Plant Conservation Unit

Five Year Research Review

2011-2015

University of Cape Town • iYunivesithi yaseKapa • Universiteit van Kaapstad

SPES BONA

www.pcu.uct.ac.za

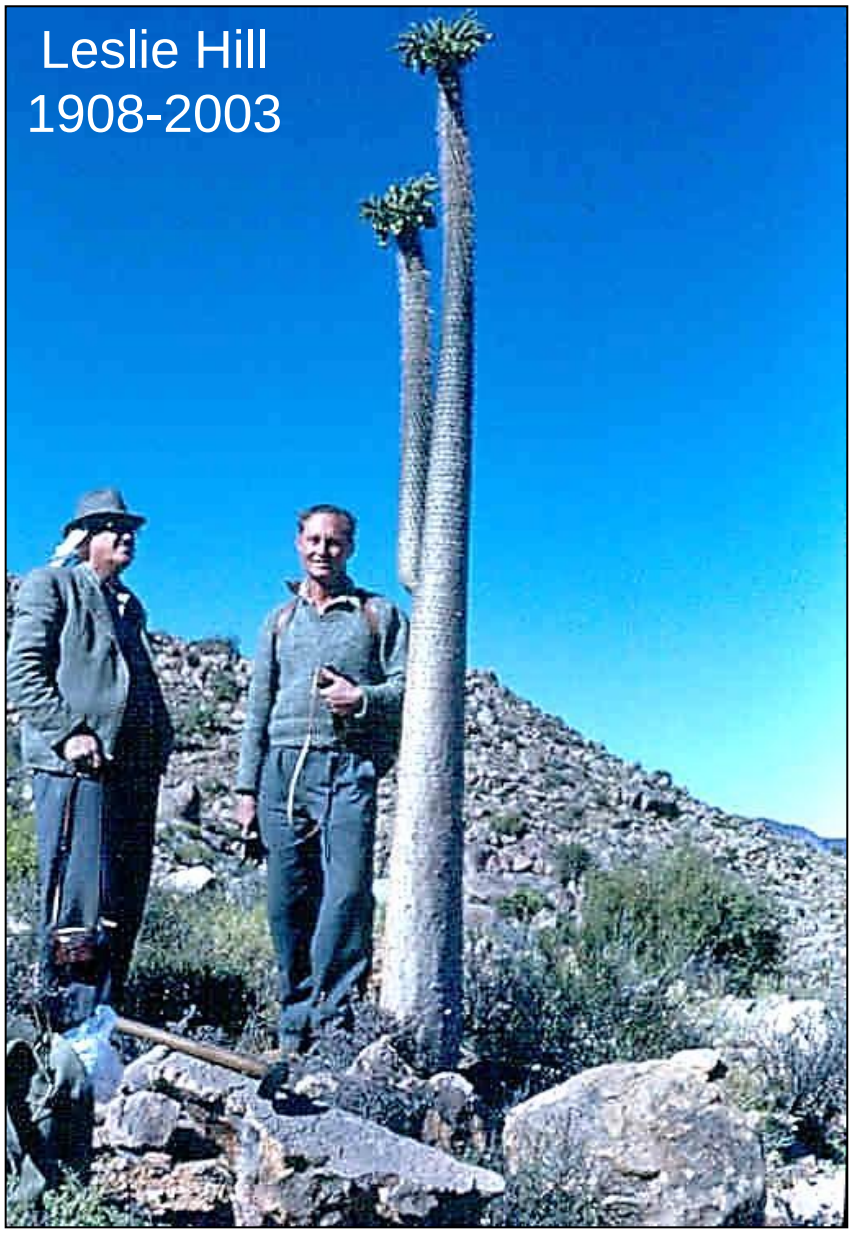




OUTLINE

1. Introduction
   - Historical overview
   - Vision & mission
   - Personnel
   - Governance
   - Infrastructure & facilities
   - Social media & communication
2. Research
   - Programmes
   - Output
   - Partners
   - Service to society
3. Developing capacity in research
4. Funding
5. Next steps

HISTORICAL OVERVIEW



- Chair endowed by Leslie Hill in 1991
- Richard Cowling appointed March 1992
- Institute for Plant Conservation (IPC) created in July 1993 by Richard with appointment of Dave Richardson
- Richard Cowling departs May 2000
- Timm Hoffman appointed April 2001
- Dave Richardson departs Dec 2004
- Lindsey Gillson appointed April 2006
- Institute for Plant Conservation becomes the Plant Conservation Unit (PCU) in 2006

VISION & MISSION

Vision

To be a world-class, African-centred research & postgraduate training unit that improves the ecological understanding of Africa's biomes, the pressures facing them & the opportunities for conservation that benefits both biodiversity & people

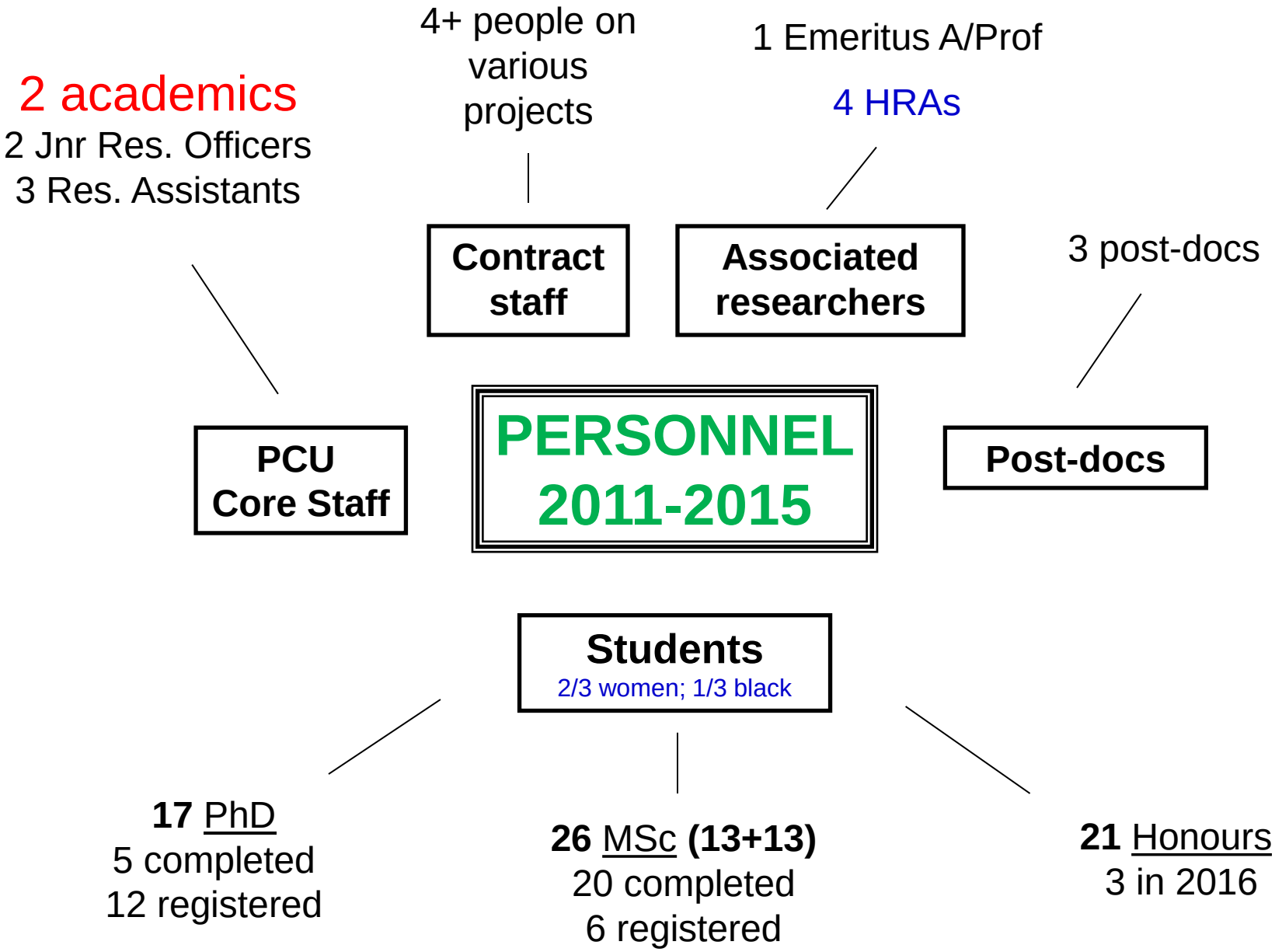
Mission

To enable sound management decisions for the sustainable use, conservation & restoration of African biomes, with a particular focus on the Greater Cape Floristic Region, & thereby contribute to people's quality of life & well-being.

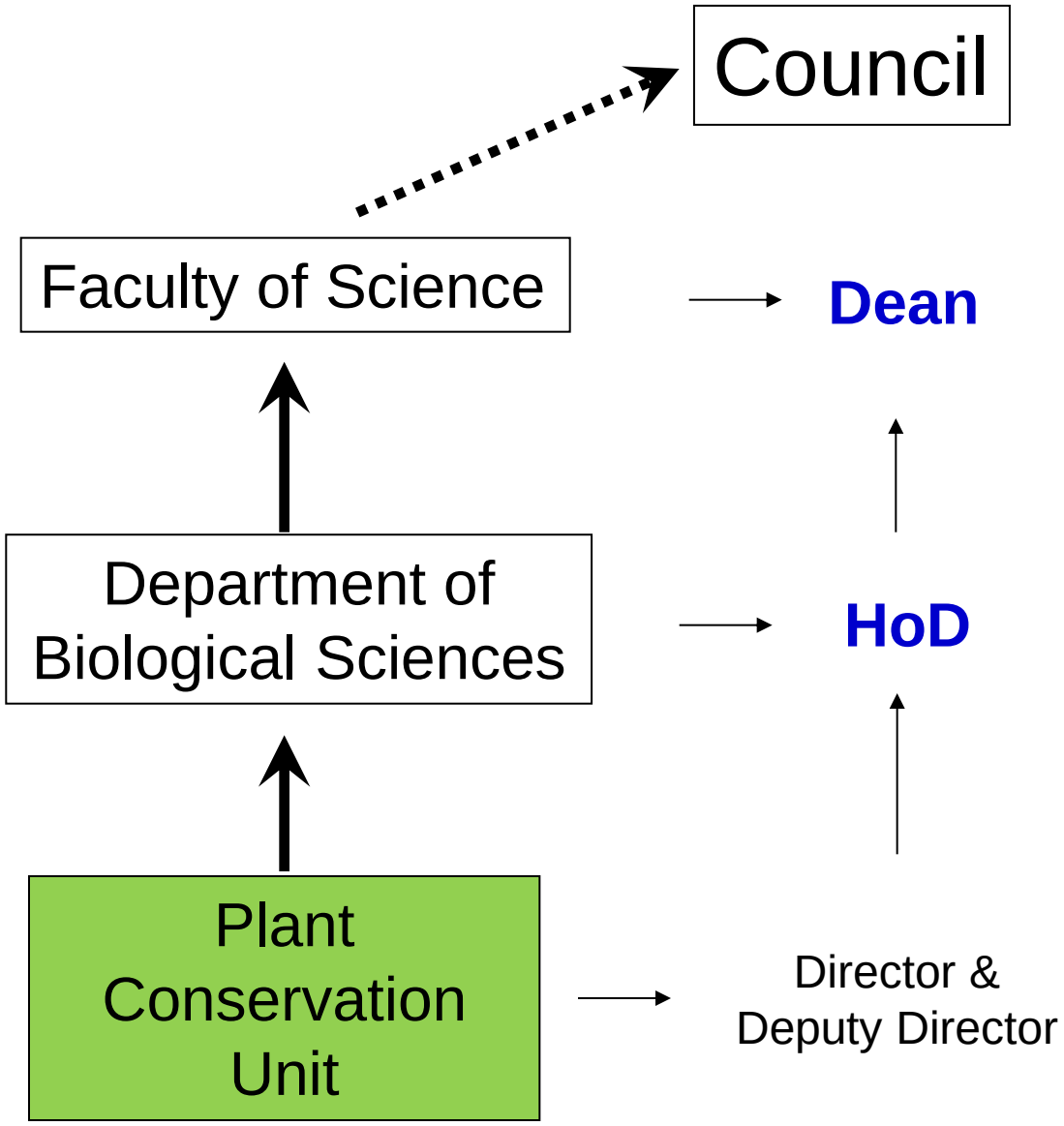
We aim to develop human & institutional capacity through research, education & social responsiveness

Key Principle: *The belief that our activities are transformative in nature*

- We attract a diversity of students from across the region, the continent & the world.
- Our research, teaching & socially responsive activities have important transformative consequences for the individual, institution, country & the continent.


2 academics
2 Jnr Res. Officers
3 Res. Assistants
4+ people on various projects
1 Emeritus A/Prof
4 HRAs
3 post-docs
Contract staff
Associated researchers
PCU Core Staff
PERSONNEL 2011-2015
Post-docs
Students
2/3 women; 1/3 black
17 PhD
5 completed
12 registered
26 MSc (13+13)
20 completed
6 registered
21 Honours
3 in 2016

GOVERNANCE



RESPONSIBILITIES

Various committees
Student evaluation
Etc.

Under- & Post-graduate teaching
Student supervision
Student evaluation
Departmental admin
Etc.

Reporting
Financial management
Strategic plan
Raise funds
Institutional admin
Etc.





INFRASTRUCTURE & FACILITIES

- ~ 300 m^2 of floor space in HW Pearson Building 'attic' (entrance foyer, 7 offices, computer room & open plan conference room with printer, drawing table, conference table, bench space, map cabinet, projection screen & kitchen facilities).
- Palaeoecology lab (HF-safe fume hood, centrifuge, water purifying system, etc.).
- Pollen reference collection: mainly savanna & fynbos. Digitising to online pollen reference database in 2016 to form part of a "virtual lab" for research & training network - palaeoecology students at UCT, UKZN, University of Uppsala & University of Stockholm.
- Computer room: 5 computers, printer, various scanners (35 mm slide, Canon & Epson V-70 flat-bed, Nikon 9000), GIS, Adobe Photoshop CS4 & Lightroom & statistical software licenses, etc.
- Recent purchase of 10TB of storage space from ICTS: Archives.
- Paulshoek research house – used by PCU & other students.
- 4X4 research vehicle - to be replaced.

PCU RESEARCH VEHICLE (R.I.P.)

Articles on destruction of Mazda

1. http://www.pcu.uct.ac.za/news/senseless-destruction-pcu-research-vehicle
2. Marianna (community pick-up needed): http://www.uct.ac.za/dailynews/?id=9651

Thanks to the Dean - it will be replaced

SOCIAL MEDIA & COMMUNICATION

- Active PCU website (www.pcu.ac.za) with links to social media accounts (Facebook, Twitter & YouTube).
  - News items reflect recent student & staff activities & are posted regularly on these platforms.
  - The move to Drupal has provided autonomy over our website content & has been instrumental in our ability to keep the site fresh & active.
- We maintain a second internet platform linked to our citizen science project, rePhotoSA (http://rephotosa.adu.org.za) associated with Facebook, Twitter & Instagram articles.




RESEARCH OVERVIEW

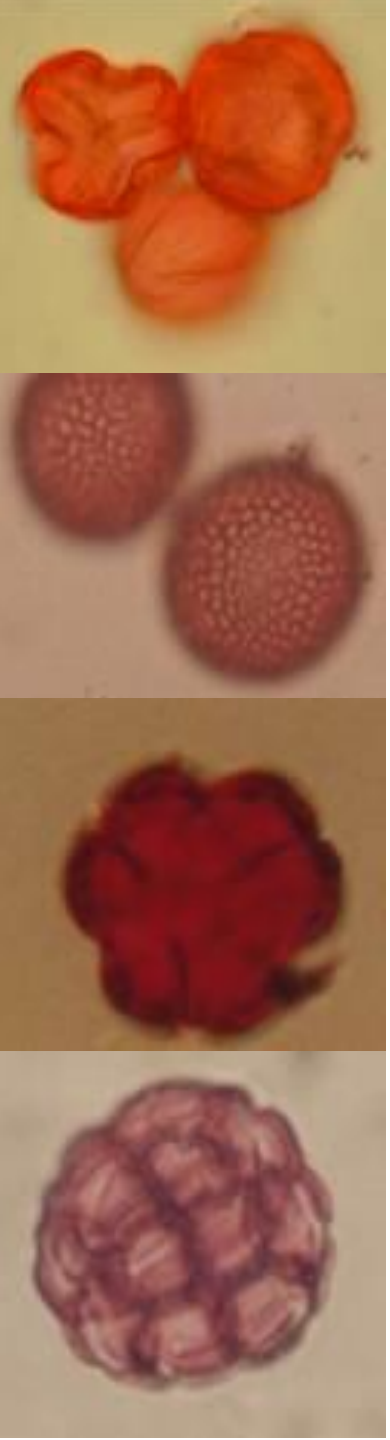
- Research Programmes: Outline & highlights
- Research output & impact
- Collaborative networks
- Future research direction




RESEARCH PROGRAMMES

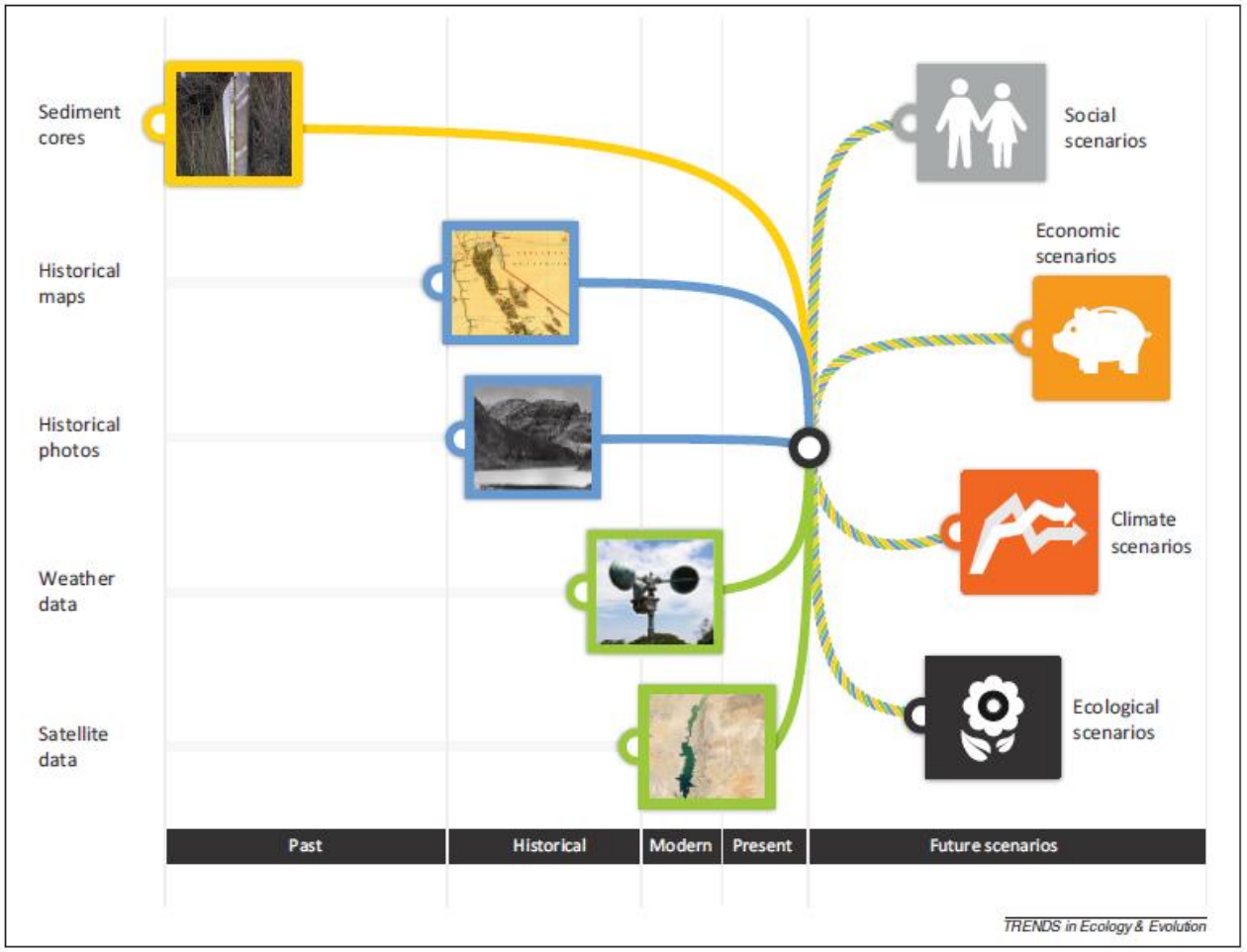
Programme & programme leader	Hon/MSc/PhD theses	Peer-reviewed articles
Applied palaeoecology & ecosystem change Lindsey Gillson	3 / 2 / 0	17
Environmental history Timm Hoffman	9 / 8 / 1	22
Land use & sustainable development Timm Hoffman	5 / 2 / 2	23
Disturbance & restoration ecology Peter Carrick	0 / 2 / 0	5
Biocontrol John Hoffmann	1 / 2 / 0	5
Other (e.g. Conservation assessment) Timm Hoffman	0 / 4 / 0	1
Total	**18 / 20 / 3**	**73**

The boundaries between these programmes are relatively permeable & students with an interest in undertaking interdisciplinary work are accommodated within the PCU with outside advice & supervision where appropriate.

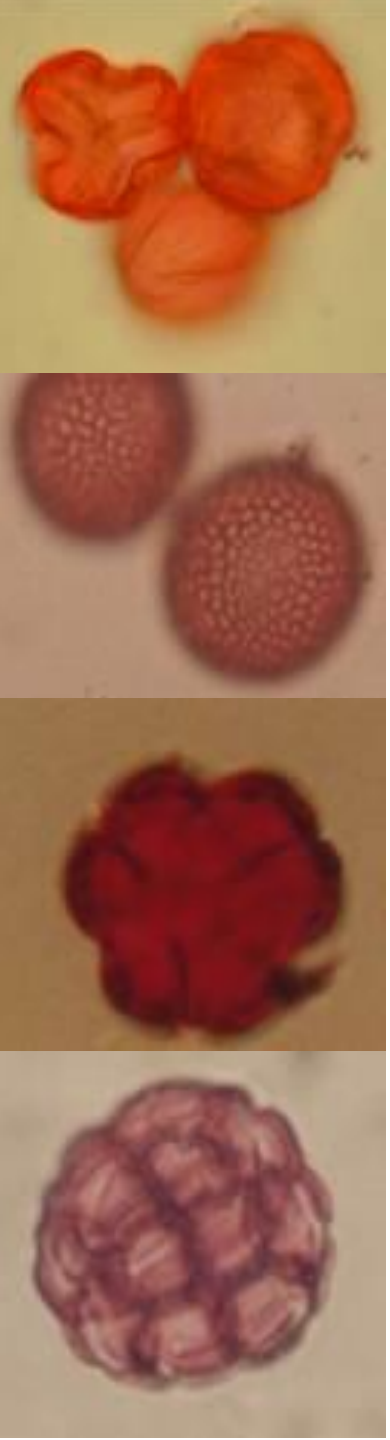


I. Applied Palaeoecology & Ecosystem Change

- Investigates application of long-term data in conservation biology & ecosystem management.



Gillson and Marchant, 2014



I. Applied Palaeoecology & Ecosystem Change

- Integrates palaeoecological data into improved understanding of long-term landscape dynamics.
- Investigates application of long-term data from palaeoecological records in conservation biology & ecosystem management.
- Two main research strands are:
  - Application of palaeo-ecological data in biodiversity conservation & ecosystem management.
  - Biome boundaries & tipping points.



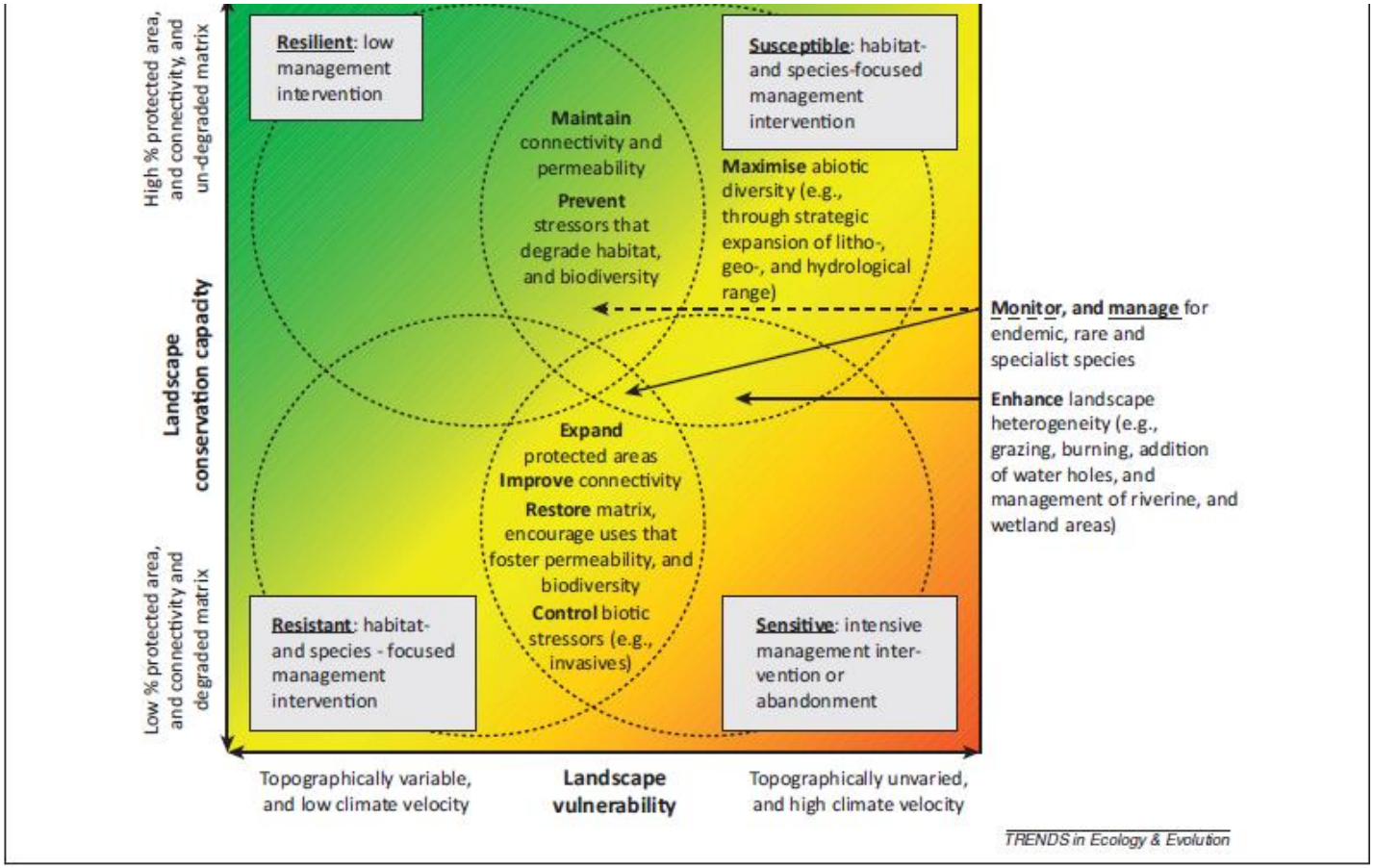

Opinion

Cell PRESS

Accommodating climate change contingencies in conservation strategy

Lindsey Gillson[1], Terence P. Dawson[2], Sam Jack[1], and Melodie A. McGeoch[3]

[1] Plant Conservation Unit, Botany Department, Private Bag X3, University of Cape Town, Rondebosch 7701, South Africa
[2] School of the Environment, University of Dundee, Perth Road, Dundee, DD1 4HN, UK
[3] School of Biological Sciences, Monash University, Clayton, VIC 3800, Australia





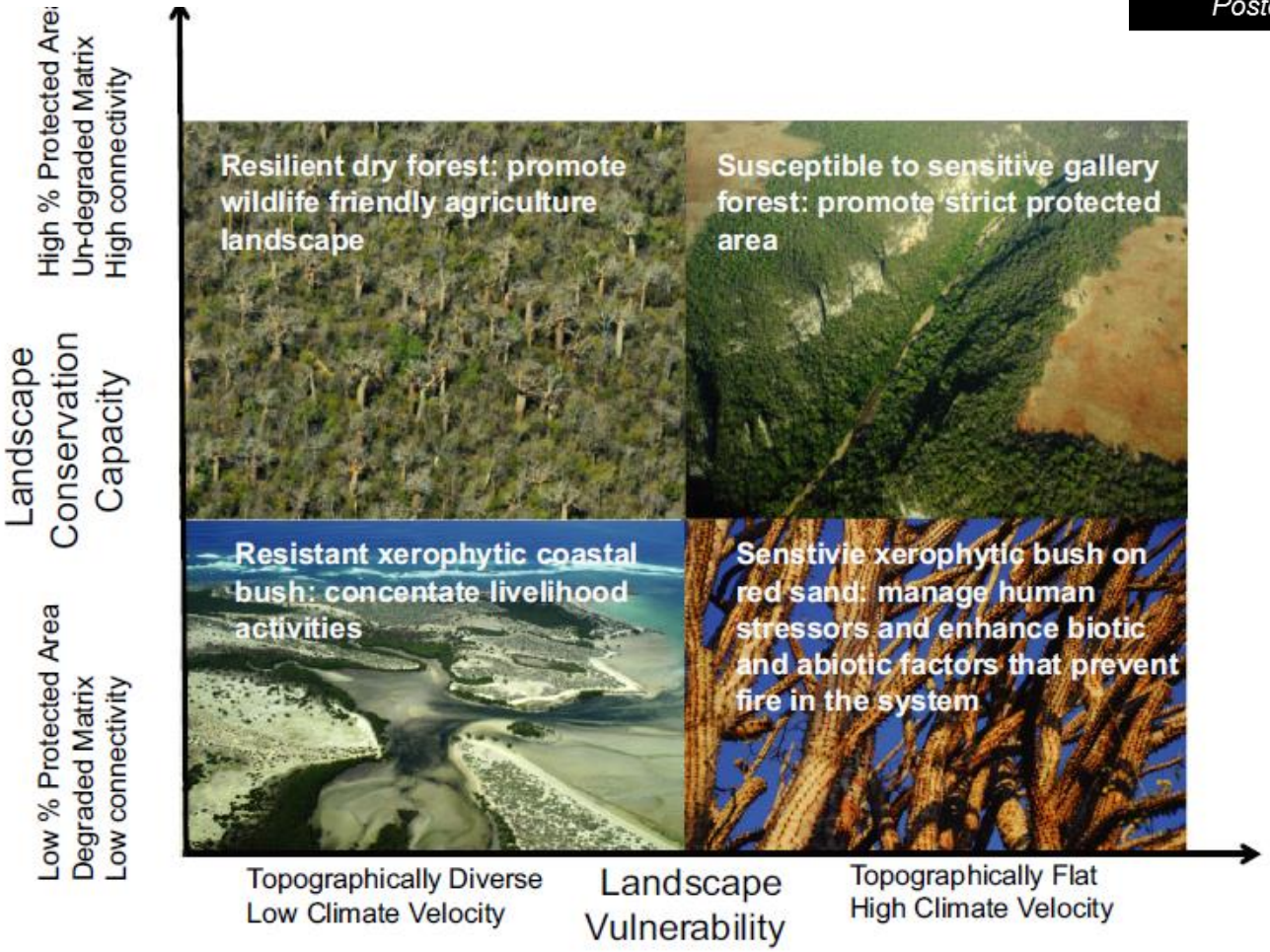

Landscape Ecol
DOI 10.1007/s10980-015-0269-2

RESEARCH ARTICLE

A landscape vulnerability framework for identifying integrated conservation and adaptation pathways to climate change: the case of Madagascar's spiny forest

Malika Virah-Sawmy · Lindsey Gillson · Charlie J. Gardner · Atholl Anderson · Geoffrey Clark · Simon Haberle

Malika Virah-Sawmy
Postdoc (2014)



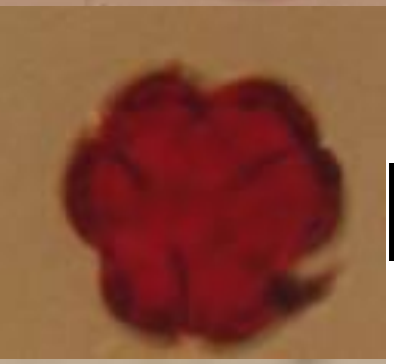
Estelle Razanatsoa
PhD Candidate

CLIMATE CHANGE & PASTORALISM AS DRIVERS OF VEGETATION CHANGE ON THE MAHAFALY PLATEAU AND CENTRAL HIGHLANDS OF MADAGASCAR

Tsilavo Razafanatsoa
Msc Candidate

- Investigates rate & extent of climate change in southwestern Madagascar from multi-proxy analysis of the last two millennia.
- Long-term records from diatoms to provide information on rainfall for every 100-200 years.
- A smaller scale of rainfall variability to be obtained from isotope analysis of the baobab ring – the first for this region
- Palaeoecological proxies (pollen, charcoal & spores) used to reconstruct & retrace the history of vegetation during the last 2000 years.
- To understand how stakeholders & NGO's working to conserve Madagascar's biodiversity can implement a better strategy to improve people's way of life in the dry region of the south.
- In the central Highlands Tsilavo's project looks at climate and humans as drivers of changes in forest composition and extent

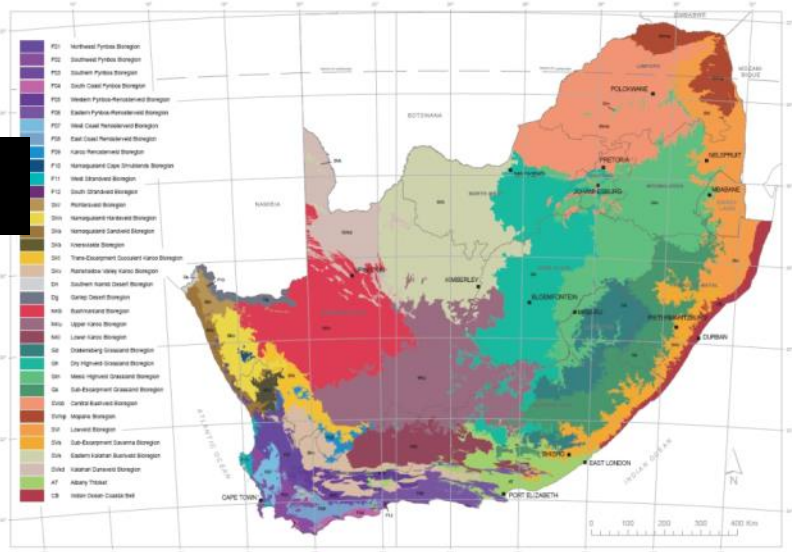





Biome Boundaries and Tipping Points

- Ecological communities are at environmental, physiological and / or ecological limits at biome boundaries
- Boundaries are therefore useful in studying and predicting ecosystem dynamics as they are sensitive to change.

James MacPherson
PhD Candidate



Elinor Breman
DPhil

Cherie Forbes
MSc

Abraham Dabengwa
PhD Candidate

Glynis Humphrey
PhD Candidate

Interdisciplinary Studies of Landscape Change and Ecosystem Management

Cherie Forbes
PhD Candidate

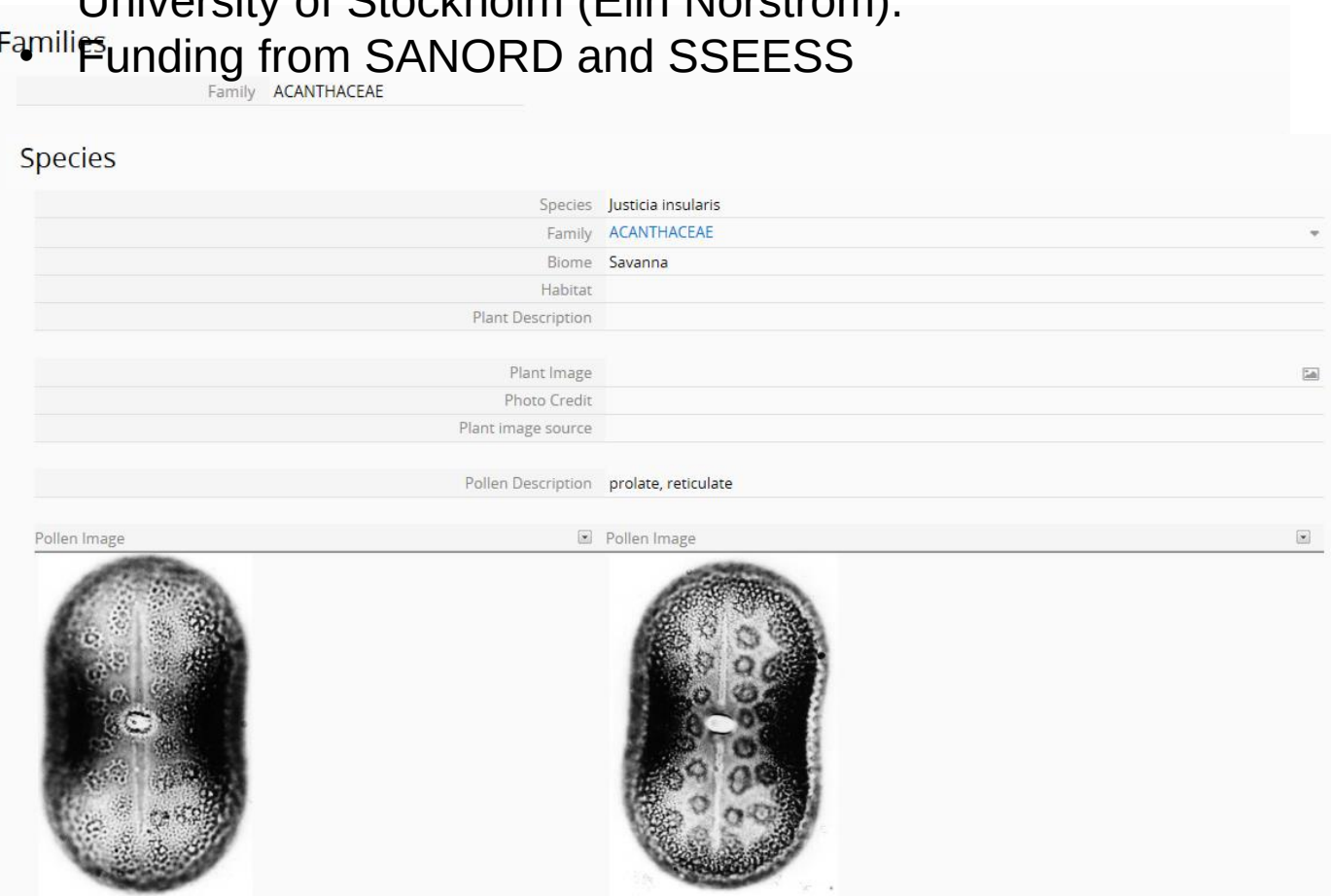
- Palaeoecology as one strand in a complex, interdisciplinary understanding of landscape change, including both social and environmental drivers
- Multiple methods including stakeholder interviews, GIS, modelling, alongside palaeoecology.
- Projects are in Bwabwata National Park, Namibia (Glynis) and Groot Winterhoek, Western Cape (Cherie).
- Glynis is investigating the ecological and social drivers of fire.
- Cherie will explore long-term environmental change (water quality, sediment erosion, fire, herbivory & biodiversity) in response to climate & land-use variability over the past centuries-millennia.
- Results will inform management and provide a perspective on future management options.





“Virtual Lab”

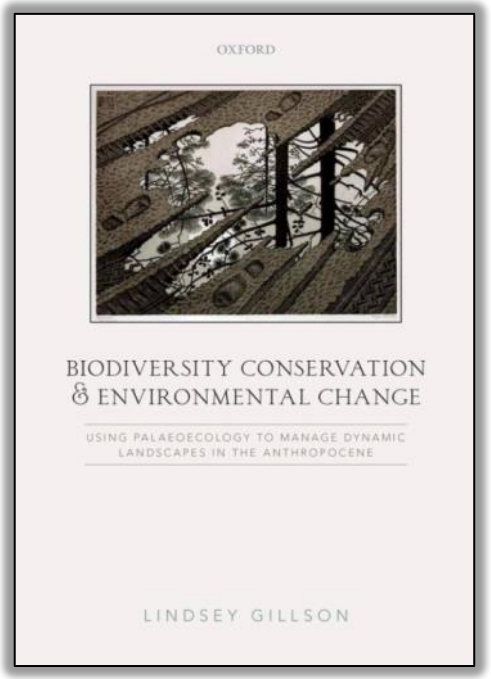
- Various courses and workshops to date (phytoliths, spores, palaeo-climate modelling
- On-line pollen data base, with digitised pollen reference collection
- UCT, UKZN (Jemma Finch), University of Uppsala (Anneli Ekblom), and University of Stockholm (Elin Norstrom).
- Funding from SANORD and SSEESS



Yolanda Chirango
Research Assistant

Palaeo Highlights and Strategy

- Book on palaeoecology and conservation looks at various conservation problems (elephants, fire management, climate change) through the lens of palaeoecology. Favourable reviews in TREE, Ecology and others
- On-line pollen database will be launched within the next few months & placed on PCU website
- Plan to continue developing network of sites in southern Africa to investigate biome boundary dynamics
- Work with modellers to simulate change over time, with the aims of:
  - Helping to improve future predictions
  - Developing tools for landscape managers
- ~ 4 PhD students to graduate over next reporting period
- Continue “mainstreaming” palaeoecology through contribution to international conferences, committees, reports and publications



ADDITIONAL PALAEO AND CONSERVATION PUBLICATIONS

- Ekblom A, Virah-Sawmy M *et al.* 2014. *Migration & interaction between Madagascar & eastern Africa, 500 BC – 1000 AD: The archeological perspective.* Indian Ocean World History [In Press].
- Gardner CJ, Virah-Sawmy M *et al.* 2013. Protected areas for conservation & poverty alleviation: Experiences from Madagascar. *Journal of Applied Ecology*16 DOI: 10.1111/1365-2664.12164
- Gillson L 2015. *Biodiversity Conservation & Environmental Change: using palaeoecology to manage dynamic landscapes in the Anthropocene*. Oxford University Press, Oxford. 215pp
- Breman E, Gillson L & Willis K 2012. How fire & climate shaped grass-dominated vegetation & forest mosaics in northern South Africa during past millennia. *The Holocene* 22:1427-1439.
- Ekblom A, Gillson L & Notelid M 2011. A Historical Ecology of the Limpopo & Kruger National Parks & Lower Limpopo Valley. *Journal of Archaeology & Ancient History* 1:1-29.
- Ekblom A, Gillson L, Risberg J, Holmgren K & Chidoub Z 2012. Rainfall variability & vegetation dynamics of the lower Limpopo Valley, Southern Africa, 500 AD to present. *Palaeogeography, Palaeoclimatology, Palaeoecology* 363-364: 69-78.
- Gillson L 2013. *Patch Dynamics*. Oxford Bibliographies in Ecology. Ed. David Gibson. New York: Oxford University Press, 30/9/2013.
- Gillson L 2015. Evidence of a Tipping Point in a southern African savanna? *Ecological Complexity* 21, 78-86.
- Gillson L & Marchant R 2014. From myopia to clarity: Sharpening the focus of ecosystem management through the lens of palaeoecology. *Trends in Ecology & Evolution* 29:317-325.
- Gillson L, Dawson TP, Jack S & McGeoch MA 2013. Accommodating climate change contingencies in conservation strategy. *Trends in Ecology & Evolution* 28(3): 135-142.
- Gillson L, Midgley GF & Wakeling JL 2012. Exploring the significance of land-cover change in South Africa. *South African Journal of Science* 108: 3 Pages.
- Virah-Sawmy M *et al.* 2013. *The Durban Vision in practice: Experiences in participatory governance of Madagascar's new protected areas.* In: I Scales (editor). Madagascar at Crossroads. Earthscan publication, UK.
- Virah-Sawmy M, Gillson L, Gardner CJ, Anderson A, Clark G & Haberle S 2016. A landscape vulnerability framework for identifying integrated conservation & adaptation pathways to climate change: The case of Madagascar's spiny forest. *Landscape Ecology* 31:637-654. DOI: 10.1007/s10980-015-0269-2.
- Virah-Sawmy M 2015. *Holocene book review: Extinct Madagascar- Picturing the Island's Past,* The Holocene. *SAGE Publications* 0959683615572728, pp 296





II. ENVIRONMENTAL HISTORY

How has the vegetation of southern Africa changed and why?

Focus on southern African biomes & vegetation types in terms of major environmental change themes such as:

- Changes in floristics & structure, Degradation / desertification, Bush encroachment, Land tenure, etc.

Also focus on global change impacts on key indicator species such as:

- *Widdringtonia cedarbergensis* (Clanwilliam cedar)
- *Aloe dichotoma, A. pillansii* (Quiver trees)
- *Encephalartos* spp. (Cycads)
- *Pachypodium namaquanum* (Halfmens)
- *Protea caffra*

Major emphasis on building historical landscape photograph archive for long-term monitoring purposes

OVERVIEW OF SOURCES

PALAEOECOLOGY

(palynology, diatoms, phytoliths, fungal spores, charcoal, etc.)

ARCHAEOLOGY
(wood charcoal)

ARCHIVAL SOURCES

(newspapers, travellers records, 'Blue Books', etc.)

ORAL HISTORY
(land user interviews)

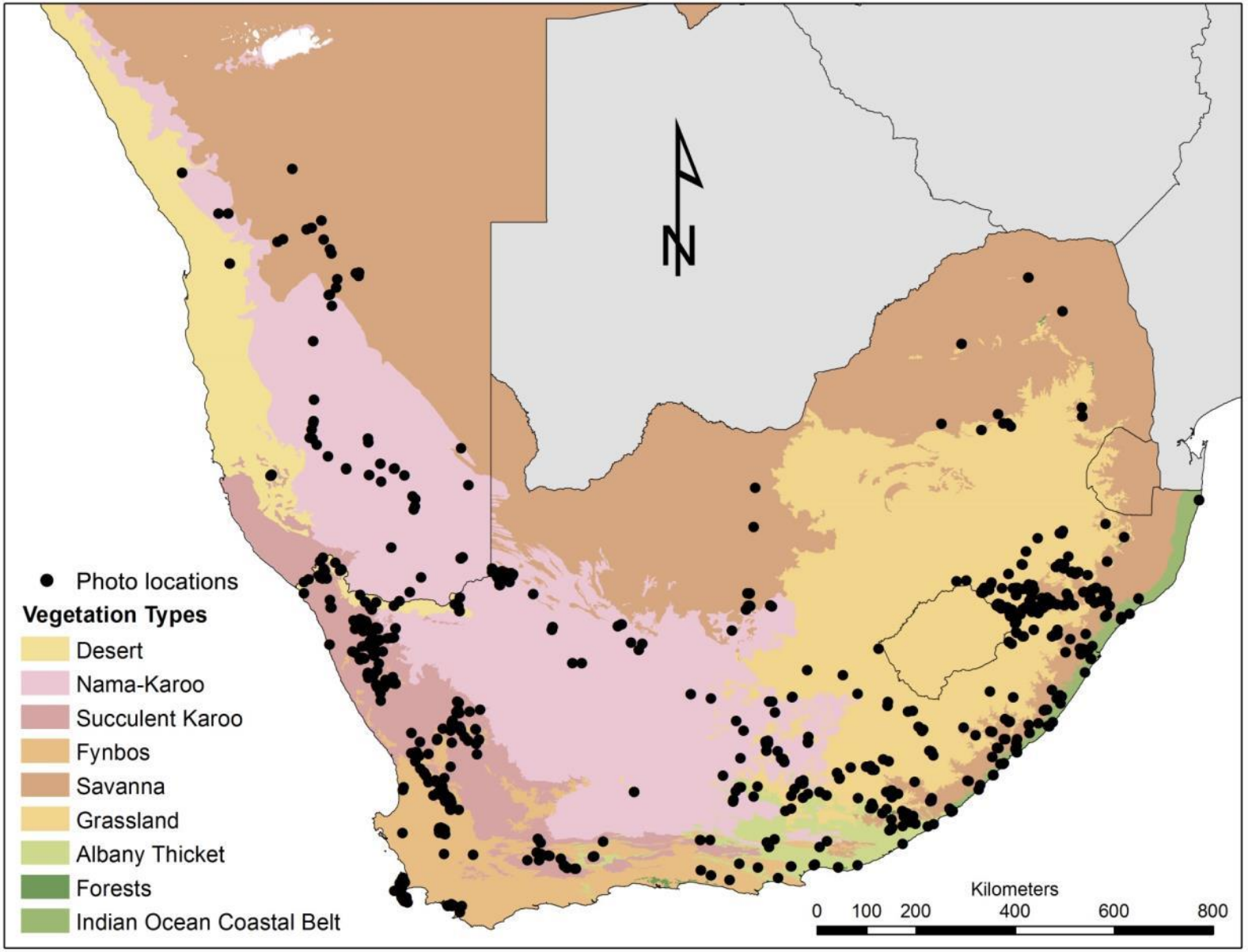
HISTORICAL SURVEYS
(botanical surveys)

REMOTE SENSING

(repeat photography, aerial photography, satellite imagery)

METEOROLOGICAL RECORDS
(diaries, SAWS)

To date we have taken about 1,650 images out of 20,000+ historical photographs in our collection with representation in all of southern Africa's major biomes

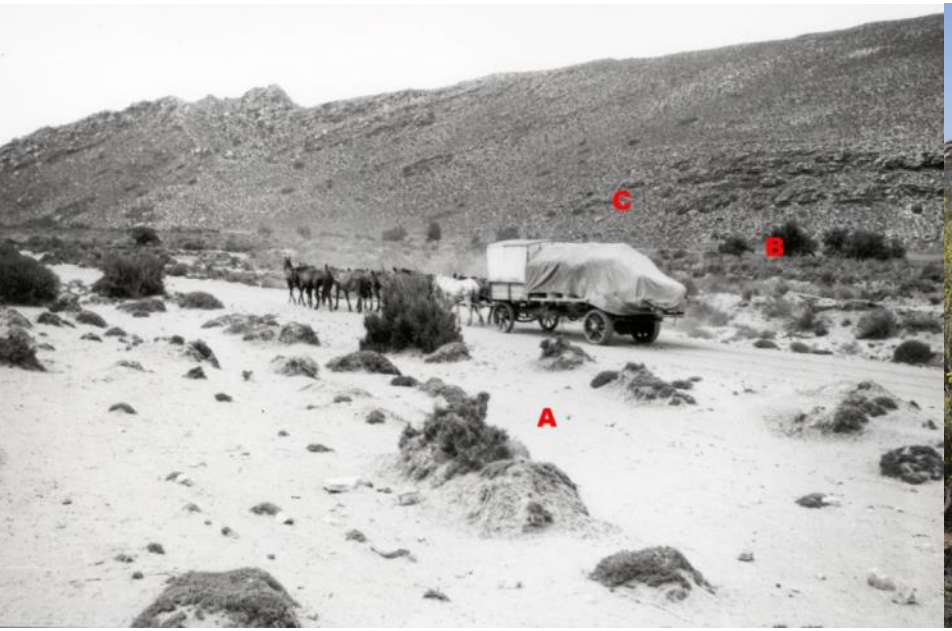


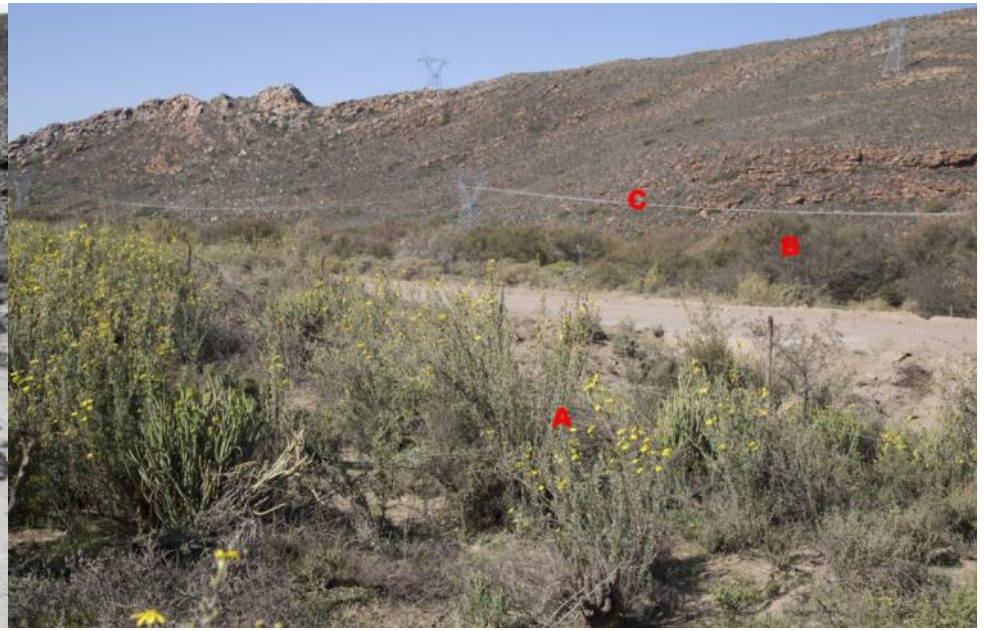
Repeats
72
125
206
258
152
196
23
7
34

Hana Petersen
BSc(Hons) (2015)

Using repeat photography to quantify vegetation change in the Tanqua Karoo over the last century

- 25 locations photographed by Rudolf Marloth, Margaret Levyns, John Acocks
- Overall increase in shrub cover on plains and slopes and increase in trees, sedges and tall grasses in rivers
- Main reasons include reduction in stocking rates and shifts in land use practices
- Results have implications for TKNP ito benchmarks and management objectives





CHANGES IN DISTRIBUTION OF INDIGENOUS FOREST IN TABLE MOUNTAIN NATIONAL PARK FROM 1880 – 2012

Zoe Poulsen
MSc student (2013)

Poulsen 2011

Blinkwater Ravine

Mmoto Masubelele

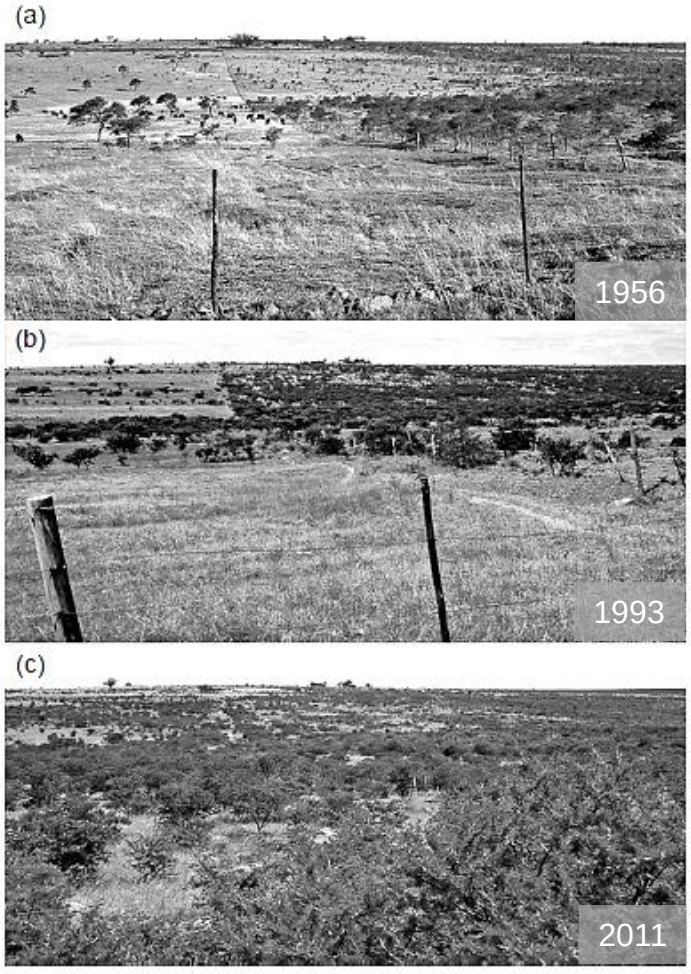
PhD (2012)

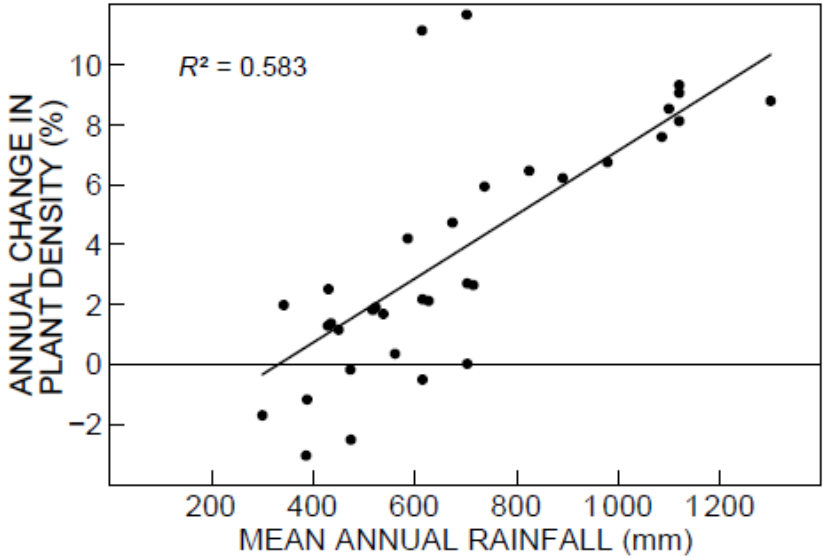
LONG-TERM ENVIRONMENTAL & VEGETATION CHANGE IN KAROO OVER THE 20th CENTURY

- Masubelele ML, Hoffman MT & Bond WJ 2015. A repeat photograph analysis of long-term vegetation change in semi-arid South Africa in response to land use & climate. *Journal of Vegetation Science* 26(5): 1013-1023. DOI: 10.1111/jvs.12303/full.
- Masubelele M, Hoffman MT & Bond WJ 2015. Biome stability & long-term vegetation change in the semi-arid, south-eastern interior of South Africa: a synthesis of repeat photo-monitoring studies. *South African Journal of Botany* 101: 139-147. DOI: 10.1016/j.sajb.2015.06.001.
- Masubelele ML, Hoffman MT, Bond WJ & Burdett P 2013. Vegetation change (1988-2010) in the Camdeboo National Park, South Africa using fixed-point photo monitoring: The role of herbivory & climate. *Koedoe - African Protected Area Conservation & Science* 55(1), Art. #1127, 16 pages. DOI: 10.4102/koedoe.v55i1.1127-1.
- Masubelele ML, Hoffman MT, Bond WJ & Gambiza J 2014. A 50 year study shows grass cover has increased in shrublands of semi-arid South Africa. *Journal of Arid Environments* 104: 43-51. DOI: 10.1016/j.jaridenv.2014.01.011.

James Puttick
PhD Candidate

THE EXTENT, RATE & DRIVERS OF CHANGE ACROSS GRASSLAND, SAVANNA & FOREST BOUNDARIES IN THE MESIC EASTERN REGION OF SA OVER THE LAST CENTURY



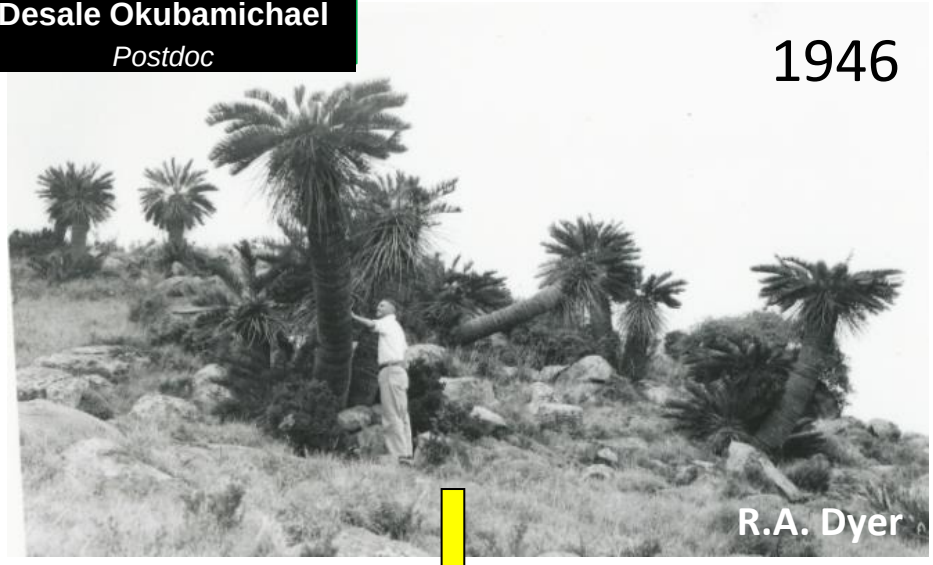


- O'Connor TG, Puttick JR & Hoffman MT 2014. Bush encroachment in southern Africa: changes & causes. *African Journal of Range & Forage Science* 31(2): 67-88. DOI: 10.2989/10220119.2014.939996.
- Puttick JR, Hoffman MT & Gambiza J 2011. Historical & recent land-use impacts on the vegetation of Bathurst, a municipal commonage, Eastern Cape, South Africa. *African Journal of Range & Forage Science* 28(1): 9-20. DOI: 10.2989/10220119.2011.570946.
- Puttick JR, Hoffman MT & Gambiza J 2014. The impact of land use on woody plant cover & species composition on the Grahamstown municipal commonage: implications for South Africa's land reform programme. *African Journal of Range & Forage Science* 31(2): 123-133. DOI: 10.2989/10220119.2014.910835.
- Puttick JR, Hoffman MT & Gambiza J 2014. The influence of South Africa's post-apartheid land reform policies on bush encroachment & range condition: A case study of Fort Beaufort's Municipal Commonage. *African Journal of Range & Forage Science* 31(2): 133-145. DOI: 10.2989/10220119.2014.880943.

Desale Okubamichael
Postdoc

THE DEMISE OF CYCADS (*E. frederici-guilielmi*) AT TSOLO, EASTERN CAPE

1946



- 53 locations, 107 photos, 626 individuals from 3 time steps (1940s, 1995, 2014)
- 78% survived to 1995 but only 16% to 2014
- Losses: private > communal > conservation
- Theft & trade, muti collection, Allee effects
- Solutions: education & law enforcement

1995

2014

Joe White
BSc (Hons) 2013

LONG-TERM CHANGES IN *Widdringtonia cedarbergensis* USING REPEAT PHOTOGRAPHY

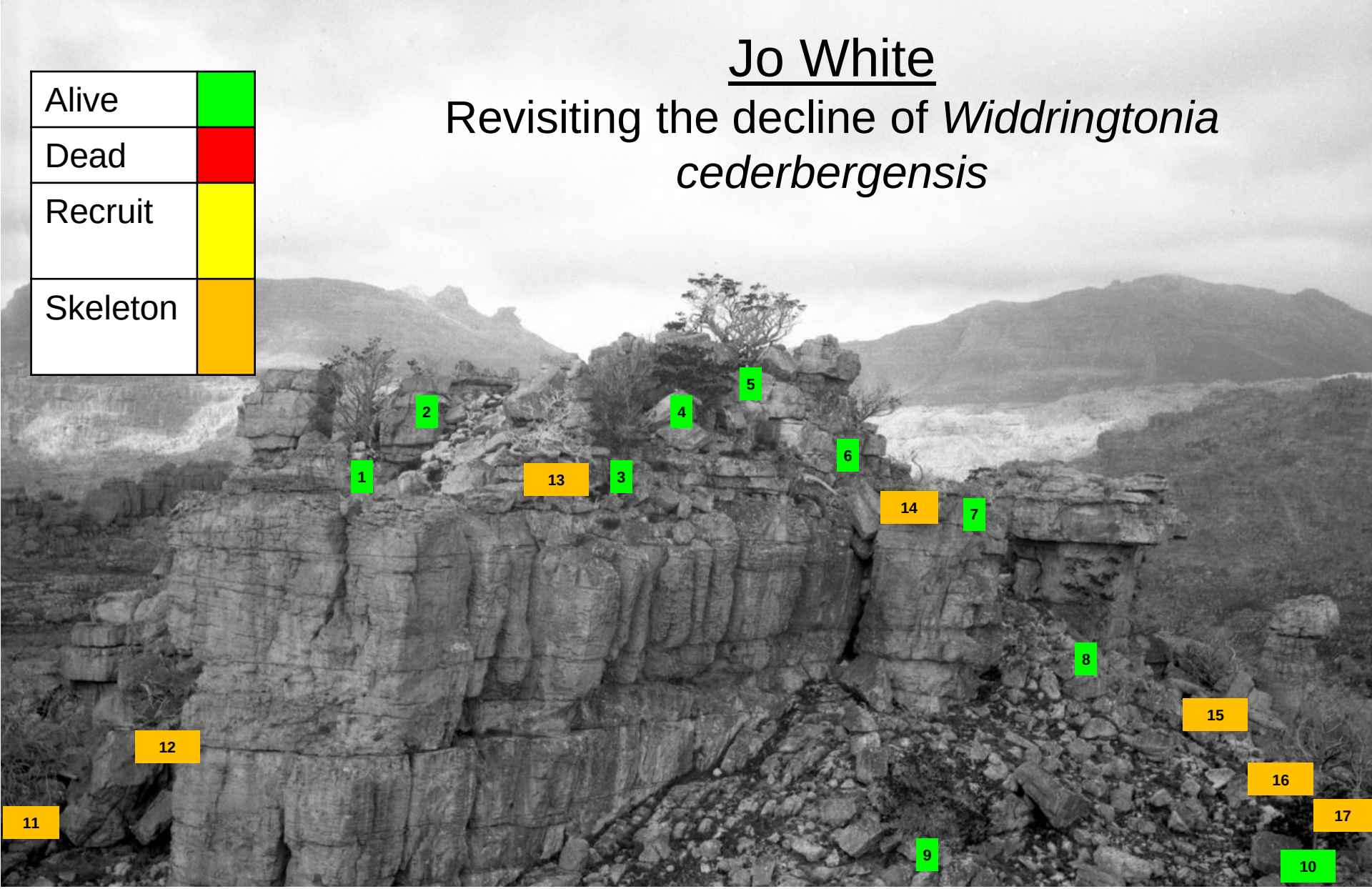
- Analysis of long-term changes in Clanwilliam Cedar populations using repeat photography.
- In the repeat photograph, taken 82 years later, 8 out of 10 trees died.
- Change in fire & temperature.

- White JDM, Jack SL, Hoffman MT, Puttick J, Bonora D & February EC 2016. Collapse of an iconic conifer: Long-term changes in the demography of *Widdringtonia cedarbergensis* using repeat photography. *BMC Ecology*. [In press].

Jo White

Revisiting the decline of *Widdringtonia cederbergensis*

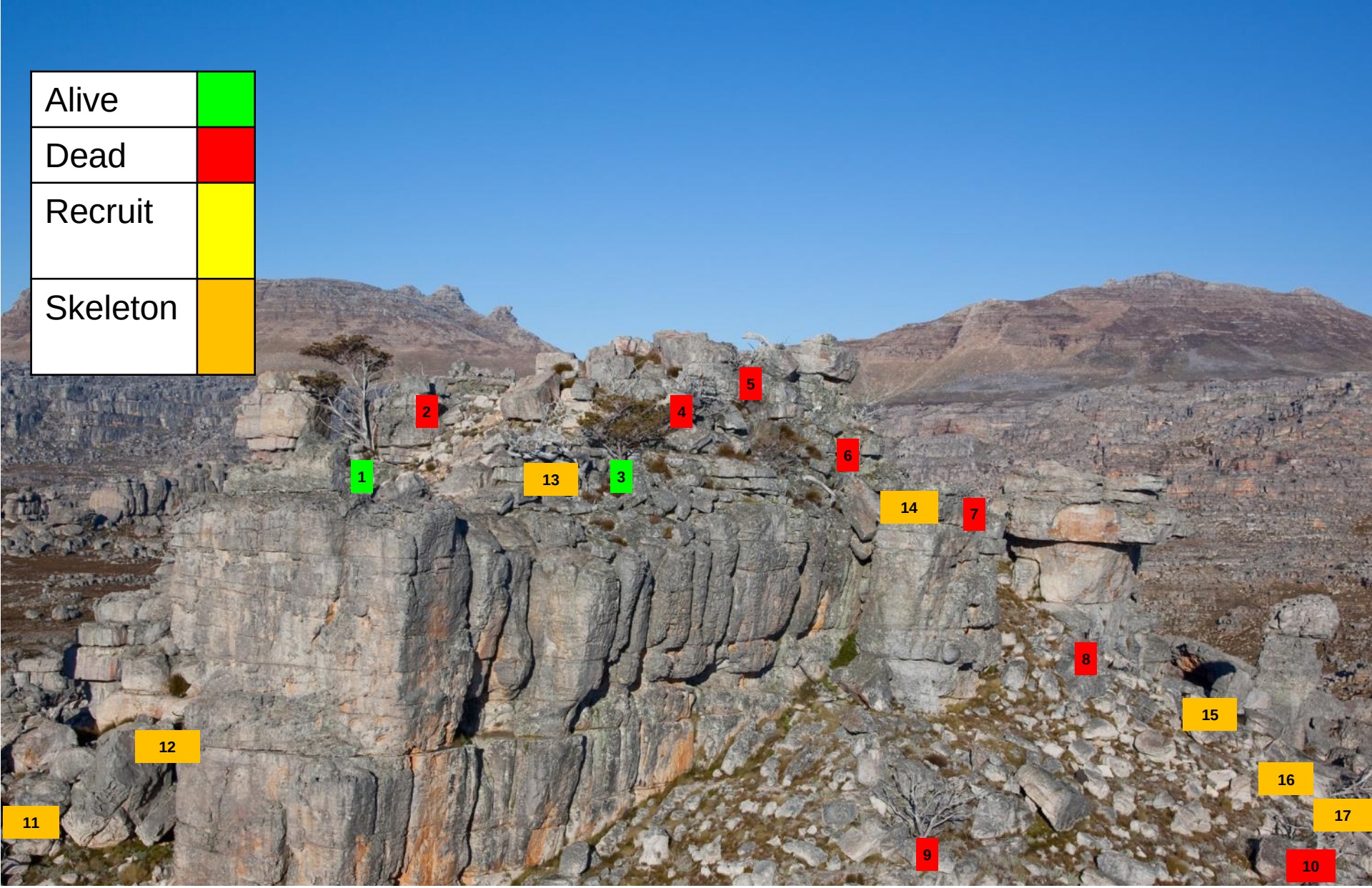
Alive	
Dead	
Recruit	
Skeleton	



Howes-Howell 1931

1043_Cathedral Rocks 14

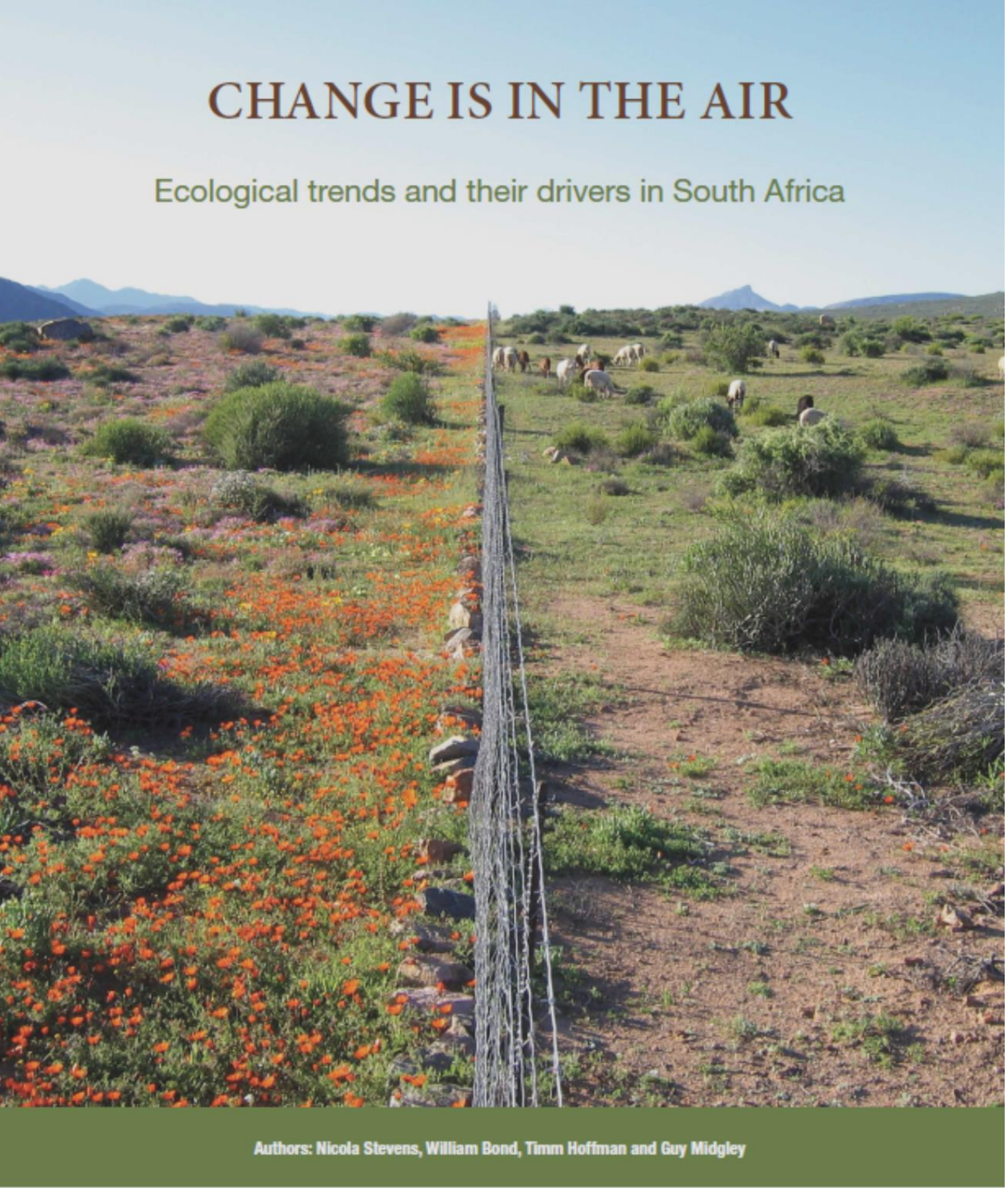
Nov/Dec



Puttick & Jack 2012

1043_Cathedral Rocks 14

10 Oct

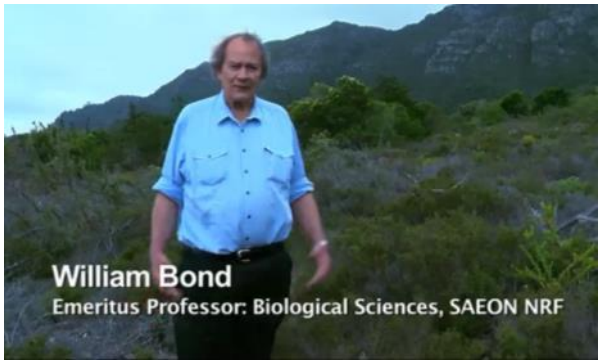


"Change is in the air"

www.saeon.ac.za

Science Forum
Pretoria
8th December 2015

32 page booklet &
15 minute video



science & technology
Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

NRF National Research Foundation | SAEON South African Environmental Observation Network

rePhotoSA

The repeat photography project of southern African landscapes

Home | About | Get Involved | Search photos | Upload

http://rephotosa.adu.org.za

GO

Welcome to rePhotoSA

This project encourages you as the public or 'citizen scientist' to contribute to an understanding of how South Africa's environment has been changing and is continuing to change. This is done by comparing two photographs of the same view, taken at different times, and then recording the major changes that have taken place between the photos. This approach is called 'repeat photography'.

Read more about repeat photography in the **About** section, or begin browsing our photographic database **here** to look for images in your area, for which you can take repeat photos and help increase our collection of repeat photographs. You might just discover some enchanting images from places in your distant past.

Quick links

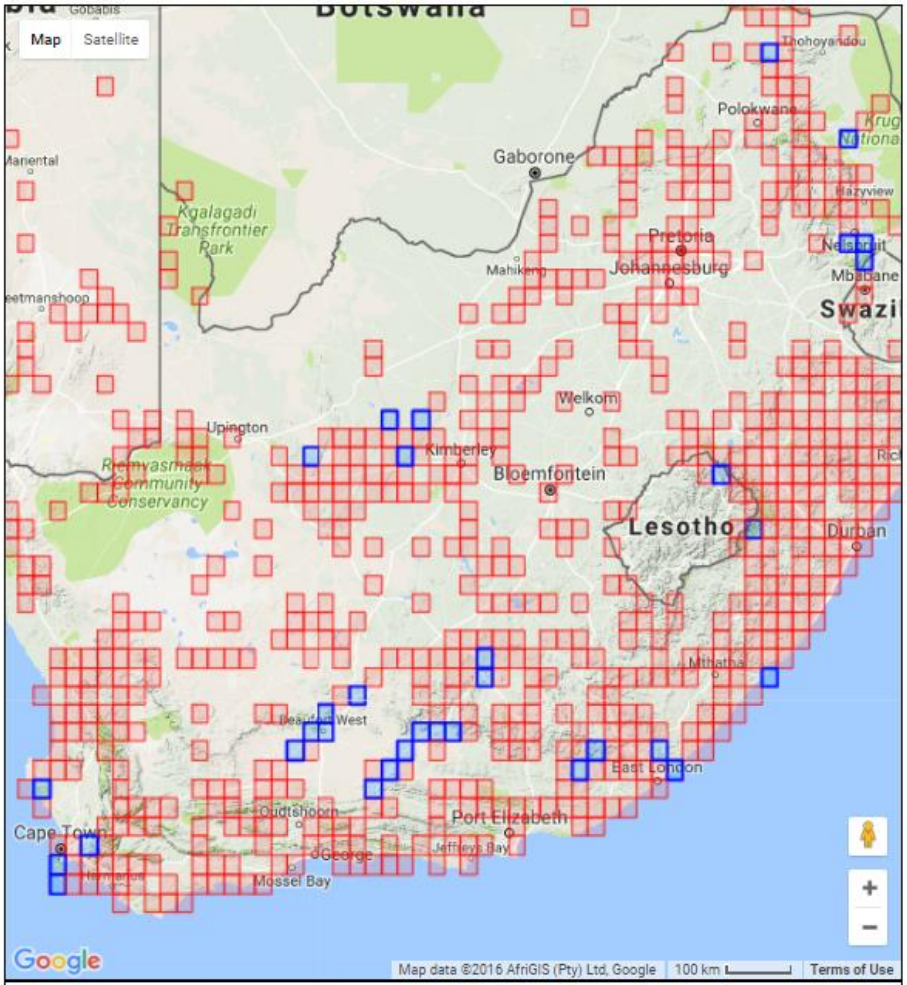
- Register
- FAQs
- Repeat photography
- Publications
- Multimedia
- Contact us
- Copyright information

rePhotoSA

The repeat photography project of southern African landscapes

Map showing QDSs with historical photos

To see the photos for a particular QDS, click on the relevant block.

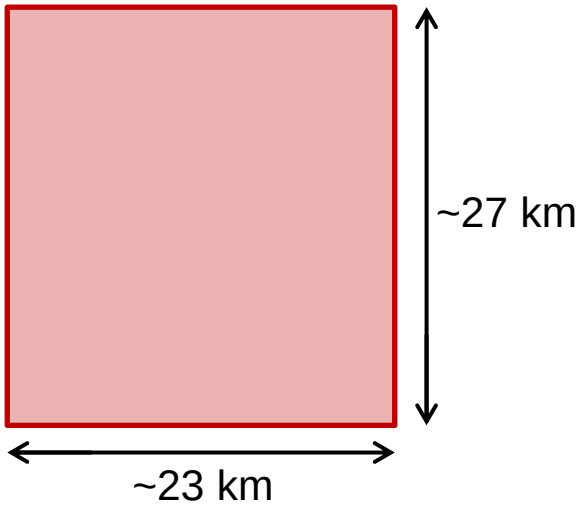


Hovering over: 3029DB: 1 image & 0 repeats

Quick links

Register
FAQs
Become a citizen scientist
Donate historical photographs
Become a donor
Repeat photography
Publications
Multimedia
Contact us
Copyright information

QDS = Quarter Degree Square



Programme Highlights and Strategy

- Active student throughput (9 Hons, 8 MSc, 1 PhD); 5 students registered
- 22 publications across several key themes and platforms
- Launch of citizen science rePhotoSA initiative during the review period which dove-tails and is well-integrated with environmental history research programme

- Future focus is to:
  - Build the historical photo database (currently ca. 20,000 images) with help from UCT Libraries and upload to rePhotoSA (ca. 5,000)
  - Build citizen scientist involvement in rePhotoSA
  - Increase number of repeat photographs from student projects in collection (1,650+) and upload to rePhotoSA website
  - Publish edited volume of several case studies associated with this programme and which utilise repeat photography




III. LAND USE & SUSTAINABLE DEVELOPMENT

What is the impact of current land use practices on the biomes of southern Africa ? (focus on GCFR)

LOCAL STUDIES

- Drakensberg foothills (Marx)
- Sanbona Wildlife Reserve (Eichenberger)
- *Aloe dichotoma* (van Blerk)

REGIONAL STUDIES

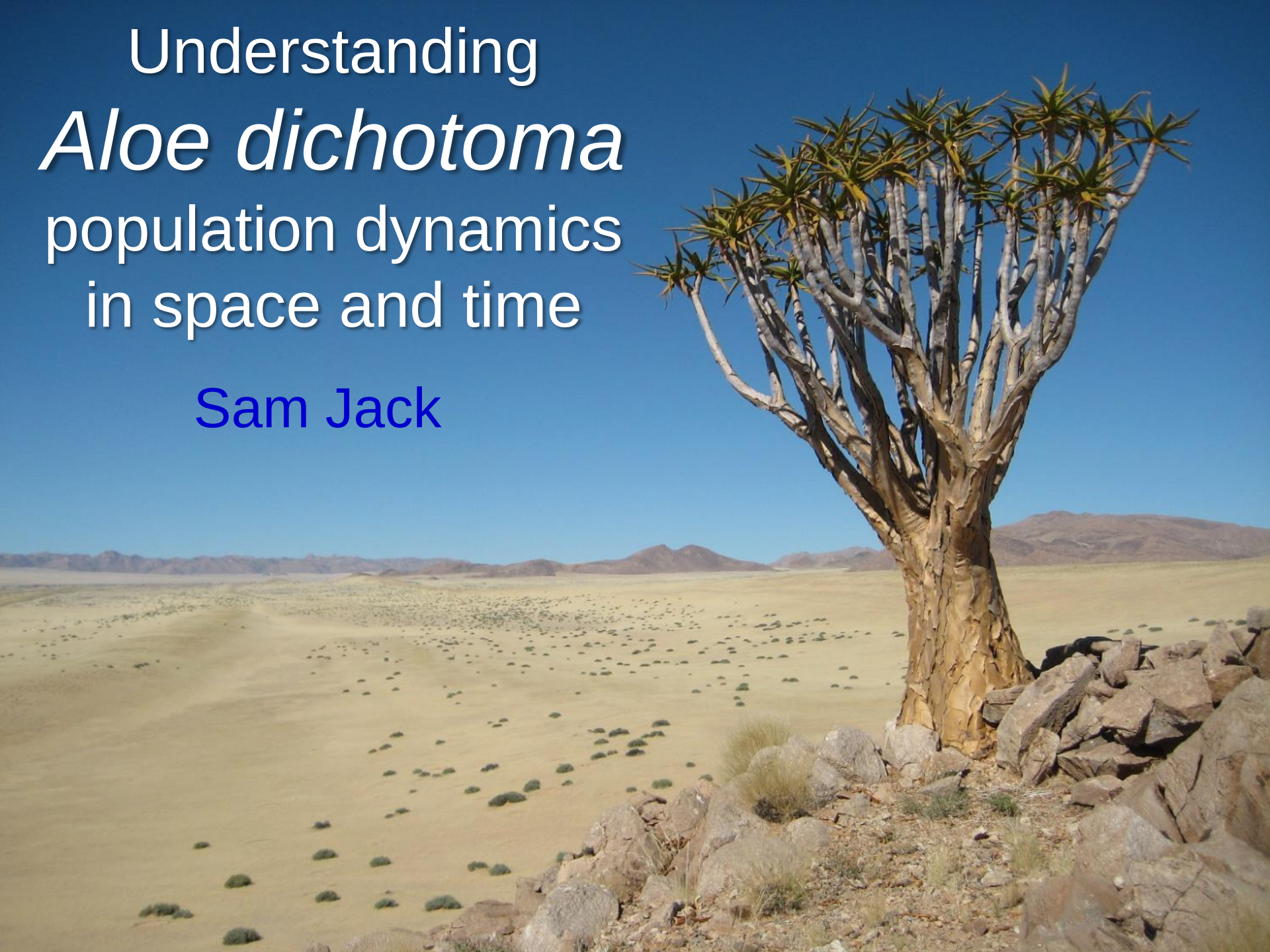
- Namaqualand (Samuels, Jack)
- Renosterveld (Poulsen)
- Karoo (Petersen, Shadwell)

LONG-TERM STUDIES

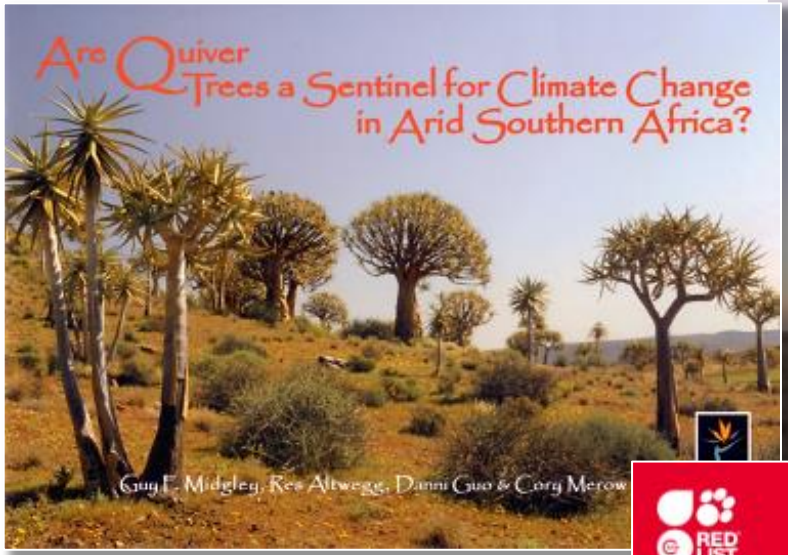
- Riemvasmaak (Fleury)
- Paulshoek (Lot, Nenzhelele, Wheat, Lutchminarayan)

Understanding *Aloe dichotoma* population dynamics in space and time

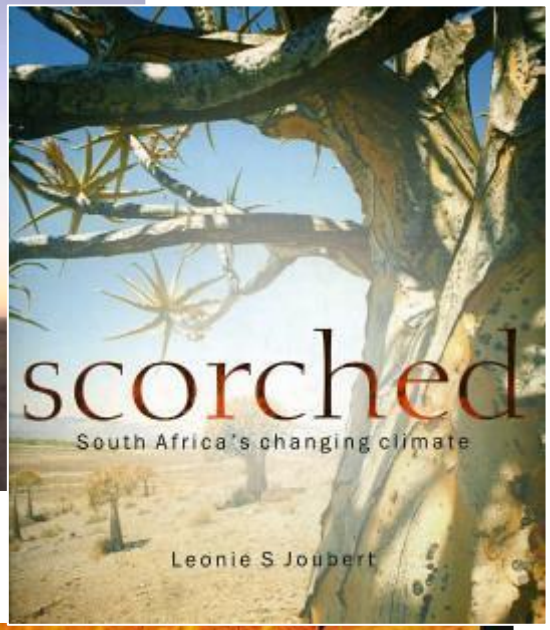
Sam Jack



Hot news!

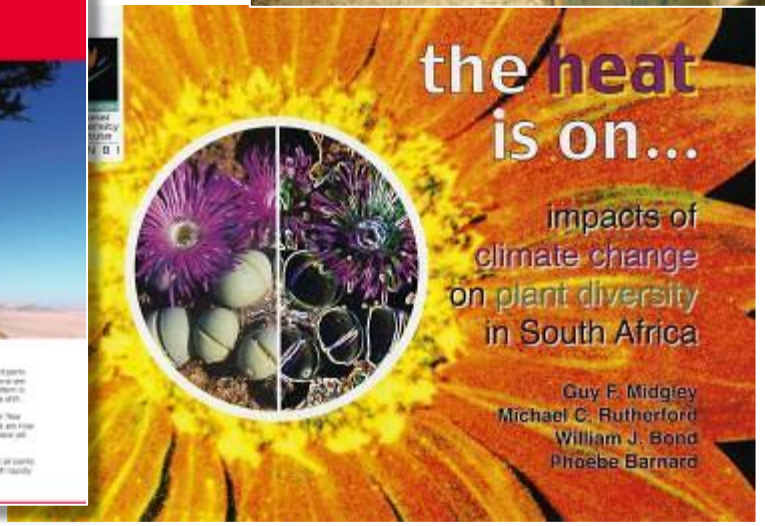

Are Quiver Trees a Sentinel for Climate Change in Arid Southern Africa?
Guy F. Midgley, Res Altwegg, Danni Guo & Cory Merow


All of a Quiver


scorched
South Africa's changing climate
Leonie S Joubert


RED LIST
QUIVER TREES AND CLIMATE CHANGE
Desert giants feel the heat
Summary


CAPE TIMES
Home
Cape Times Home
News
Sport
Business
Opinion
Arts
Media
Quiver tree a victim of climate change
Melanie Gosling
Environment Writer
QUIVER trees, those iconic, long-lived giant tree aloes of the arid regions of South Africa and Namibia, are all in bloom in the Richtersveld, their yellow flowers bright against the desert background.
But while these unusual plants appear healthy and thriving to the motorist barrelling north along the N7, this is not the case for all of them, particularly those in the northern part of their distribution range. Climate change is affecting them, and the population is declining as a result.
Scientists have found the quiver trees seem to be responding to global warming by shifting their distribution range, both in terms of latitude and altitude.
About 10 years ago, researchers became aware that there were big die-offs of quiver trees.


the heat is on...
impacts of climate change on plant diversity in South Africa
Guy F. Midgley
Michael C. Rutherford
William J. Bond
Phoebe Barnard

PASTORAL MOBILITY IN A VARIABLE & SPATIALLY CONSTRAINED SOUTH AFRICAN ENVIRONMENT

Igshaan Samuels
PhD (2013)

- Samuels I, Allsopp N & Hoffman MT 2013. How could herd mobility be used to manage resources & livestock grazing in semi-arid rangeland commons? *African Journal of Range & Forage Science* 30(1&2): 85-89. DOI: 10.2989/10220119.2013.781063.










Plant Conservation Unit

The assessment of environmental change in Riemvasmaak, Northern Cape, South Africa twenty years after resettlement

Gabriela Fleury

Supervisors: Prof. Timm Hoffman and Simon Todd

Percy FitzPatrick Institute, University of Cape Town, Cape Town, South Africa

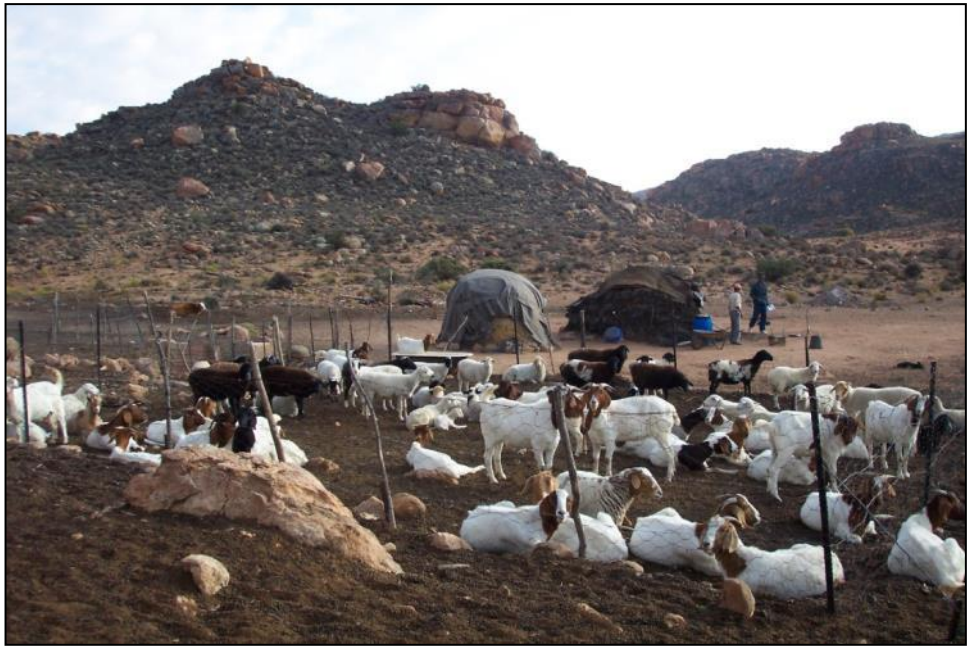
LONG-TERM RESEARCH SITE AT PAULSHOEK, NAMAQUALAND

100 households, ~ 500 people, 1 of 10 villages in Leliefontein communal area
government grants main source of income, subsistence resource use, transformed landscapes

PAULSHOEK RESEARCH SITE

Since starting in 1995 research at Paulshoek has yielded:

- 25 journal articles
- 11 book chapters / conference proceedings
- 10 Honours theses
- 15 MSc theses
- 6 PhD theses
- 3 Videos / movies



PAULSHOEK: MAIN DATA SETS

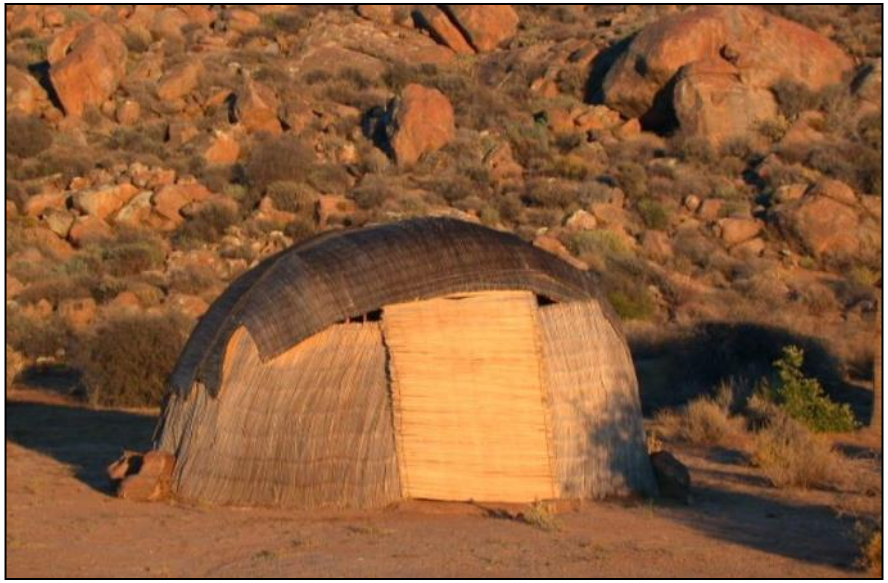
Name	Frequency	Start
Rainfall & weather	Daily	1996
Plant phenology	Monthly	1999
Livestock production	Monthly	1998
Crop production	Annual	1995
Donkey census	Annual	2002
Permanent plots (rested & grazed)	Annual	2006
Grazing impact on *Cheiridopsis*	Annual	2000
Simon Todd's fence-line contrast study	Decadal	1996, 2006, 2016
Plant use (medicinal, firewood)	Ad hoc	Various
Household livelihoods survey	Ad hoc	1995, 2009
School leaver's profiles	Ad hoc	2004
Etc. (e.g. once-off studies that could be repeated)		

Predation impacts on livestock in Paulshoek

Kirtanya Lutchminarayan

Nicola Wheat
PhD (2014)

ETHNOBOTANICAL, PHYTOCHEMICAL & METABOLOMICS INVESTIGATION OF PLANTS, PAULSHOEK



- Wheat N 2014. An ethnobotanical, phytochemical & metabolomics investigation of plants from the Paulshoek Communal Area, Namaqualand.
- Green L, Gammon DW, Hoffman MT, Cohen J, Hilgart A, Morrell RG, Verran H & Wheat N 2015. Plants, people & health: Three disciplines at work in Namaqualand. *South African Journal of Science* 111(9/10), Art. #2014-0276, 12 pages. DOI: 10.17159/sajs.2015/20140276.

Elelwani Nenzhelele
Msc Candidate

LONG TERM IMPACT OF LIVESTOCK GRAZING IN THE SUCCULENT KAROO: A 20 YEARS' OVERVIEW

Elelwani Nenzhelele (MSc Candidate) & Marianna Lot

- Long-term changes in vegetation composition & cover across a fence-line which separates communally-grazed areas from privately-owned farms.
- Based on Simon Todd's research in 1996 & 2006.

Programme Highlights and Strategy

- Active student throughput (5 Hons, 2 MSc, 2 PhD); 6 students registered
- 23 publications across several key themes and platforms
- Established secure employment for Marianna Lot to maintain long-term datasets in Paulshoek

- Future focus is to:
  - Ensure completion of student theses and publication of outstanding manuscripts
  - Keep Paulshoek work as cornerstone of programme but look for other opportunities for building key elements (e.g. land degradation)
  - Find a student to analyse the long-term livestock data for Paulshoek
  - Prepare for book on Paulshoek containing a synthesis of all work done in the communal area since 1995

IV. DISTURBANCE & RESTORATION ECOLOGY

- Conceived & managed by Peter Carrick with the aim to develop intellectual tools for rehabilitating & restoring degraded mining areas & overgrazed communal areas of Namaqualand.
- Over 5 years, dedicated three-week bloc on Conservation Biology MSc course at UCT, including week-long field trip where students conduct a field-study & write up as scientific paper.
- Week-long research & information sharing workshops between researchers & practitioners of ecological restoration in southern Africa, Australia & USA.
- In recognition of his achievements in the field of restoration ecology Peter won the 2012 NSTF-BHP Billiton Award for his *"…outstanding contribution to Science Engineering Technology & Innovation (SETI) leading to innovation in an NPO.*"

- PCU also contributed financially to RENU-KAROO - A restoration initiative led by Sue Milton & Richard Dean from Prince Albert in the southern Karoo. (Local employment & conservation benefits)

Carina Becker
PhD Candidate

THE ECOLOGICAL UNDERSTANDING & RESTORATION OF DEGRADED LANDS IN THE KAMIESBERG, NAMAQUALAND, SOUTH AFRICA

- Research in Namaqualand.
- Nurture Restore Innovate & Conservation South Africa gearing up to roll out large-scale restoration in Namaqualand based on the results of Carina's research.

- Becker CH, Coetsee C, Cowling RM & Potts AJ 2015. The local landscape boundary between the Albany subtropical thicket & Nama-Karoo shrubland is not influenced by edaphic factors. *South African Journal of Botany*. DOI:10.1016/j.sajb2014.12.003
- Carrick PJ, Erickson TE, Becker CH, Mayence CE & Bourne AR 2015. Comparing ecological restoration in South Africa & Western Australia: The benefits of a 'travelling workshop'. *Ecological Management & Restoration* 16: 86-94.




V. BIOLOGICAL CONTROL OF INVASIVE TREES

- Managed by Emeritus A/Prof John Hoffmann (advisory capacity & remains active in research); work carried out primarily by two research officers: Carien Kleinjan & Fiona Impson – joined in 2014.
- Funded through the South African Department of Environmental Affairs (DEA), National Resource Management Programmes.
- Focused on the biological control of invasive tree species, particularly Australian acacias (1 Hons, 2 MSc, 5 publications).
- Currently a suite of 11 biological control agents deployed against 10 of the 16 Australian acacias declared invasive in South Africa.
- Research in this programme encompasses all aspects of weed biocontrol including:
  - surveys for candidate agents,
  - importation & risk assessment,
  - obtaining requisite permission to release agents,
  - evaluation of their efficacy once established, &
  - knowledge transfer to managers & policy makers.




VI. CONSERVATION ASSESSMENT

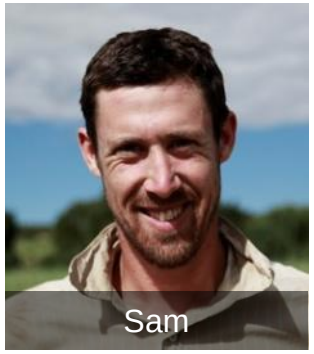
- Led by Timm Hoffman but usually in co-supervisory capacity supporting Percy Fitzpatrick Institute's Conservation Biology Masters students interested in botanical projects.
- Contributions include:
  - Assessment of endemic plants from Maputaland regional centre of endemism as well as an investigation into the efficacy of trade records kept by *CITES*.
  - Understanding by nursery managers & impact of the new alien plant regulations on their trade.
  - Ecological assessment of conditions within several key rivers of the Western Cape & conducted a census of the Gariep River. Establishment of long-term monitoring sites for future research.
- Little direct expertise in the fields advanced by the student projects in this programme but will continue to support such work particularly if we are part of larger supervisory teams of colleagues from other universities & research institutions.

Hermenegildo Matimele
MSc (2016)

AN ASSESSMENT OF THE DISTRIBUTION & CONSERVATION STATUS OF ENDEMIC & NEAR ENDEMIC PLANT SPECIES IN MAPUTALAND

- Focus on 13 endemics from Maputaland Centre of Endemism in southern Mozambique.
- To provide first conservation assessment for the majority of targeted species.
- To suggest most appropriate approach for conserving these endemics in a region that is under tremendous threat primarily from urbanisation, agriculture & charcoal production.
- Supported by SANBI, Buffelskloof Nature Reserve (Mpumalanga) & Kew (England).

SENQU2SEA



- Mega-transect survey of Gariep River
- Over two months paddled the length of Gariep River (>2,000 km) from Qacha's Nek high in Maluti Mountains (Lesotho) to Alexander Bay
- Created baseline photographic record of the river & surrounds by taking regular shots on river every 2 km & from elevated positions on the river bank
- Surveys undertaken on two other Cape river systems

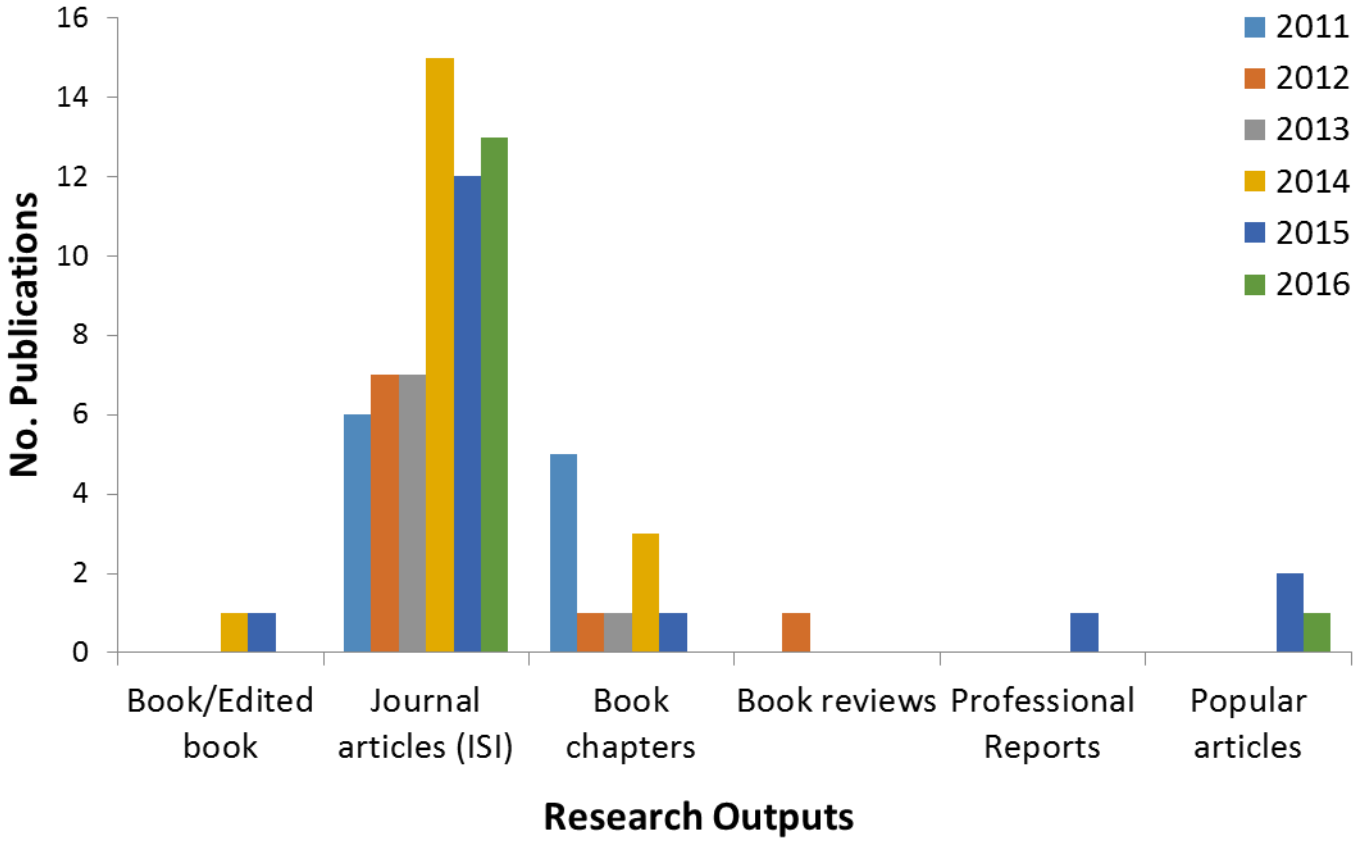



RESEARCH OVERVIEW

- Research Programmes: Outline & highlights
- Research output & impact
- Collaborative networks
- Future research direction

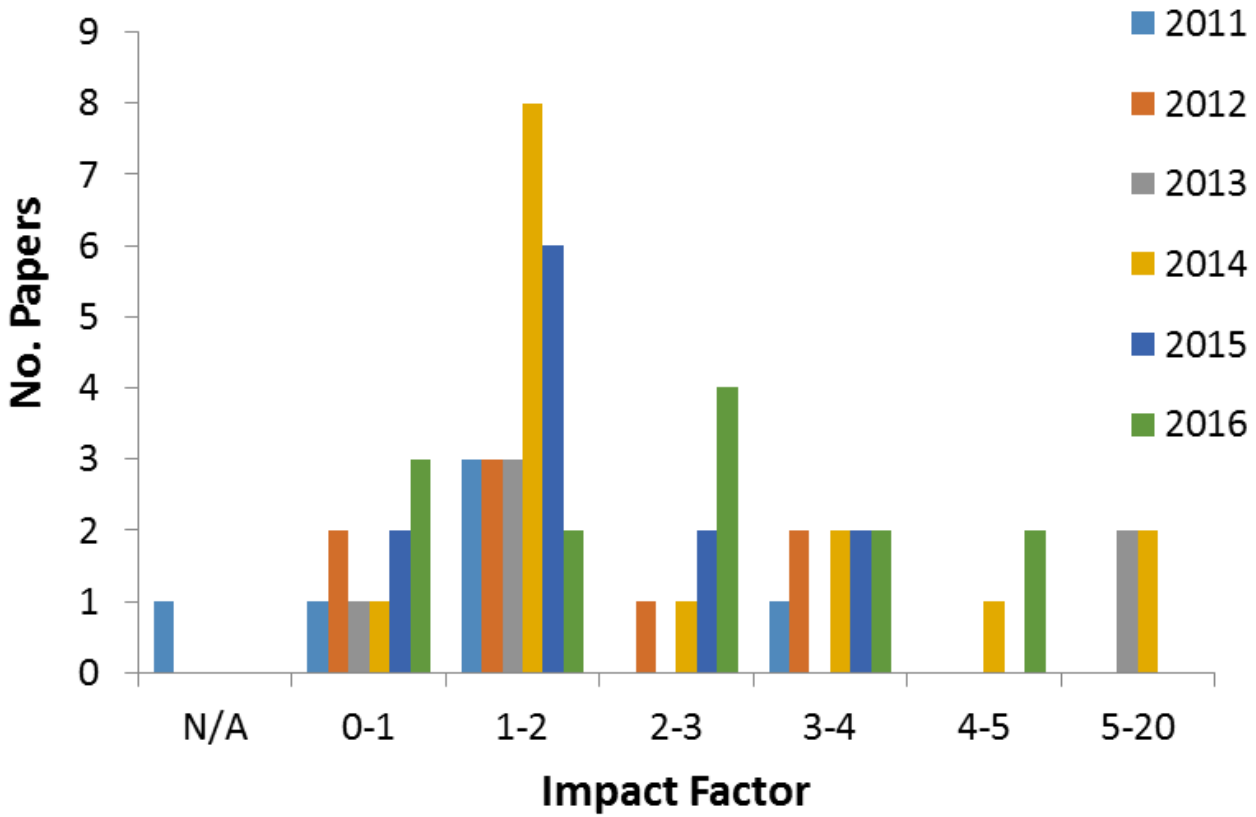
RESEARCH OUTPUT: LITERATURE

- 60 peer-reviewed articles in 38 journals.
- 1 Book & 1 Edited book volume
- 11 Peer-reviewed book chapters
- 2 Book reviews & professional reports
- 3 Popular articles

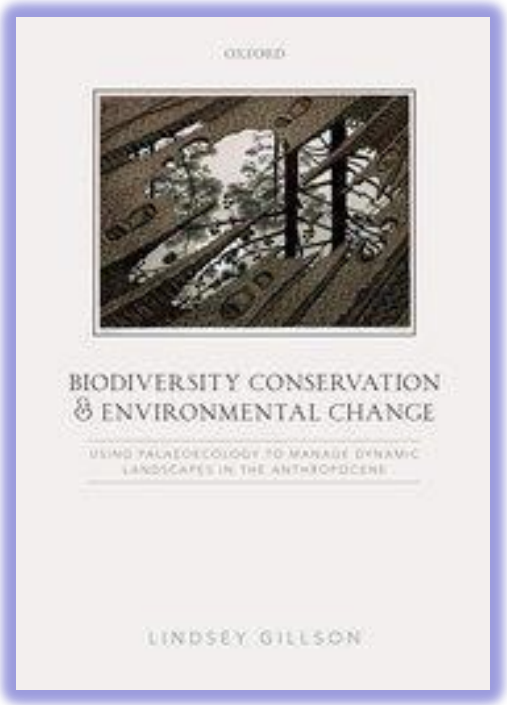


RESEARCH OUTPUT: IMPACT

- The average journal impact factor is 2.7.
- Range from 0.5-16.7.
- 25 papers (42%) published in journal with IF 1-2, majority 2014/15.



RESEARCH OUTPUT
HIGHLIGHTS



Lindsey's book, "*Biodiversity Conservation & Environmental Change: Using palaeoecology to manage dynamic landscapes in the Anthropocene*" (2015) by Oxford University Press.

Synthesis of the applications of palaeoecology & other long-term data in biodiversity conservation & ecosystem management.

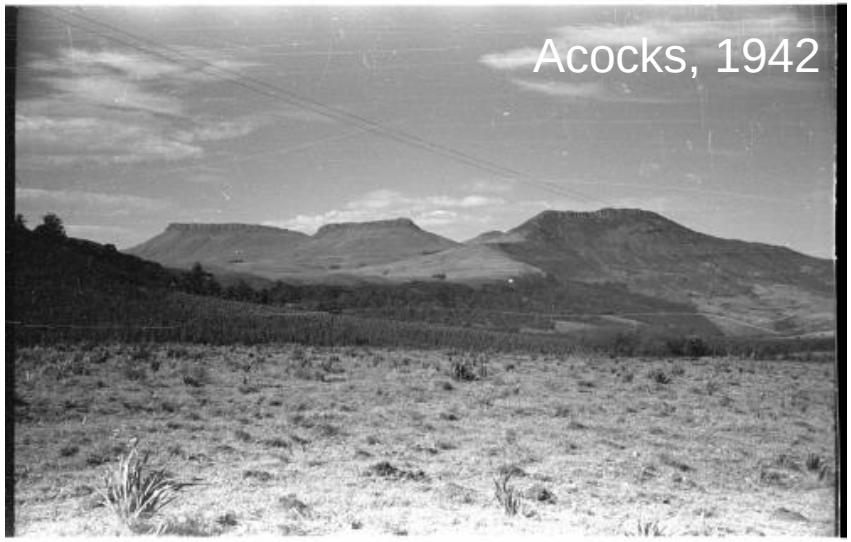
rePhotoSA

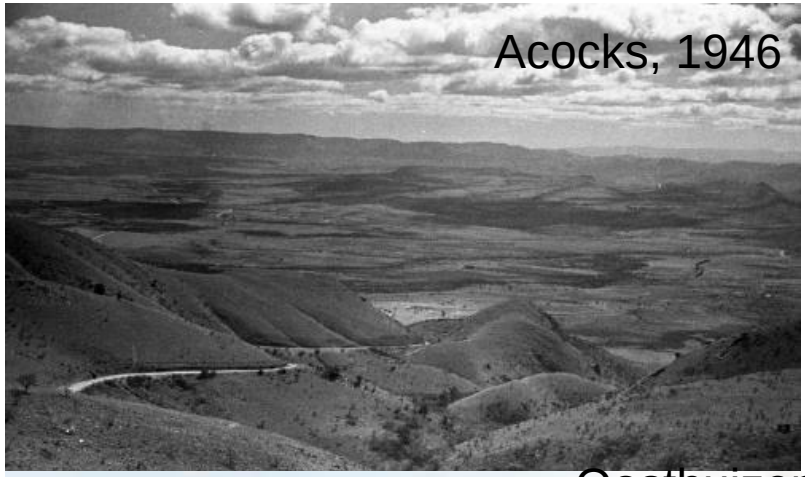
The repeat photography project of southern African landscapes

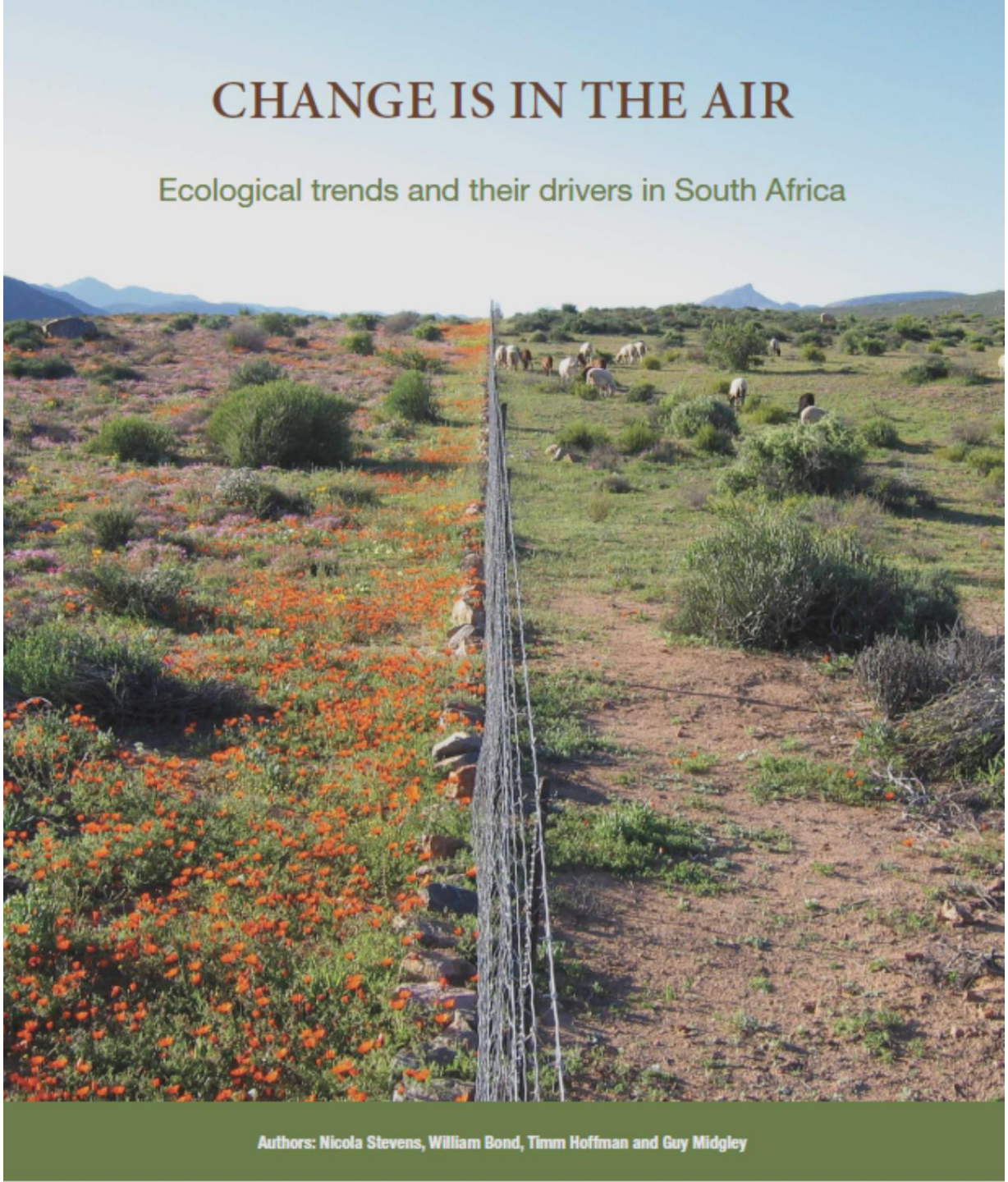
RESEARCH OUTPUT

HIGHLIGHTS

- PCU & ADU citizen science project.
- Launched August 2015.
- > 65 good repeats & growing.





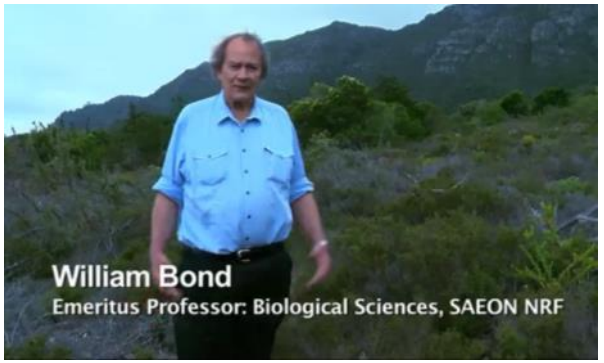


"Change is in the air"

www.saeon.ac.za

Science Forum
Pretoria
8th December 2015

32 page booklet &
15 minute video

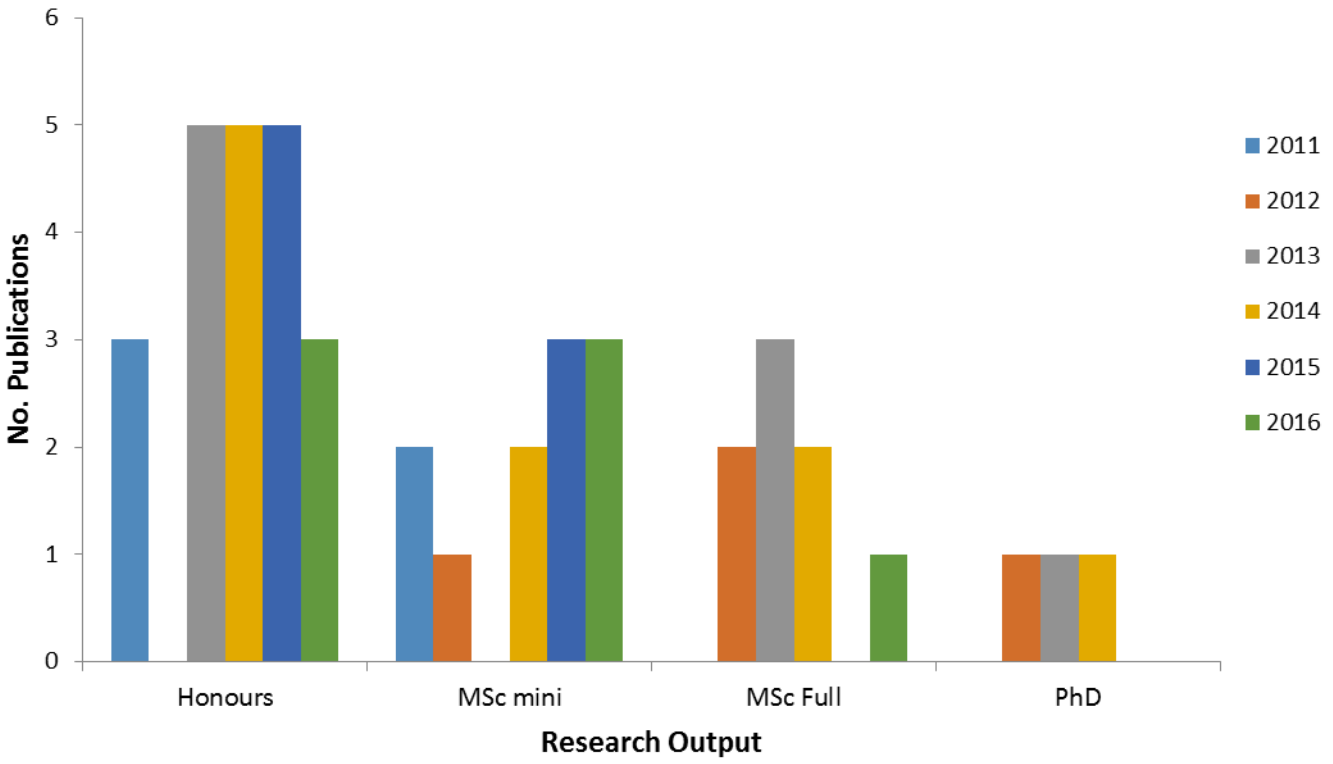


science & technology
Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA

NRF National Research Foundation | SAEON South African Environmental Observation Network

RESEARCH OUTPUT: GRADUANDS

- 43 graduands overall
- 21 Honours theses
- 11 MSc Mini-theses
- 8 MSc theses
- 3 PhD theses






RESEARCH OVERVIEW

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COLLABORATIVE NETWORKS:
(1) WITHIN LOCAL UNIVERSITIES

UCT: DEPARTMENT	COLLABORATORS
Biological Sciences	Jeremy Midgley, William Bond, Mike Cramer, Ed February, Adam West, Samson Chimphango, Mike Picker, Charles Griffiths
EGS	Mike Meadows, Pippin Anderson, Frank Eckhardt, Gina Ziervogel
Chemistry	David Gammon
Anthropology	Leslie Green
Manuscripts & Archives, Libraries	Renate Meyer, Paul Weinberg (Humanitec)

STELLENBOSCH: DEPARTMENT	COLLABORATORS
Centre for Invasion Biology	Heidi Hirsch, Jaco le Roux, John Wilson

COLLABORATIVE NETWORKS:
(2) REGIONAL & NATIONAL

Institution	Department	Collaborators
Wits University	Biology	Sally Archibald
UKZN	Biology	Dave Ward, Mathieu Rouget
Rhodes University	Environmental Science	James Gambiza
CapeNature	Little Karoo region	Marienne de Villiers
Eskom	Koeberg Nature Reserve	Jurina le Roux
Garies Municipality	Paulshoek Village	Jan Claassen, Johanna Lot
Northern Cape Agriculture	Directorate: Nature Conservation	Elsabe Powell
Iziko Museums	West Coast Fossil Park	Pippa Haarhoff
Western Cape Agriculture	Elsenburg	Mike Wallace
ARC	Range & Forage Institute	Igshaan Samuels
ARC	Plant Protection Institute	
CSIR	Natural Resources section	Brian van Wilgen, Claire Davis, Benis Egoh
SANBI	Kirstenbosch Research Centre	John Donaldson
SAEON	Fynbos, Grasslands, Arid Lands	Simon Todd, Helga van der Merwe, Jasper Slingsby, Tim O'Connor, William Bond
SANParks	Tokai Research Centre	Mmoto Masubelele

COLLABORATIVE NETWORKS: (3) INTERNATIONAL

Institution	Department	Person(s)
Australis Biological Pty. Ltd, Australia		Robin Adair
Federation University Australia	Faculty of Science & Technology	Peter Gell
Fundación para el Estudio de Especies Invasivas (FUEDEI), Argentina		Guillermo J. Cabrera Walsh
Institut National de la Recherche Agronomique (INRA), France		Alain Roques
Desert Botanic Garden, Phoenix Arizona, USA		Joe McAuliffe
National University of Science & Technology, Namibia	Department of Ecology & Conservation	Dave Joubert
Namibian Government	Ministry of Environment & Tourism	Kirsti Nghindinwa
Spanish National Research Council	Institucio Catalana de Recerca	Antonieta Jerardino
Tel Aviv University, Israel		Netta Dorchin
Universidade de Coimbra, Portugal,		Hélia Marchante
University of Edinburgh	Centre of African Studies	Rick Rohde
University of Hamburg	Botany	Norbert Juergens, Ute Schmiedel
University of Kaiserslautern	Biology	Natalie Kunz
University of Namibia	Department of Biology	Ndafuda Shiponeni
University of Oxford	Environmental Change Institute	John Boardman
University of Southampton	Department of Geography & the Environment	John Dearing
University of Uppsala, Sweden	Department of Archaeology & Ancient History	Anneli Ekblöm
University of York	Environment Department	Rob Marchant




RESEARCH OVERVIEW

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FUTURE DIRECTIONS

1. Ensure that current PhD & MSc students submit their thesis on time.

- Despite financial, intellectual & logistic support & engaged mentorship many students (particularly PhD) made slower progress that expected.
- Mid-year review process initiated to assess student progress in relation to PPA (Planned Progress & Activities) agreement, which is developed at the start of each year.

2. To produce a few high impact publications similar to Lindsey's achievements for the current reporting cycle.

- Through synthesis of the bigger ecological & conservation stories that emerge from the diverse range of PCU studies.
- An edited volume of repeat photography case studies is also envisioned.
- More papers…..




FUTURE DIRECTIONS

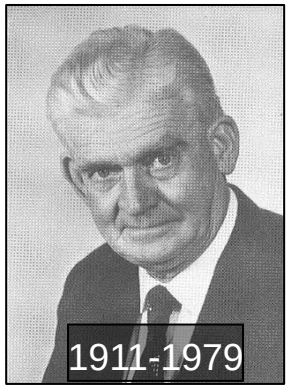
3. rePhotoSA (http://rephotosa.adu.org.za)

- collaboration between the PCU, the ADU & citizen scientists.
- rePhotoSA ~ 1 years old (launched 12 August 2015).
- ~ 65 repeats uploaded by citizen scientists.
- Only project of its kind in Africa (& only successful one in the world) & we would like to build it as a model project that other research groups could emulate.
- Relies heavily on availability of historical photographs therefore the full complement of historical images in the PCU collection need to be prepared & uploaded to the website.
- Must be sustained to grow the number of participants & number of repeats uploaded to the website (popular articles, workshops & citizen science days – local & provincial).
- Looking to expand further into southern Africa (current photographs largely within SA & Namibia).

rePhotoSA
The repeat photography project of southern African landscapes




FUTURE DIRECTIONS



4. Timm Hoffman sabbatical leave in 2018

- Preparation of John Acocks biography.

5. Leslie Hill Succulent Karoo Trust

- Purchase of land for conservation.
- Stewardship initiatives in Northern & Western Cape.
- New research initiative to support LHSKT work for renewed effort in Succulent Karoo to build land use & sustainable development programme & to provide bursary opportunities to students.

PCU

WWF

FUTURE DIRECTIONS

6. Palaeoecology & long-term landscape dynamics

- Initiatives planned: broad aim of “mainstreaming” palaeoecology into the broader ecological, conservation & sustainability literature.
- Special issue on 1) biodiversity & palaeoecology in preparation for PAGES magazine (past global changes); & Anthropocene on Palaeoecology & Sustainability.
- More collaboration with modellers: Sally Archibald (Wits) & John Dearing (Southampton).
- Continue to develop integrative, multidisciplinary projects which combine palaeoecology as one strand in developing nuanced narratives of landscape change.

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

UNIVERSITY OF Southampton

PAGES PAST GLOBAL CHANGES

RESEARCH & SERVICE TO SOCIETY

- The scientific community
- Industry & government
- Civil society

NRF

rePhotoSA

The repeat photography project of southern African landscapes





THE SCIENTIFIC COMMUNITY

- Participation at local (35), national (70) & international (21) conferences, seminars & workshops.
- Lindsey & Timm invited as keynote speakers (RSA, Germany, Sweden, France, UK, USA).
- Main local conferences include:
  - Fynbos Forum,
  - Arid Zone Ecology Forum (AZEF),
  - Savanna Science Networking Meetings, &
  - the South African Association of Botanists.
- Significant contributions in editorial & peer-review process for national & high-ranking international journals:
  - e.g. Journal of Applied Ecology, Ecological Applications, Journal of Biography, Journal of Vegetation Science.
  - Lindsey Gillson on editorial board of *Landscape Ecology* (2005-2009) & now Associate Editor of *The Anthopocene*.
  - Timm Hoffman on editorial board of *Pastoralism* & *Ecosphere*.
  - John Hoffmann is an editor for *Biological Control*.
  - Fiona Impson (chair), Carien Kleinjan (Scientific Programme) & John Hoffmann served on the organizing committee for the XIV International Symposium on the Biological Control of Weeds, Skukuza, KNP.





THE SCIENTIFIC COMMUNITY: AZEF

- A dedicated forum for researchers & students to meet annually to share their research findings.
- Timm Hoffman & Sam Venter serve on the Organising Committee.
- PCU has contributed R20,000 / year since 2014 to support AZEF activities.





THE SCIENTIFIC COMMUNITY

- Lindsey Gillson is Deputy HoD & is responsible for Applied Biology Major.
- Service on University Committees:
  1. Lindsey: Science Faculty Animal Ethics Committee & the Environment & Management Working Group.
  2. Timm: Institutional Forum & chair of Science Faculty's Research Ethics Committee.
- Lindsey is on the Scientific Steering Committee for the:
  1. African Climate & Development Initiative (ACDI) [UCT]
  2. Leads a Faculty Strategic Impact Area initiative on Biodiversity & Environmental Change in Cape Floristic Region.
- **Nationally:** Lindsey is involved in Land Cover Change Consortium & was co-Theme Leader for ACCESS sustainability & ecosystem services theme until 2015.
- **Internationally:** Lindsey is a member of (1) PAGES (Past Global Changes) Scientific Steering Committee; (2) is a lead author on Intergovernmental Panel on Biodiversity & Ecosystem Services (IPBES) Africa Regional Report





THE SCIENTIFIC COMMUNITY

- Lindsey & Timm examined > 15 MSc & PhD theses over the review period.
- These include PhD theses from Norway & Sweden which required travelling to the host country to examine the student in a public oral examination.
- Timm served on NRFs Plant Sciences Assessment Panel for NRF Rating system in 2011.
- Timm was an external examiner for the Botany Department of Venda University in 2012 & 2013.
- Both Timm & Lindsey both regularly review research proposals from local & international funding agencies.
- Both Timm & Lindsey both regularly peer review publications.

NRF | National Research Foundation



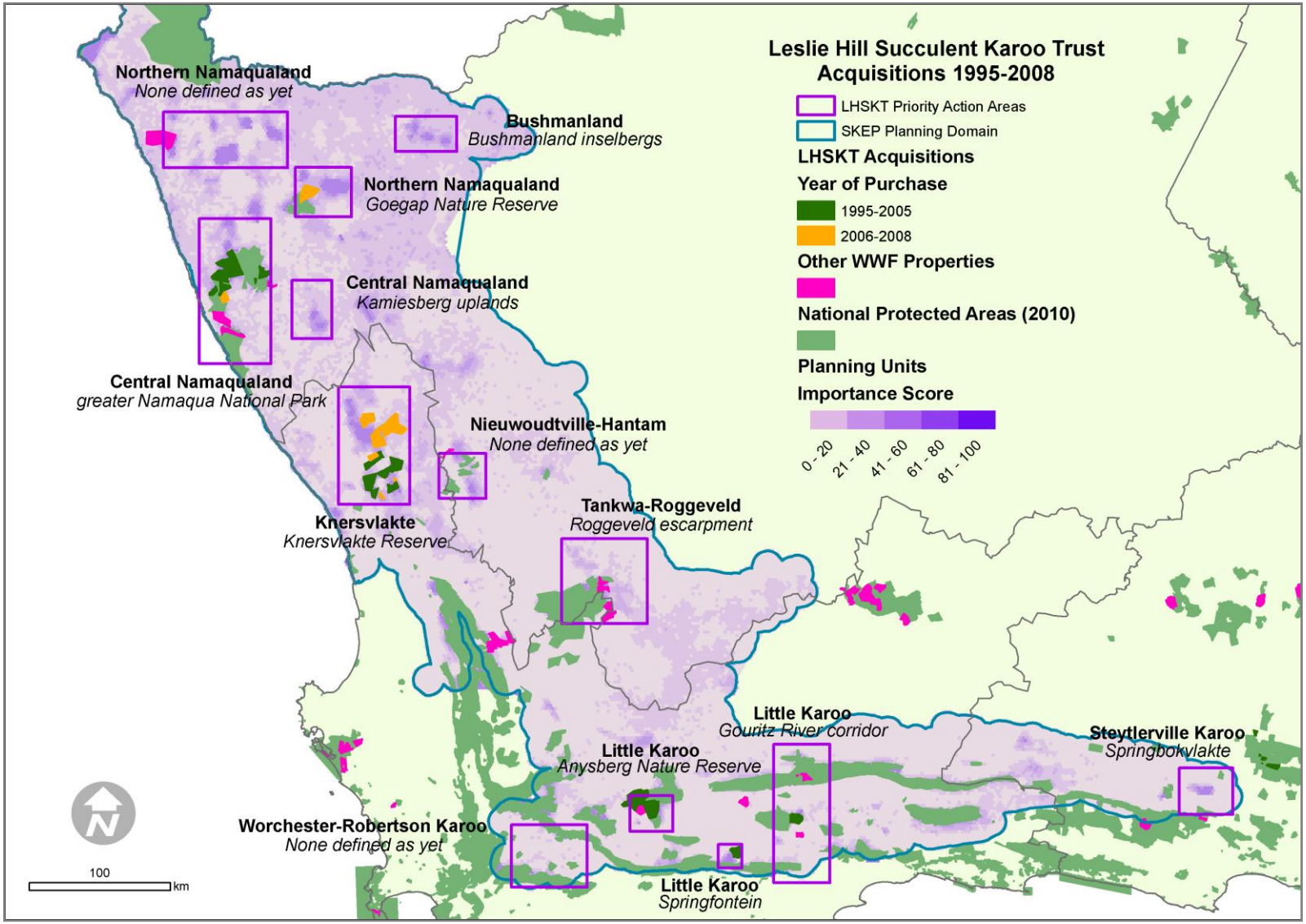


CONSERVATION INDUSTRY

- The PCU serves the conservation industry through:
  - participation in scientific & civil forums,
  - workshops,
  - committees &
  - direct contact with decision makers at local, provincial & national government levels.
- Major contribution via the Leslie Hill Succulent Karoo Trust (LHSKT):
  - Administered by WWF-SA.
  - Development of a network of conservation areas to conserve diversity of succulent flora of the region.
  - Attendance of Trust meetings with leading conservation agencies (e.g. CapeNature, SANParks) concerning identification & possible purchase of key conservation properties.
  - Director of the PCU & Trustee of LHSKT is also responsible for leading the research committee: New initiative & the first research projects should start in 2017.

SERVICE TO THE CONSERVATION INDUSTRY: LHSKT

69 Properties (>200,000 ha) purchased between 1995-2016



CIVIL SOCIETY & NGO SECTOR

- Many of our projects bring the PCU into direct contact with civil society, such as **Paulshoek**:
  - community member, Marianna Lot, employed as research assistant for land use & sustainable development programme.
  - Marianna assists researchers & post-grads who work in the village & surrounding commons.
- Funding provided to several projects & individuals over the course of the reporting period, including:
  - **RENU-KAROO** led by Sue Milton & Richard Dean focused on restoration of degraded Karoo environments of southern Cape.
  - PCU funding ended in 2011 but was used to support 3 people from Prince Albert community over 4 years.
  - Now supports 14 people & makes a significant contribution to a community where unemployment is over 65%.

Renu-karoo

CIVIL SOCIETY & NGO SECTOR

- A major new initiative of the PCU is the launch of citizen science project **rePhotoSA:**
  - Details on http://rephotosa.adu.org.za including instructions on how to repeat historical photographs & upload them to the website.
  - To build a network of active citizen scientists willing to travel to locations where historical photographs have been taken & to take a repeat.
  - ~ 65 repeat photographs uploaded by citizen scientists.
  - Several popular articles written & citizen science days attended.
  - We see great potential in this project & are looking for ways to build its value in school curricula & local environmental interest groups.

Biological Sciences

PCU

ADU

rePhotoSA

The repeat photography project of southern African landscapes





CIVIL SOCIETY & NGO SECTOR

- DEA-NRMP contract: strong emphasis on capacity building & implementation of biological control.
- Two implementation teams in Western Cape trained & managed by Fiona Impson & ARC-PPRI.
- Teams based in Grabouw & George & provide employment for 18 previously disadvantaged individuals.
- Teams responsible for collecting, redistribution & monitoring of biological control agents in the province.
- To bridge the gap between research & implementation at a national level, there are regular interactions between researchers & NRMP Biodiversity officers (stationed in each Province).
- Quarterly local stakeholder's meetings (involving ARC-PPRI, CapeNature, SANParks, City of Cape Town) to discuss problems & progress in biocontrol implementation.




DEVELOPING CAPACITY IN RESEARCH

- Undergraduate & postgraduate teaching
- Research culture, mentorship & support





DEVELOPING CAPACITY IN RESEARCH:
UNDERGRADUATE & POSTGRADUATE TEACHING

- Two permanent PCU academic staff members each contribute two full teaching loads in the Department.

Undergraduate
Ecology, global change & conservation

→

Honours
Dynamic Landscape Module

→

Masters
Conservation Biology Masters

- PCU Staff & occasionally postgraduate students have lectured on the following courses within UCT's Faculty of Science:
  - BIO3013F Global Change
  - BIO3014S Conservation Biology (Course Convenors)
  - BIO3015F Ecosystem Ecology
  - BOT400W: Honours module shared by Lindsey & Timm on Conserving Dynamic Landscapes
  - BIO5007W Masters in Conservation Biology (PCU staff teach a total of six weeks on this course, covering Biodiversity & Climate Change (Gillson), Community Ecology (Hoffman) & Disturbance & Restoration Ecology (Carrick).




DEVELOPING CAPACITY IN RESEARCH:
UNDERGRADUATE & POSTGRADUATE TEACHING

- During postgraduate studies, we equip our students with a range of training & skills in:
  - repeat photography,
  - palynology,
  - charcoal analysis, &
  - other palaeoecological proxies.

- In addition, we run occasional training workshops in collaboration with outside contributors, such as:
  - phytolith training by Carlos Cardova,
  - spore analyses by Anneli Ekblom, &
  - training in statistical techniques through SEEC.




DEVELOPING CAPACITY IN RESEARCH:
RESEARCH CULTURE, MENTORSHIP & SUPPORT

- PCU offers a supportive environment where postgraduates can interact freely & engage in peer learning.
- Maintain an active research culture through a research-centred PCU Monday lunchtime meeting where staff / postgrads are encouraged to:
  - present & discuss their research results,
  - practice conference presentations, or
  - discuss the interpretation of data (own or from an article).
- Postgrads sign a MoU that establishes clearly the responsibilities of supervisors & students.
- Timm & Lindsey meet regularly with students & in addition are available for informal meetings on an ad hoc basis.
- Students encouraged to regularly produce written work so that writing skills are honed throughout the MSc & PhD process.
- A formal update on progress is held twice a year with students when reference to the MoU is made.




DEVELOPING CAPACITY IN RESEARCH:
RESEARCH CULTURE, MENTORSHIP & SUPPORT

ADDITIONAL FACILITIES / MECHANISMS:

- Informal interactions facilitated by the availability of our own tearoom & kitchen facilitates that encourages discussion.
- PCU students part of wider Department of Biological Sciences postgrad community where there are further opportunities to discuss relevant literature & careers in science, attend seminars & socialise with colleagues.
- We also accompany students into the field where the techniques & practices of the particular task are demonstrated.
- Where applicable, training in laboratory techniques is provided.

DEVELOPING CAPACITY IN RESEARCH:
RESEARCH CULTURE, MENTORSHIP & SUPPORT

Cherie

Elelwani

Ruan

FUNDING 2011-2015

- 3 investment funds (3 separate portfolios, 1-3)
  1. R5 million endowment to UCT from Mr Leslie Hill (1992): Managed by UCT's Joint Investment Committee. Current value ????
  2. Portfolio 2 provides for some of the contract staff, bursary & major capital expenses of the PCU
  3. Vehicle replacement fund
- Several project income funds
  - Most contributions from national sources (ACCESS) while NRF & UCT have made important contributions to some of the programmes over the last 5 years; some international sources (WWUN)

STRENGTHS

- Active contribution to the building of the conservation capacity through PA expansion, stewardships and other approaches
- Diversity and international profile of student and post-doc group
- Field capacity and activity in and outside of protected areas
- Vibrant, supportive community and research environment within the PCU
- Facilities: computer lab, palaeo lab and meeting space

WEAKNESSES

- Slow throughput of PhD students
- Lack of external funding security
- Contribution to transformation targets?
- Little 'buy-in' from DBS colleagues

OPPORTUNITIES

- Secure more international and general funding and collaboration to secure and build our post-doc/ post-grad team
- Work more closely with modellers to build a more predictive understanding along past-present-future continuum – potential to increase applications in conservation management
- Contribute more to international fora (IPCC, IPBES, SSC, PAGES)
- Greater interdisciplinary focus to our work (Petra, Glynis)

THREATS

- Climate of unrest and instability on campuses across SA; loss of morale
- Loss of capacity (e.g. PCU vehicle)
- Funds to pay research assistants
- Loss of field capacity

Thank you to all of our collaborators & supporters