywords: eland, strandveld, restoration, urban conservation.

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With the ongoing threats to biodiversity and pressure from human activities on the unique flora of the Cape, the need for modern conservation practices has emerged. Experimenting with new tools to manage natural areas is creating opportunity for new conservation practices to reach a balance between human needs and protecting Earth's living systems. Protected areas play an important role in urban conservation and offer opportunities to local people to connect with nature. By understanding and enhancing the way we conserve, these areas will enhance the way people experience and value natural areas. The Gantouw Project is testing a vegetation management tool for modern conservation practises at the Rondevlei section of the False Bay Nature Reserve. The tool, aimed to mimic the historical migration of large herbivores to what is now fragmented small protected areas, involves applying tame eland to mature Strandveld to combat bush encroachment. The method of using eland as a veld management tool, apart from the ecological value, is also proving to have other beneficial spinoffs to the local community from the Cape Flats which include employment, skills development and local communities taking ownership of the project. This four legged approach is walking this management tool into modern conservation. The first leg of the approach is eland browsing on overgrown bush, browsing alien invasive Port Jackson (Acacia saligna), clearing paths, fence lines and fire breaks - saving on time and personnel that will in the absence of eland, be scheduled to do these routine tasks. The second leg is creating opportunities and employing staff from the local Cape Flats community. Involving staff in various skills development programmes through the Cape Town Environmental Education Trust (CTEET) forms the third leg of the approach. Lastly, getting to the fourth leg of the approach of taking urban conservation by the horns is the role of the eland as ambassador animals, catching the attention of the public and connecting people with nature.

An ecological approach to landscaping

Key words: Landscaping, gardening, rehabilitation

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Most people appreciate a beautifully created garden and the benefits thereof are numerous. There are many challenges to gardeners and landscapers in our changing environment and climate. At Intaba Environmental Services we specialise in veld rehabilitation, indigenous landscaping and botanical search and rescue services. We believe the conservation potential in gardens is greatly undervalued or overlooked. A rehabilitation approach can be applied to landscaping, where exotic gardens can be transformed into a more natural environment or ecosystem with a conservation value. We assess potential garden sites in terms of the natural vegetation type ('biome') as set out in The Vegetation of Southern Africa and Lesotho (Mucina & Rutherford) and other site conditions (soil condition, erosion potential, fire hazards etc.) and design a garden that is focused on working with these factors to enhance the biodiversity, ecosystem services and aesthetics of the site. This will also prevent plant mortality and deduce the need for irrigation.

Using restoration of ecological infrastructure as an approach to climate change adaptation and mitigation for agriculture in the Fynbos Biome

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Well-functioning landscapes provide a wealth of ecological services to farmers, rural communities and downstream economic centres. These services include, among other things, the provision of water; the regulation of stream flow and soil erosion; the production of forage, crops and fuelwood, and the regulation of climate through the sequestration of carbon in biomass and soils. Furthermore, well-managed landscapes are more resilient to disturbance than degraded ones. This paper will draw on the Western Cape Climate Change Response Framework and Implementation Plan for Agriculture (2016) to make the case for restoration and long-term maintenance of ecological infrastructure as an important response to climate change in agro-ecological landscapes. The overgrazing of rangelands, the spread of invasive alien plants on and adjacent to agricultural land, and inappropriate ploughing and land management, have led to degradation in parts of the Fynbos Biome. Sheet, gully and wind erosion of soils are accelerated in bare degraded landscapes. These changes have reduced the productive capacity of such landscapes and made them more vulnerable to the adverse effects of climate change, e.g. through impacts of more intense heat waves, floods, droughts and wildfires. The scientific and economic aspects of restoring ecological infrastructure are well understood. Investing in ecological infrastructure is generally more cost-efficient and sustainable than investing in built-infrastructure alternatives. Furthermore, the restoration of degraded landscapes leads to an increase in biomass and soil carbon stocks. The South African National Terrestrial Carbon Sink Assessment identified reforestation, landscape restoration and reduced tillage as three of the country's principle land-use-based climate change mitigation measures. This response measure provides multiple benefits in the climate change context. However, context-specific implementation models and financing mechanisms are required based on partnerships between all tiers of government, landowners, local communities, non-governmental organisations and civil society.

THE IINGCUNGCU PROJECT: Restoring nectar feeding birds, building biodiversity leadership.

Key words: Plant-pollinator networks, habitat fragmentation, nectar feeding birds, ecological corridors, school gardens, school learners' engagement, and high schools.

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Plant-pollinator interactions are threatened by habitat fragmentation and little is being done to mitigate its varying impacts. Thus the *lingcungcu* study put together three chapters 1) aiming to establish a methodology to establish ecological corridors linking two protected areas using high school gardens as stepping stones planted with nectar producing plants; 2) Have nectar-feeding birds returned to restored sites?; 3) Did the study manage to nurture future leaders for biodiversity? The

methodology included setting up a nectar producing and bird-pollinated plant species list for the Cape Floristic Region (CFR); criteria for establishment of ecological corridors and another for selection of suitable plants for planting at high schools; selection of suitable plants for planting within the study area. This chapter concludes with a communication and a media strategy used to communicate the study progress. The results following bird observations suggest that planting suitable nectar producing plants can restore nectar feeding birds, thus restoring plant-pollinator networks. An upward trend in bird abundance was observed on the two species i.e. *Zosterops virens* (Cape white-eye) and *Cinnyris chalybeus* (Southern double-collard sunbird).
Furthermore, the results following interaction with grade 10 learners showed an increasing trend over time in the experimental group especially in their responses to one of the grouped questions that tested the knowledge variable. This concludes that there was a significant statistical interaction between the two variables Period (time) and Treatment. I found that learners are always eager to engage in new projects to learn new things and that their attitudes can change over time towards biodiversity when engaged in environmental education projects. Restorative efforts on a landscape scale, especially in urban ecosystems, can be best achieved when ecologists begin working together with social scientists. Biodiversity will continue its perilous path if it does not consider humanity its biggest partner in perpetual existence.

Session 6: Sustainable use and cultivation

Spatial variation in sensitivity of serotinous Proteaceae to wildflower harvesting inferred from large-scale demographic data in the Cape Floristic Region

Treurnicht, M., Pagel, J., Slingsby, J.A., Esler, K.J. & Schurr, F.M.
Harvesting Proteaceae inflorescences from natural populations (i.e. wildflower harvesting) contributes significantly to the 'biodiversity economy' of the Cape Floristic Region (CFR). Wildflower harvesting is currently regarded as a conservation-friendly approach compared to cultivation practices. However, many Proteaceae are serotinous and rely on canopy-stored seed reserves to regenerate after fire, making species potentially vulnerable to flower removal. To safeguard populations and species against overexploitation, conservation guidelines recommend that no more than 50% of the current year's flowers be removed during a single harvesting event. However, it is currently unknown whether this "50% harvesting rule" applies across multiple species and across their geographical ranges. Resolving this is important for conservation efforts to derive species-specific, locally- and regionally adapted wildflower harvesting guidelines for the CFR. We investigate long-term population viability of serotinous Proteaceae in response to wildflower harvesting in the CFR. Specifically, we use data on large-scale demographic variation (fecundity, seedling recruitment and fire survival) to parameterize dynamic population models that predict the effects of wildflower harvesting across environmental gradients of fire disturbance, climate and soil factors. Among the study species, our preliminary results show that sensitivity to harvesting increases under drought- and heat stress whereas variation in cold stress and soil nutrients played a less important role. We found not only considerable interspecific variation in the sensitivity to harvesting, but also high intraspecific variation across populations in different environments. These findings have important implications for serotinous Proteaceae and cautions against the application of general management guidelines, like a 50% harvesting-level, across species and regions. Overall, our findings are useful to set priorities for the sustainable management of Proteaceae diversity in the CFR.

Disa barbata and other terrestrial orchids of the Fynbos Biome - surprises and experiences.

Hildegard Crous

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Terrestrial orchids are a significant component of the fynbos biome. They count amongst the most beautiful, intriguing and desirable plants of the fynbos. They occupy a variety of habitat niches within the biome and culturally are greatly affected by fires, floods and human encroachment. Understanding their cultural needs helps clarify how these plants survive. The disa barbata project has been the flagship project to understanding how these plants develop through the various stages from seed to mature flowering plant.

Re-opening the case for wild Frankenflora: testing Protea species for hybidization using DNA and HRM analysis

Timothy Macqueen

In 2006, Dr Tony Rebelo wrote an article entitled "A Hybridization between planted Proteas and their cultivars with wild Proteas: The Frankenflora" as part of the Protea Atlas Project. Since then, the sum of all papers published directly dealing with the topic of hybridization in wild Proteas is: 0. Note that there is an extensive list of publications on commercial Protea hybrids! Inter- and intra-specific hybridization is a highly potential, and entirely understudied, threat to Cape biodiversity. Anthropogenic dispersal of Cape lineages has dire consequences for genetic integrity of many Cape species as was highlighted by Dr Rebelo more than a decade ago. Hybridization between protea species will be tested using genetic and morphological methods to provide a robust case study of hybridization of *Protea eximia* and *P. susannae* in the Van Stadens Flower Reserve, outside Port Elizabeth and together with demographic modelling, can be used to calculate the extent and rate of hybridization across these species in this area. High-Resolution Melt analysis (HRM) screening will be used to investigate levels of hybridization and the degree of relatedness of hybrids to the original 'pure' parent species. This project aims to get the Frankenflora issue back onto the conservation table (at least in terms of providing robust published scientific evidence). HRM is a relatively cheap method and so will provide the ability to potentially genetically screen entire populations. The Cape is facing a long list of threats. This project aims to help ensure that our own Eastern Cape species are not included on that list, highlighting the peril by starting off with a straightforward and unexplored study system. In future, a study such as this will be of great importance to Fynbos biodiversity and the internationally lucrative local cut flower industry in South Africa.

How can farmers help in conserving the evolutionary potential of Honeybush (Cyclopia spp)?

Nicholas Galuszynski

With the demand for Honeybush products expanding beyond what wild populations can supply, raw material is increasingly being produced in an agricultural setting. While, actively relieving some of the harvesting pressures placed on the remaining wild populations of Honeybush (*Cyclopia* spp.), this agricultural approach to production raises a number of new conservation issues. Some of these issues are centred around the protection of the evolutionary potential and history of the species targeted for cultivation, and if left unaddressed, place the industry at risk of repeating the mistakes of

existing Cape floral products. These issues include the potential formation and escape of hybrid species (eg. *Protea*) and the replacement of diverse, natural populations with homogenous cultivated stands (eg. *Rooibos*). Here the focus will be on two species commonly cultivated for tea production, which are relatively widespread across the Cape, *C.subternata* (*Vlei-tee*) and *C.intermedia* (*Berg-tee*). Being widespread, separate populations are likely to have accumulated unique genetic and ecological traits in response to their specific environments and degrees of isolation. By investigating the distribution of genetic lineages occurring within these species I hope to identify areas where genetic breaks occur, and populations of special conservation concern (unique genetic signatures). This information can then assist in describing the limits to which seed and seedling should be sourced and spread by farmers and inform future breeding strategies, while maintaining the natural genetic structure and protecting the evolutionary potential of this important natural resource.

Session 7: Climate Change

Collapse of an iconic conifer: Long-term changes in the demography of *Widdringtonia cedarbergensis* using repeat photography

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Conifer populations appear disproportionately threatened by global change. Most examples of population decline are, however, drawn from the northern hemisphere and long-term rates of decline are not well documented as historical data are often lacking. Here we use a long-term (1931-2013), large repeat photography dataset together with environmental data and fire records to account for the decline of the critically endangered Clanwilliam Cedar, *Widdringtonia cedarbergensis.* Our results show that from an initial total of 1315 live trees in historical photographs, 74% had died and only 45 (3.4%) had recruited in the repeat photographs, leaving 392 live individuals. Juveniles (mature adults) had decreased (increased) from 27% (73%) to 8% (92%) over the intervening period. Our model demonstrated that mortality in natural populations was related to greater fire frequency, higher temperatures, lower altitudes, more fire-prone (i.e. less rocky) habitats and aspect (i.e. their occurrence on north and south facing slopes). Individuals that established in open habitats at lower, hotter elevations with a greater frequency of fire appear to be more vulnerable to mortality than those individuals growing in protected, rocky environments at higher, cooler locations with less frequent fires. Climate models predict increasing temperatures for our study area (and likely increases in wildfires). If these predictions are realised there will be further declines in the species. These results demonstrate the importance for long term ecological research in understanding the effect of climate change on species demography.

Climate, fire and frogs: a sign of things to come?

Dr Andrew A. Turner
CapeNature Scientific Services

Fynbos is a fire-driven biome that has evolved over several million years. Managing this biome to maintain its vast biodiversity is challenging due to the difficulty of A) controlling fire, B) knowing what

regimes (as represented by an acceptable distribution fire frequencies) are appropriate for conserving the largest fraction of that biodiversity, C) successfully managing invasive alien species (primarily woody plants) and D) changing climate (anthropogenically driven climate change is happening over short-time scales). A brief examination of CapeNature's long-term frog monitoring data shows that fire-driven population fluctuations can be dramatic but that there is spatial variation in effect and response. The cumulative effects of these changes over time are important to inform management for the long-term persistence of the full suite of indigenous species present.

Predicting Plant Responses to Climate Change in a Biodiversity Hotspot

Keywords: climate change, South Africa, *Pelargonium*, biodiversity, flowering times, herbarium specimens, phenology

Tanisha Williams, Carl D. Schlichting, Kent E. Holsinger

Climate change is affecting species composition and diversity across the globe. Phenological changes could provide the most sensitive and best indicators of changes in climate, yet there are relatively few long-term phenological data available to analyze such patterns. Herbarium specimens are a valuable resource for understanding how species have responded to climate change in the historic past, and past responses are likely to be a good indicator of how they will respond in the future. Recent studies in Europe, Japan, and North America have shown changes in phenological events in response to varying climate conditions, such as warming temperatures, chilling winters, and photoperiod. Unfortunately, few such studies have been carried out in the southern hemisphere. We examined changes in peak flowering time from 1850-2005 in South Africa in the widespread, diverse genus *Pelargonium*. We combined records from more than 8,100 herbarium specimens with historical weather data on temperature and precipitation to examine the impact of climate change on flowering phenology. Records from more than 200 *Pelargonium* species throughout South Africa were analyzed. We combined data from over 2,000 weather stations in South Africa with a high-resolution map of current climate to estimate historical climate conditions for each of the 4,600 geographic sites included in our sample. Our analyses examine the extent to which clades or life forms show different patterns of change in phenology. This study is the first to assess large-scale climate and phenological patterns throughout a highly diverse African genus, and it illustrates that herbarium records provide an effective method for detecting effects of climate change on flowering phenology across large geographic scales.

Session 8: Planning and Management

The 2017 Western Cape Biodiversity Spatial Plan

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The vision of the Western Cape Biodiversity Spatial Plan (WCBSP) is that biodiversity and ecological infrastructure are highly valued as assets, integrated into all planning spheres, and managed in a sustainable way so as to ensure the persistence of healthy, functioning and representative ecosystems and associated services which benefit all. This paper will provide an overview of the

suite of BSP-related products now available, including maps and a guidance handbook. We will then outline how the products should be taken up by planners, Environmental Assessment Practitioners, specialists and decision-makers as well as the general public. As endorsed by the minister, the BSP will be used not only for reactive decision-making but also for a positive-planning approach which will reduce conflict in the landscape and improve resilience and water security which will benefit people in the long-term.

THE DOUGHNUT OF PROTECTED AREAS MANAGEMENT IN THE CITY OF CAPE TOWN

Key words: conservation management, management effectiveness

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The City of Cape Town (CCT) is located within a global biodiversity hotspot. Within this challenging landscape, the City of Cape Town manages 16 protected areas which covers over 16,000 ha; the 3 large recreational vleis; critically endangered vegetation and species. Recently the protected areas management system were the subject of an external assessment by a group of DTU Executive MBA students from the Technical University of Denmark. These students reviewed the management system and came up with some interesting and innovated ways of looking at these systems and how management could be improved. This paper shows their findings and the Doughnut of reserve management.

TMFs contribution towards implementing the Western Cape Protected Area Expansion

Key words: Table Mountain Fund; Protected areas; Aichi target 11

Kerry Maree
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The Table Mountain Fund is a capital trust fund which was founded by WWF-South Africa in 1993. With start-up capital secured through local South African donors, the fund was later significantly bolstered through generous support from The Global Environment Facility. The fund develops and funds projects to secure the irreplaceable biodiversity of the worlds' smallest and most diverse floral kingdom, the Cape Floristic Region (CFR). More than twenty years later the fund continues to disburse funds to worthy conservation projects located throughout the CFR, having funded over 288 projects and disbursed over R 62 000 000 to a wide range of project partners. One of the key objectives of the fund is to safeguard biodiversity in perpetuity. It achieves this through supporting elaborate partnerships between state organisations, conservation NGOs and altruistic private land owners all in a bid to deliver on the provinces' Protected Area Expansion Strategy. The Table Mountain Fund will show-case that portion of its investment portfolio which has focussed on expanding the protected area network of the fynbos biome. It will highlight how seed funding has catalysed significant financial contributions, resulted in coordinated efforts amongst stakeholders

involved in protected area expansion, and ultimately allowed the country to inch towards meeting its AICHI target 11 within the fynbos biome.

Gains and losses in Overberg Renosterveld: are we winning or losing?

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Overberg Renosterveld is in dire straits. This has been recognised for decades. The Overberg Renosterveld Conservation Trust was established five years ago in order to address the crucial need for putting long-lasting conservation measures in place within this landscape. Our strategy has been two-fold: We have initiated and implemented: i) a Conservation Easement Programme and ii) a Watercourse Restoration Project; both of which have enjoyed success. But while we expand our conservation footprint, the removal and degradation of virgin land continues – in fact, it is worsening. While our gains are significant, our losses may be more so. Given the fact that this *Critically Endangered*, irreplaceable habitat is already transformed far beyond the conservation targets needed to maintain ecological functioning, are we fighting a losing battle? In this presentation, we will share conservation successes in the context of the state of the broader Overberg Rûens landscape as well as discuss the urgent need for high-level action from State departments.

Lowland Natural Corridors in Greater Cape Town: the M3 Road Verge, Constantia as a Case Study

Dr RC McDowell

How do Corridors Benefit Plant Communities/ Flora? In terms of reduced natural habitats, we can refer to “Remnants” and “Stepping Stones” but my emphasis is on “Corridors” which are, in effect, “Linear Remnants”. Reference is made to a road side case study on the M3, Constantia, CT. I have re-evaluated the relevance of natural corridors under various headings as they relate specifically to flora. The bulk of published work to date still emphasises the value of natural corridors as conduits and/or habitats for fauna. By ‘natural corridors’ I refer to those strips of natural and/or restorable habitats very often unintentionally protected (if only very tenuously!) alongside roads, power-lines and railways. I re-examine the roles of such natural corridors in terms of flora for: 1. Endangered Species’ Refuges; 2. Habitat Cross-Sections; 3. Protection for Vulnerable Habitats; 4. Migration Conduits; 5. Migration Limitations; 6. Facilitation for Evolution iro. Climatic Change. In terms of the Case Study I place the M3 verge into perspective as a relatively small stretch of linear highway (Granite Fynbos) verge containing a surprisingly high diversity of some 62 species out of a total of some 127 listed from the adjacent near vicinity (mainly from those listed from remnants at Zonnestraal farm and Wynberg Park). By way of practical problems for conservation in the longer term, I evaluate the cultural challenge of preventing damage and/or destruction to our highly under-rated natural and/or touristic resource via ecologically-undesirable mowing/ bush-cutting and/or road expansion practices. By way of conclusion, I discuss potential for maximizing the role of natural floral corridors by adopting certain selected practices used overseas within analogous habitats such as in

SW Australia as well as highlighting certain of their weaknesses and lack of practicality within our predominantly third world situation.
 # Work arising from the RRR 2015: Road & Rail Reserve Indaba (Roadmap to Conserving our Precious Remnant Habitats)

Thinking ahead: making sure we have an insurance policy for our threatened plant species

Keywords: National Strategy for Plant Conservation, ex-situ conservation, restoration

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South Africa is known as one of the most floral rich countries in the world. However, South Africa also has the highest documented number of extinct plant species than any other country in the world and has more than 2 500 plants species that are threatened with extinction, as a result of anthropogenic impacts, including, habitat loss and transformation, over-exploitation, pollution and the spread of invasive alien plants. A major concern in this regard is the subsequent loss of biological diversity and associated ecological, social and economic goods and services necessary for sustaining life. As signatories to the CBD South Africa has developed a national strategy to conserve plants that aligns with the Global strategy for plant conservation. One of the main aims of the strategy is to facilitate the urgent and effective conservation of the country's plant species. The Custodians of Rare and Endangered Wildflowers are actively involved in many aspects of implementing the strategy. Here, we will present a project focused on Target 8 of the South Africa's Strategy for Plant Conservation, aimed at conserving at least 60% of threatened plants in *ex situ* collections, and available for recovery (restoration) programmes, with 2% in active reintroduction programmes. CREW has been supporting the SANBI National Botanical Gardens to developing priority species lists for inclusion in ex-situ collection and restoration and reintroduction programmes. In this presentation we will discuss the selection and prioritization process and well as show examples of species restoration and reintroduction plans.

***Marasmodes*: a Canary in the donut**

Key words: National Plant Conservation Strategy, threatened plants, taxonomy

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Highly restricted, highly threatened plant species are likely to be early warning markers that allow us to track change in an increasingly turbulent time. A recent revision of *Marasmodes* by Magee et al has confirmed that this is indeed the most threatened genus in South. Unusually, integral to this revision were specimens and field observations of ten years of targeted fieldwork by CREW, CapeNature & associates. As such, species' range, variation and population sizes were already well

studied, able to be assessed for the RedList and certain taxonomic conundrums solved all in one fell swoop. The systematic approach to mapping habitats and priorities as used in CREW's Tulbagh Renosterveld Project proved a valuable base for *Marasmodes* work and will be used again in future. This process also contributed to the National Plant Conservation Strategy 3.4 "Taxonomic revisions of Priority Genera produced."

Hands off! Identifying critical habitat sites for threatened plant species

Key words: National Plant Conservation Strategy, threatened plants, conservation planning

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South Africa has the richest temperate flora globally and is home to three global biodiversity hotspots namely the Cape Floristic region, the Succulent Karoo region and the Maputaland-Pondoland Region. In addition, we have 15 centres of plant endemism identified that defines important areas of plant diversity. Target 5 of the National Plant Conservation Strategy is focussed on identifying important plant areas (IPA's) and integrating them into conservation planning processes. The international IPA concept has been integrated into the global standard which is Key Biodiversity Areas (KBA's). These KBA's emphasise threatened species and ecosystems, geographically restricted species and ecosystems, centres of endemism, and areas of high ecological value. Our current conservation planning processes does well to capture threatened species and habitats but because of high levels of biodiversity it is necessary to prioritise areas that are identified as important for conservation. The Threatened Species Programme embarked on a project to map the mostly highly restricted, highly threatened plants in the country. The criteria used were species that occurred in one locality or known from an area of less than 10km^2. We will share methodology, results and some case studies of species and sites identified.

Bird-friendly: Habitat Management Guidelines for the endemic birds of the Fynbos Biome

Key words: Birds, Endemics, Fynbos Biome, Management,

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BirdLife South Africa is a National NGO tasked with conserving the threatened and endemic birds of South Africa, and their associated habitats. In 2016 a four year research project focused on the fynbos endemic birds came to a close, and the information generated from this research project was used to draft habitat management guidelines for these species. There are eight species which can be considered as strict endemics within the Fynbos Biome, namely; Cape Sugarbird, Orange-breasted Sunbird, Cape Rock-jumper, Cape Siskin, Victorin's Warbler, Protea Seedeater, Hottentot Buttonquail and the Agulhas Long-billed Lark. These species face a range of threats across the biome, including habitat transformation through agricultural expansion or alien vegetation infestation, fire regime changes, climate change effects and other threats such as poisoning. Each of these

threats impacts on each of the fynbos endemic birds to varying degrees. We scored each threat for each species, to determine the most important mitigation actions. The results of the threat scoring and priority conservation actions are presented, alongside aspects of each species' ecology. For example; Cape Rock-jumpers will be at greatest threat from shifts in their bio-climatic envelope due to climate change; whereas Cape Sugarbirds are predicted to decline with inappropriate fire regimes. A suite of overarching conservation actions targeting the threats, designed as habitat management guidelines for these birds, are also presented. The conservation actions include a number of interventions for agricultural landowners, appropriate fire management, alien vegetation eradication and habitat rehabilitation. We hope that diverse stakeholders including managers of protected areas, scientists at NGOs or government agencies, and private landowners, find the guidelines to be a useful tool for enhancing the conservation of the Fynbos endemic bird species.

Living alongside meso-predators on an eco-sensitive estate.

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Meso-predator (eg: caracal) occupancy and their influence on domestic cats and small herbivores have been a pressing issue on Atlantic Beach Estate for a couple of years, with rising concern from some parties regarding loss of pets and unnatural predation levels. The natural areas on the golf course are managed by a dedicated conservation site manager and labour team seconded to the City of Cape Town and contracted to CTEET. There has been a significant increase in domestic cat carcasses found and cats vanishing on the Estate since 2015. Many factors can lead to domestic cats disappearing; however caracals have been earmarked as the main culprit by a group of residents who demand the removal of the predator. Subsequently the Biodiversity Management Branch of the City has been requested to investigate the matter. A camera trap monitoring survey was initiated on 17 May 2017 and will continue for 3 months. The studies' objectives are to estimate occupancy and relative abundance of caracal on the Estate compared to the adjacent sections of Blaauwberg Nature Reserve. Furthermore this study aims to determine whether the activity of the caracal is unnatural by comparing data to that of other nature reserves in the City of Cape Town where similar data records of caracal are available. Small mammal and domestic cat occupancy and abundance will also be investigated. The Estate is approaching full capacity in terms of residential units and with each household permitted to keep up to 2 cats - the domestic cat population have increased exponentially in recent years. Land use change and habitat fragmentation are major drivers of global environmental change (Kiffner et al 2015). Ecoestates have become a key attraction as a residential lifestyle option. The demand is increasing and humans are encroaching deeper and deeper into natural environments. The result is more human-animal conflict than ever before. Under what conditions should pets be allowed on an eco-estate? How do we manage this phenomenon from an ecological standpoint, to ensure sustainability of our threatened ecosystems?

Effects of various Wastewater Effluent Discharge on Environmental and Biological Conditions of the Vygekraal and Kuils Rivers downstream of Athlone and Zandvliet WWTWs respectively

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All Wastewater Treatment Works (WWTWs) operations are subject to all applicable provisions of the National Water Act, 1998 (Act 36 of 1998). The discharge of inefficiently treated wastewater into receiving rivers may adversely affect river health and hence contravene the WWTW effluent discharge permit conditions. The aim of the study was to determine the current river health status for the Vygekraal and Kuils river reaches associated with various wastewater activities. The river health was determined through the assessment of present ecological conditions; including instream habitat assessment, water quality and benthic macroinvertebrates, upstream and downstream of the Athlone and Zandvliet WWTWs respectively. The objectives of the study were to (a) determine the effects of wastewater discharge on the water quality, abundance and composition of benthic macroinvertebrates and their habitats associated with Vygekraal and Kuils rivers (b) determine if WWTWs permit conditions are effective in supporting healthy river conditions. Sampling was conducted upstream and downstream of the associated WWTWs. Benthic macroinvertebrates were sampled following the South African Scoring System method, diversity of instream habitats by using the Invertebrate Habitat Assessment System and YSI probe system was used for onsite measurements for selected water quality parameters. Statistical methods were used for temporal and spatial scale analysis. Benthic macroinvertebrates showed that monitored sites from both rivers have poor water quality. However, it was unclear how much contribution was associated with each of the possible contamination source (i.e. WWTWs and other surrounding activities). The WWTWs treated effluent was found to be complying with the license conditions despite macroinvertebrates being severely affected. Therefore, the is a serious need to reconsider the purpose of WWTW effluent limits with the aim of river conservation than just compliance reasons as more rivers will be compromised.

Estuary mouth breaching as an emergency control measure for *Prymnesium parvum:* A Zandvlei case study

Key words: Estuary, algae, Zandvlei

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In early autumn 1978 and 2012, blooms of *Prymnesium parvum* (Golden Algae) resulted in very significant and widely publicized fish kill events. *Prymnesium parvum* induces the usual algae-related diurnal oxygen depletion/supersaturation cycle which commonly kills fish in the early hours of the morning. In addition it produces, at times, a toxin that inhibits oxygen transport in gill tissue. In combination, the two mechanisms can cause a 100% death rate. In February this year (2017), a bloom was again noted in a canal in Marina Da Gama. This time an emergency plan was put into action which involved a mouth breaching for the purposes of increasing salinity variability in the

affected area, and our weed harvester was brought in to agitate and oxygenate the affected waters during the early morning. A rigorous monitoring programme was put in place to determine the effectiveness of the intervention with the help of Lwandle Technologies, a marine environmental consultancy. The hypothesis was that the algae would not fare well under rapid salinity changes, and that even if we could not cause sufficient salinity variability in the affected area, we could at least keep the bloom confined to the affected area. Little conclusive research has been done on salinity tolerance of *Prymensium parvum*, but it is believed to be tolerant of mid-range estuarine salinities. Our intervention therefore was implemented out of necessity, with hope, but with a large dose of uncertainty. The salinity in the area affected increased by 2 to 4 ppt, and outside this area by up to 10ppt. The bloom thankfully dissipated, then reappeared a week later, but quickly dissipated again. The intervention appears to have been successful, but other factors, such as wind and cloud cover, also played a role.

Protecting the Strategic Water Source Areas of the Fynbos Biome for water security under climate change

Keywords: Strategic Water Source Areas, Fynbos Biome, ecosystem services

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The protection of strategic water source areas (SWSAs), for both ground and surface water, is critical for achieving water security and for sustaining the aquatic ecosystems that provide and convey the water. The surface-water (s)SWSAs are situated in the main mountain ranges while the groundwater (g)SWSAs are found primarily in the lowlands. The sSWSAs cover 2.1 million ha (26% of the biome) and produce a mean annual runoff of 5036 million m3/a (10% of the national) or 2 310 m^3/ha/a, 5.9 times the national runoff. The water sustains most settlements and all irrigated agriculture but only 27% of SWSAs is under formal protection, with lowland areas largely unprotected. These are working landscapes with mixed land-uses including conservation, cultivation and forest plantations, and alien plant invasions are ubiquitous. Many of the activities in these areas have adverse impacts on water quantity or quality which need to be avoided or mitigated and some areas need restoration to reduce sediment loss. Protection of the quantity and quality of the water the SWSAs provide will require a co-ordinated and collaborative approach involving many government bodies and the private sector. The extent, range of land ownership and existing uses make formal protection unworkable and unachievable. The best option is to combine a bottom-up approach of water and land stewardship with top-down co-operative and supportive governance. The current drought has highlighted the urgency of ensuring effective protection for these areas.

PRESENCE: Using knowledge to build a living landscape

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Living Lands works to establish Living Landscapes on a catchment level in South Africa. A living landscape consists of a variety of healthy ecosystems and land uses that are used to generate natural as well as social capital. It is home to ecological, agricultural, and social systems which are managed so that they can function sustainably.
The PRESENCE Learning Network (PRESENCE) is a network which serves as a solid platform to support and mainstream restoration of 'living landscapes' in South Africa. It is active in forming mutually beneficial and synergistic partnerships between universities, government, other institutions, and local stakeholders. PRESENCE aims to promote interdisciplinary partnerships that will contribute to building a culture of knowledge gaining and sharing. The importance of the research coordination of PRESENCE is twofold, firstly projects undertaken here fit within an inter-disciplinary framework and secondly, outputs are fed back to the landscapes. PRESENCE hosts knowledge sharing workshops to continue knowledge exchange, learning and sharing.
PRESENCE represents a hub of knowledge within the Living Lands landscapes and is used to promote a culture of learning for students and staff alike. One of the main assets of Living Lands and PRESENCE is the amount of knowledge and information which is gained through research students and internships.

How the Ant taught Scholars about Science – a story by Iimbovane Outreach Project

Sophia Turner

In her Donut framework Kate Ratworth depicts a vision for an equitable and sustainable future by setting out social and planetary boundaries. Education is one of humanities' twelve foundational needs and biodiversity loss is one of our planet's nine boundaries. Here we present a pathway to improved biodiversity education. Biodiversity is a concept that is covered in Secondary Education level Life Sciences. Sadly, studies have shown that all biodiversity-related themes are ranked as the lowest in terms of interest at the Grade 10 level. It was also ranked as the most difficult content area. This topic is filled with dense terminology and abstract examples that students are unable to relate to. A large percentage of our country's youth do not have access to areas where they can appreciate the diversity of plants and animals that makes our country a global biodiversity hotspot. Iimbovane Outreach Project addresses this issue by helping Grade 10 Life Sciences learners experience biodiversity in a tangible and available environment – their school grounds. The project uses simple scientific methods to help pupils develop their investigation skills and to grasp the science underlying biodiversity conservation. This is done through the collection of ant samples in their school grounds, the identification of ant species, the analysing of data and the development of conclusions. By examining the variety of ant species, how diversity changes over time and how they interact with other components of ecosystems, learners come to grips with the concepts of biodiversity and environmental change.

Environmental education opportunities in aftercare facilities in the Cape Winelands.

Keywords: Environmental Education, Aftercare facilities, Farms

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Environmental education (EE) opportunities for learners range from 1. in-curriculum teaching time, 2. school excursions and 3. after school opportunities. In-curriculum EE opportunities require alignment to the school curriculum and needs to be within class time and support the teacher within their restricted teaching programs. These include WESSA's Eco-schools and Junior LandCare. There are currently many opportunities for school outings and excursions such as the Aquarium and various environmental education centres. However these involve a lengthy process, paperwork for approval, transport and funds (usually from parents) to be arranged. In many farming communities in the Cape Winelands, children attend Aftercare facilities (usually on the farms) where there is much less restrictions with regards to EE opportunities. Recently we have had over 17 farms joint sponsoring an EE program in their community and development of a 'Friday afternoon' EE program for over 40 Aftercare facilities in the Cape Winelands through the 'Leer & Leef' Program. The program seeks to get the children outdoors and connect with nature for 3 hours on a Friday afternoon. The lessons focus on three themes: water, soil, plants and wildlife and provides worksheets for two age groups - grade R-3 and 4-7. Teacher training is the next challenge to the effectiveness of the program, which we are seeking funding for.

Cape leopards and human-wildlife conflict.

Key words: Cape Leopard Trust; leopard conservation; environmental education

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The Cape Leopard Trust, launched in August 2004 as an active predator conservation working group in the Cape uses research as a tool for conservation, finding solutions to human-wildlife conflict. The rare Cape mountain leopard is used as a flagship and umbrella species, highlighting broader environmental issues. The Cape Leopard Trust recognises that farmer-predator conflict remains a highly emotive issue – both for those who lose livestock as well as for those of us who are wholly opposed to the destructive and indiscriminate methods of predator control. In seeking solutions, The Cape Leopard Trust has always been committed to establishing sustainable long-term strategies to human-wildlife conflict, based on scientific fact rather than emotional conjecture. To achieve this, we employ two simple methodologies: a) we rely on rigorous scientific studies to back up our research findings. (b) we employ constructive solution-seeking strategies that include farmers and other affected parties, as opposed to berating and alienating them. We do not engage in attacks on those with a different viewpoint, as this compromises our integrity. Instead, we urge all stakeholders to redirect their efforts towards constructive collaboration with the Cape Leopard Trust, with farmers and with statutory organisations, based on tried and tested methods. In addition to the "hard science" research component, the Cape Leopard Trust is also actively involved in the training and empowering of local community residents as well as working with farming communities to find ways to minimize depredation of livestock by the Cape's threatened and persecuted predator population. Human-wildlife problems will not be solved overnight, but we can attempt to reduce the number of animals being injured or killed injudiciously by having farmers use more humane methods of control, rather

than poisons, snares and gin traps. Our environmental education project, through its activities, seeks to support the challenge of overcoming human-wildlife conflict.

Citizen Scientist at work: Collecting long-term monitoring data

Keywords: conservation, demographic monitoring, citizen scientists, national plant conservation strategy

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At present, the most significant cause of biodiversity loss in the Fynbos biome and throughout South Africa is the transformation of the natural vegetation through anthropogenic activities. Agricultural processes are the largest contributors towards the transformation as it covers 13 million hectares. Land transformation effectively contributes to the destruction of critical habitats, which threatens many endemic floral species within the affected habitats. The successful management of the threatened species can be greatly facilitated by the ability to monitor the relevant population trends. Demographic monitoring is the collection and analysis of repeated observations to evaluate the population trends to reach a management objective. The Custodians of Rare and Endangered Wildflowers (CREW) have been monitoring a wide range of species across the Western Cape Province. This monitoring contributes towards Target: 3 of the South African Strategy for Plant Conservation, which aims at monitoring plant taxa of conservation concern. The species have been selected for inclusion in these projects for a range of reasons (understanding more about the ecology, threats and the future persistence) which will be discussed as well as important lessons learned from working with citizen scientist. Citizen scientists took part in a survey, where we assessed how they felt about taking part in this type of data collection and to share their experiences. We will also present preliminary results from our projects and discuss what the analysis has revealed about the species thus far, the current status and what the future plans are for these long-term monitoring projects. Data are collected overtime and worked through systematically which will provide the opportunity to adapt the monitoring protocol to different environmental scenarios and provide opportunities to ask new questions about the data.

Revealing hidden threats to fynbos biodiversity with citizen science

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Cape Citizen Science is an initiative to engage non-scientists in a hypothesis-driven research in the Cape Floral Kingdom. Citizens contribute as pathogen hunters to reveal the diversity and distribution of Phytophthora species through five methods of engagement. The initiative aims to combine research with education and has engaged more than 100 youth through ‘hikes for science’ and 50 professional staff through workshops. More than 30 dying plants have been reported online and an additional 9 home gardens have been visited following research invitations. Thirty plants and 10 soil

samples have also been delivered to the laboratory in Stellenbosch. In total, these activities have contributed more than 400 cultures to the research. Preliminary sequence results indicate that citizens have isolated at least 3 Phytophthora species. These results demonstrate that citizens are capable of contributing to microbiology focused ecological research and that their contributions are invaluable to science.

Changing lives through nature - Reconnecting people to nature; the CTEET crèche to Career model explained

Keywords: Reconnecting People and Nature, Nature Deficit Disorder, Youth programmes, Skills development

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Worldwide, people are suffering from Nature Deficit Disorder (Louv, R, 2005), not a medical diagonsis, but rather a symptom of our current lifestyles and is the combination of the physiological, physical and cognitive costs we suffer due to our alienation from nature. With people (especially children) spending 90% of time indoors and over 50 hours per week on a device (7hours per day) which has led to the increase in ADHD, childhood obesity, higher stress levels, lower social skills. The only cure is a change of thinking and "Vitamin N"- the reconnection with nature. (Louv, R. 2005, 2011) Historically Cape Town Environmental Education Trust (CTEET) aimed to run environmental education camps, but it became clear that a multi-faceted approach was needed in order to really change lives through nature. It is for this reason that the CTEET has adopted the crèche to career model2, to reconnect children, people and communities with nature across the City of Cape Town through various activities and projects. Starting with nursery school story time, day programmes at schools, overnight camps at three camp sites, long-term development of children through the Conservation Leadership Programme and working with Eco-Clubs and whole-schools in the Eco-Schools programme during schooling years. Out of school youth are given opportunities through various skills programmes, learnerships, internships and bursaries, giving them the skills and experience needed to enter the Green Sector, particularly conservation. CTEET also creates career opportunities through the Nature Care Fund, with stewardship agreements with the private sector e.g. Milnerton Racecourse Conservation Area, Atlantic Beach Golf Estate Conservation Area, the Gantouw Project and the Burghers Walk Penguin Monitoring Programme. This paper aims to showcase the successes of this model, the importance of reconnecting people with nature, the importance of partnerships and how CTEET changes lives through nature.

CASABIO a Citizen Science platform where professionals and amateurs intersect

Key words: Citizen science

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Citizen science in Africa appears synonymous with frustration and poor identifications. In the rapidly moving digital landscape of citizen science it seems an impossible task for a nascent organization to carve a niche. By focusing on South Africa, particularly Cape Town, and providing engaging tools for enthusiasts and scientists to explore the content, we feel we've achieved this task. We present the fifth generation system that focuses on unrivalled speed and incorporation of observations. Additionally we unveil a number of tools for exploring these observations including field guides for enthusiasts and herbarium labels for scientists. Additionally our mapping feature allows users to explore both distributions and observations. We also unveil local and national CASABIO programmes and projects that aim to engage the public in documenting flora and fauna and appreciating our natural heritage.

Table Mountain Fund (TMF) Small Grant Programme

Boitshekwane Kgantsi
TMF

In 2009, the Critical Ecosystem Partnership Fund (CEPF) provided TMF with funding to address two fundamental challenges within the local conservation sector at that stage:
Participation by civil society in formal conservation in South Africa was perceived as a niche, middle-class endeavour. Conservation needed to activate and strengthen an expanded rural constituency in order to meet targets that were almost indivisible from South Africa's rural development and local economic development policy objectives; and Capacity to support and sustain local conservation action was limited, and linkages with formal authorities, especially municipalities, were tenuous or non-existent. As a response to this, TMF aligned its strategic objectives to include supporting the growth and development of new entrants to the conservation sector and to facilitate the inclusion and involvement of a wider range of stakeholders in conservation. This is mostly achieved through the granting of small grants (R15 000 – R50 000) whereby the primary objectives are equally environmental and socio-economic and the secondary objective of the programme is to enhance the relationship between the municipalities and local communities. With a now well-established small grant programme, fast approaching a decade in operation, we introduce the forum to the overarching programme with specific focus on a) the TMF/ SANBI funded Cape Flats Nature Partners Fund which has recently come to an end; as well as b) the new crop of TMF funded Small Grant Facilities to be initiated in 2017. We share some lessons learnt regards working with local communities when implementing such facilities and outline potential opportunities whereby you as conservationists can assist your local communities in assessing such grants.

Poster Abstracts

Watercourse Restoration in the Rûens Renosterveld

Key words: Watercourse, Restoration, Renosterveld

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The Overberg Renosterveld Conservation Trust and the WWF Nedbank Green Trust launched a watercourse restoration project within the Overberg Wheatbelt to conserve and restore Critically Endangered Rûens Renosterveld ecosystems. With more than 95% of the original extent of these systems transformed, it has become imperative to connect the largest fragments of natural vegetation to ensure that representative remnants for each ecosystem are conserved to ensure their persistence. The corridors that connect these fragments are the watercourses and river systems of the Overberg. The restoration project has focused on management interventions to halt and reverse habitat degradation in watercourses; landowner awareness of the biodiversity of which they are custodians; with the culmination of the commitment of land through Conservation Easements into conservation land use in perpetuity.

The Muizenberg East Conservation Cluster: Using camera traps as a tool for wildlife monitoring on fragmented habitats within an urban environment

Keywords: wildlife; camera traps; urban; environment; corridors; Muizenberg East

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The Muizenberg East Conservation Cluster comprises of fragmented patches of natural areas within the Muizenberg area of Cape Town. These sites lie within the Fynbos biome, forming an integral part of the City of Cape Town's biodiversity network, a network of interconnecting corridors and conservation areas so as to ensure continuance of natural ecological processes. Camera traps are used to monitor wildlife on these sites and have shown that a variety of animals move between these fragmented sites. The results have been successful and have increased stakeholder engagement between the surrounding residents and tenants of the Capricorn Business Park with good buy-in and support of the conservation areas. The sites form a vital corridor connecting it to surrounding natural sites within the Muizenberg East area as well as the greater Zandvlei Estuary Nature Reserve. The conservation areas consist of irreplaceable Cape Flats Dune strandveld of mostly high conservation value and supports three Red List plant species namely *Psoralea glaucina* (critically endangered and occurring nowhere else in the world), *Passerina palludosa* and *Muraltia mitior* (these being local endemics). It is home to a wide variety of plant and animal life and provides one of the last breeding sites for the endangered Western leopard toad still known to occur here. Survival of fragmented sites such as these will depend on the correct management of these sites of which the Muizenberg East Conservation Cluster can be used as a working example of successful management of small areas in urban environments. Camera traps were set up at random in the conservation areas to monitor wildlife movements between fences initially. This project showcases the high level of movement of

these animals between The Capricorn Business Park, Soralia Village and Muizenberg East Private Nature Reserve. Animals that have been caught on the camera trap include Cape grysbok, Small spotted genet, Cape spurfowl, Small grey mongoose, Water Mongoose, Cape Robin-chat and African porcupine. It has also shown the high activity of domestic cats within natural areas and confirms the impact domestic cats have on our wildlife populations.

iSpot UPGRADE 2017

Key words: biodiversity, citizen science, biogeography, distribution

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iSpot is the widely used Citizen Science Virtual Museum hosted by the South African National Biodiversity Institute. In order to keep abreast of spammers and hackers iSpot has undergone a major revamp of its operating system. Here we summarize the current status of iSpot in southern Africa, and outline some of the implications of the update The Add an Observation Wizard has been reworked, and will be featuring a drag and drop functionality for more rapid uploads of pictures when posting observations. The Species Dictionary has been modified to allow a dynamic inspection of the different taxa and their data, while the Species Browser allows a visual identification of the taxa in any group down to the species level, with a focus on the more common species. The update is planned to be implemented by October 2017. We hope that these updates will continue to keep iSpot as the premier ID tool for biodiversity on the subcontinent (with over 31 000 taxa of animals, plants and moulds posted and identified in 308 000 postings), for rapid IDs (with half of all IDs within a few hours), as well as for projects coordinated by both regular users and professionals and Regional and National Projects (such as the Red List and BioGaps) concerning documenting our biodiversity. More excitingly we hope that it will allow cellphone apps to be able to interact directly with iSpot, allowing more scholar and remote survey applications.

Hippopotamus (*Hippopotamus amphibuis*) introduction into the Rietvlei section of Table Bay Nature reserve: How many can be accommodated?

Fabrice Turikumwe

The Rietvlei Wetland Area of Table Bay Nature Reserve has a long standing challenge with invasive grass species. The general consensus from various advisors for the management of the grass, is for an introduction of hippopotami, who are known bulk grazers, to manage the highly invasive grass species namely: Paspalum vaginatum and (Kikuyu) Pennisetum clandestinum. The purpose of this study is to estimate how many hippopotami could be hosted at Rietvlei if introduced, using the forage versus hippopotamus ratio of Rondevlei Nature Reserve as a guide. The first part of the study will be to map out the area of the available forage at Rondevlei and then to map out the similar vegetation occuring at Rietvlei and thus form an estimate of the number of hippopotami that could be hosted at Rietvlei under sub-optimal conditions.

Calculating relative abundance of *Raphicerus melanotis* (Cape Grysbok) using camera traps and a drive count at Table Bay Nature Reserve, Milnerton Racecourse Section

A van den Berg

A drive count census for Cape Grysbok (*Raphicerus melanotis)* is done every two years at Milnerton Racecourse. It was determined that the optimal population size that Milnerton racecourse can sustain is 12 individuals and the recommended sex ratio for Cape Grysbok is 1:1. In isolated vegetation Cape Grysbok population numbers can rapidly increase, thus it is important to control their numbers through management intervention. When the population size exceeds 10 to 12 individual's, management intervention is required. During a drive count in 2014 done by City of Cape Town Nature Conservation staff, 8 Cape Grsysbok were counted. 3 Cape Grysbok was removed from Milnerton Racecourse and replaced with two from Atlantic beach estate in Melkbos. The aim of this project was to control Cape Grysbok numbers at Milnerton Racecourse and to ensure the genetic integrity of the individuals at both sites. Another drive count took place in 2016 with members of the public, where 22 Cape Grysbok were counted. As Milnerton Racecourse is a small section of 19.2ha, it might be impossible that it can sustain 22 Cape Grysbok. Thus the question arises can the results of the previous drive count be trusted. Another method that can be used to calculate the relative abundance of animals is camera trapping, but with this method many problems can surface that can also give you inaccurate results. The objectives of the project are to conduct another drive count to see if the previous drive count was trustworthy and also to use camera trapping as another method to see if it will deliver more accurate results. Thus the aim of the project will be to compare the data obtained of Cape Grysbok numbers from camera traps placed at Milnerton Racecourse with the results of a drive count which will be done after camera traps have been removed from the field. The possibility of using a drone with an infra-red camera to conduct a Cape Grysbok count will also be tested as a new method of game counts in future.

Will there be enough water? The effects of climate change on the Western Cape's water supply

Lief Theron

With reference to Kate Raworth's "Doughnut"-model and the drought that has gripped the Western Cape in recent times, the poster will attempt to illustrate how a climatic shift towards a drier Western Cape will impact people and the environment. The poster will also look at the current measures for conserving water and what measures will need to be put in place to maintain an adequate water supply for people across the entire socio-economic spectrum.

The Cape Leopard Trust Education Project: Leopard presentations, camps and day trips.

Key words: Cape Leopard Trust; Biodiversity conservation; Environmental education activities

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The Cape Leopard Trust was launched in August 2004 as an active predator conservation working group in the Cape. It uses research as a tool for conservation, finding solutions to human-wildlife conflict and inspiring interest in the environment through an interactive environmental education programme. The rare Cape mountain leopard is used as a flagship and umbrella species, highlighting broader environmental issues. Through the environmental education programme, we facilitate experiences in nature that change the way young people see themselves and inspire them to protect the environment. Our aim is to educate and empower young people by connecting them with the natural world through a range of interactive and thought provoking experiences, instilling an attitude of reverence and respect given that people have a crucial role to play as beings that share the built and natural environment with other living forms. Our objectives are to: a) foster a positive relationship between young people and the environment by raising awareness around human-wildlife conflict issues and biodiversity conservation; (b) link research and conservation efforts to young people and the public by supporting the requirements of the national curriculum programme, youth development organisations and school activities; (c) increase the universal accessibility of conservation and environmental education to communities. The environmental education project consists of two components: a) wilderness camps ranging from 2 to 5 days in the Cederberg and other wilderness areas. (b) Cape Town based activities such as day trips, school presentations, eco clubs, exhibitions and a winter holiday programme. Activities can be tailored to the needs of a particular school or organization and are adapted according to current environmental challenges and research trends. We aim to give participants an experience that is stimulating on all levels and ultimately give them a sense of connection to the wilderness and nature.

CONSERVATION TARGETS IN THE CITY OF CAPE TOWN

Key words: conservation planning, conservation targets, Aichi targets

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The City of Cape Town (CCT) is located within a global biodiversity hotspot and has a Council approved fine scale conservation plan (BioNet) and a bioregional plan which has been approved as Council policy. The BioNet covers about 35% of the City (including CBAs and CESAs) with 15% inside the urban edge. Originally, the City set a target of securing 60% of the 2009 BioNet by 2014 and which, with its partners, it achieved in December 2016. It is now looking at a target of 65% of the BioNet by 2020. At the recent COP13, posters on how governments (national and subnational) are contributing to the Aichi targets were prepared on a standard format. A poster on the City of Cape Town's Aichi Target contribution will be presented on this template.

Fynbos vegetation is naturally adapted to fire and requires regular burning for its persistence.

Nomama Mei
SANBI

Fynbos vegetation is naturally adapted to fire and requires regular burning for its persistence. While fire is absent, Fynbos is gradually replaced by thicket species. It thrives on infertile soils and fire is the mechanism that recycles precious nutrients from old growth into the soil. Fire in fynbos is not detrimental, but very important because it rejuvenates and replaces the old growth and triggers the germination of dormant seeds. It also grants the opportunity of annuals, bulbs and perennials to grow. In our collections nursery at Kirstenbosch we sow our seeds in April/ May every year and expose them to smoke to mimic what is happening in the wild. This poster demonstrates the smoking process in the nursery.

REFERENCES : Privette, S. http://www.fynboshub.co.za/fynbos-and-fire/.

Invertebrate diversity of Haarwegskloof Renosterveld Reserve

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Very few large areas of Overberg Renosterveld are left as most (95%) of this vegetation type has been ploughed for agriculture. The majority of remaining Renosterveld fragments are on private land and are not formally conserved. Haarwegskloof Renosterveld Reserve contains the largest intact piece of Overberg Renosterveld in the world and covers about 500 ha.The reserve has more than 500 indigenous plant species and some are endemic to the reserve or only at a few other localities. These plants also provide habitats for many animals. To date we have recorded 126 birds, 37 mammals, 19 reptiles and 6 frog species. The reserve also supports a huge array of invertebrates. 142 insect families from 17 insect orders have been recorded thus far. More than 40 spider and 4 scorpion species were also recorded. Two beetle species that were thought to be extinct – a horned dung beetle and a fruit chafer – were rediscovered on the reserve in 2015/2016. A unique stick insect was found on the *Polhillia* species in the reserve, which may either be new or a novel colour form. Furthermore, an Emperor moth (*Vegetia* cf *grimmia*) which was thought to be extinct was sighted in the reserve and surroundings on a novel food plant in the Asteraceae. In this poster I showcase some of the special invertebrates found at Haarwegskloof.

FROM SCIENTIFIC TO SIMPLE: Bridging the communication gap between the natural and social sciences

Key words: Communication, simple, understanding, people, communication style

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Conservators around the world are trying to convince people of all walks of life to better conserve their resources, live more sustainably and try to understand the importance of biodiversity. Governments especially struggle with communication efforts as they are often labelled as confrontational, obstructive, negative and too technical. Layers of bureaucracy and a silo culture lead to mistrust and lack of understanding.It is more important now than ever to ensure that we communicate effectively with our diverse range of stakeholders and sectors at all levels. Whether we communicate with businesses, schools, politicians or the media, we need to ensure that our message is heard and understood.

"IF WE CANNOT GET OUR MESSAGE ACROSS, THEN HAVING A MESSAGE DOESN'T EVEN MATTER!"

In order to do this, we cannot continue to engaging with stakeholders the way we always have – through the use complex and confusing language, telling people what to do and using scientific jargon that most people do not understand. Rather then, we need to change our communication habits from hierarchical to partnership, from fragmented to consolidated, from confrontational to firm. Most importantly, we need to engage through simple, clear language.

The site occupancy and species richness of medium to large sized mammal species in the Steenbras Nature Reserve

Ntombikayise Leago Lolwane
City of Cape Town

The Steenbras Bulkwater Treatment Plant (SBTP) is a utility area within the Steenbras Nature Reserve and throughout the month of January 2017, there was a common occurrence of a Cape Leopard (*Panthera pardus*) inside the SBTP building. Management from the SBTP reached out to the Biodiversity branch of the City of Cape Town for assistance with the wild animal because it was a danger to staff working in the building. Biodiversity management and staff began to monitor the Cape Leopard by setting up observation posts throughout the night at SBTP and after observing for several nights it was estimated that the animal was a young female that may have lost its mother, just over one year of age and has managed to survive by preying on easy to catch animals around and inside the treatment plant, displaying abnormal behaviour (Wittridge pers. comm. 2017).
Once the situation at the SBTP was resolved and measures were put into place to ensure that the animal does not enter the building again, Hayley-May Wittridge (pers. comm. 2014) suggested that the treatment plant building be monitored for any future occurrences of wild animals. From this given suggestion, the author thought to monitor all utility sites within the borders of the reserve for the absence or presences of wild animal species to aid the direction of management decisions with regards to the use of utility sites within the reserve.