Plant Conservation Unit

SELF REVIEW PORTFOLIO

FIVE YEAR RESEARCH REVIEW

2011-2015

UNIVERSITY OF

CAPE TOWN

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1. INTRODUCTION

1.1 Background to the review

This review process is a way for the University of Cape Town to evaluate the quality of the activities undertaken by its research groupings such as the Plant Conservation Unit. It enables the university to assess the extent to which it is promoting research-oriented scholarship and teaching, building research capacity and producing research of an international standard. It further assesses the extent to which research influences the teaching and learning activities of the university.

This is the fifth review of the Plant Conservation Unit (PCU) since 1992, and covers the five-year period 2011-2015. Because the review is being held in November 2016, some material from the current year has also been included. As part of the process, the PCU is required to submit a self-review portfolio (SRP) which is evaluated by a panel of academic peers and UCT research administrators. One international and one national reviewer, one academic colleague from UCT's Science Faculty as well as the Deputy Vice-Chancellor (Research and Chair of URC), Deputy Vice-Chancellor (Research Designate), Members of the University Research Committee, the Dean of the Faculty of Science and the Head of the Department of Biological Sciences and UCT administrative staff from the University Research Committee (URC) make up the panel. The review panel will evaluate the SRP on 1 November 2016 when it will listen to a presentation by the Director of the PCU. The panel will then draft a summary of its findings. The DVC will then submit a report to the Dean of the Faculty of Science before it is tabled before the URC who will then advise the Director of the PCU of the outcome of the review. A summary of the results will be included in the Annual Research Report to UCT's Senate and Council.

Information derived from the Plant Conservation Unit's website (see http://www.pcu.uct.ac.za) has been used in preparing this SRP. The website has considerable additional up-to-date information about the PCU and should be consulted for further details about our staff and students and our research activities.

1.2 Historical overview of the PCU

Leslie Hill endowed a Chair of Plant Conservation to the University of Cape Town in mid-1991 and the position was filled by Richard Cowling in March 1992. To provide impetus and identity for the Chair of Plant Conservation, Richard created the Institute for Plant Conservation in July 1993 and served as its Director until he left the University at the end of May 2000. The IPC's Deputy Director, David Richardson, served as the Acting Director of the Institute until the appointment of Timm Hoffman to the Leslie Hill Chair of Plant Conservation on 1 April 2001. Dave Richardson resigned from the University at the end of 2004 and his position was filled by Lindsey Gillson in April 2006.

The name of the Institute for Plant Conservation was changed to the Plant Conservation Unit in 2006. This decision was taken in response to a recommendation by the University Research Committee that, in terms of the nomenclatural criteria for Institutions, Centres and Units within the University, the grouping should more appropriately be called a 'Unit' because of our focussed research mandate and relatively small complement of full time academic staff.

1.3 Vision and mission of the PCU

The terms of the endowment require that the Leslie Hill Chair of Plant Conservation "…devote particular attention to the conservation of the flora elements in the Cape Province with particular emphasis placed on the Western, South Western and Southern Cape and the Karoo regions." To give effect to these requirements the vision and mission statements of the PCU are as follows:

The Vision for the Plant Conservation Unit is to be a world-class, African-centred research and postgraduate training unit that improves the ecological understanding of Africa's biomes, the pressures facing them and the opportunities for conservation that benefits both biodiversity and people.

Our Mission is to enable sound management decisions for the sustainable use, conservation and restoration of African biomes, with a particular focus on the Greater Cape Floristic Region, and thereby contribute to the people's quality of life and well-being. We aim to develop human and institutional capacity through research, education and social responsiveness.

A central principle of the work of the PCU is the belief that our activities are transformative in nature. What we do through our research, teaching and socially responsive activities has important transformative consequences for the individual, the institution, the country and the continent. Through our research programmes we attract a diversity of students from across the region, the continent and the world. While we draw heavily on the pool of students from UCT's undergraduate and honours programmes many students also join the PCU from other institutions, based on our reputation and research profiles.

1.4 Personnel

<u>Staff and student complement of the PCU: 2011-2016</u>

The position and period of tenure of PCU staff and students for the period 2011-2016 are shown in Table 1 below. The PCU's permanent staff complement is comprised of two academic staff (Timm Hoffman and Lindsey Gillson) and one research assistant (Jan Claassen to 2013 and Marianna Lot from 2014 to present) who is employed in the village of Paulshoek to assist with data collection and community liaison. In 2012 the PCU Administrator position held by Anthea Stain at the time was transferred to the Department of Biological Sciences. Several Honorary Research Associates with the PCU contribute significantly to our research activities by supervising students and publishing

their work. Central to the success of the PCU are the contributions made by our contract staff who serve the unit with energy and commitment. Our research, training and outreach programmes would suffer considerably in the absence of these members. Three postdocs have been hosted by the PCU over the reporting period while Emeritus A/Prof John Hoffmann leads the biocontrol research programme within the PCU. Participants in this programme (Fiona Impson and Cariena Kleinjan) joined the PCU in 2014 upon A/Prof Hoffmann's retirement from full-time employment at the university. The PCU has also hosted Dr Joe McAuliffe (Director of Research, Desert Botanical Garden, Phoenix, Arizona) during two periods of sabbatical leave.

Table 1. Personnel complement of the PCU (including permanent staff, contract staff, research associates, postdoctoral fellows and postgraduate students) for the period 2011-present. A list of our postgraduate students with their thesis titles and supervisors/co-supervisors may be found in Appendices 1 and 2.

Name	Period	Position/Affiliation
Permanent Staff		
Timm Hoffman	2001-present	Director
Lindsey Gillson	2006-present	Deputy-Director
Jan Claassen	2009-2013	Research Assistant
Johanna Lot	2014-present	Research Assistant
Anthea Stain	2011	Administrator
Contract Staff		
Fiona Impson	2014-present	Junior Research Officer
Cariena Kleinjan	2014-present	Junior Research Officer
Sam Jack	2013-present	Research Assistant
Esther Mostert	2014-2015	Research Assistant
Samantha Venter	2016-present	Research Assistant
Yolanda Chirango	2016-present	Research Assistant
Emeritus Professors, sabbatical visitors and post-doctoral fellows		
John Hoffmann	2014-present	Emeritus A/Prof
Joe McAuliffe	2012; 2016	Desert Botanical Garden, Phoenix
Valerie Clark	2013-2014	Postdoc
Desale Okubamichael	2014-2016	Postdoc
Malika Virah-Sawmy	2013-2014	Postdoc
Honorary Research Associates		
Peter Carrick	2010-present	Nurture, Restore, Innovate (NPO)
Rick Rohde	2001-present	Edinburgh University
Simon Todd	2012-present	SAEON
Helga van der Merwe	2014-present	SAEON
PhD students		
Mmoto Masubelele	2010-2012	Environmental history

Nicola Wheat	2011-2014	Land use and sustainable development
Igshaan Samuels	2011-2013	Land use and sustainable development
James MacPherson	2012-2016	Palaeoecology
Hayley Clements	2014-2016	Land use and sustainable development
James Puttick	2012-2017	Environmental history
Abraham Dabengwa	2013-2017	Palaeoecology
Carina Becker	2014-2017	Restoration ecology
Petra Holden	2014-2017	Environmental history
Glynis Humphrey	2015-2018	Palaeoecology
Estelle Razanatsoa	2015-2018	Palaeoecology
Megan Loftie-Eaton	2015-2018	Environmental history
Zoe Poulsen	2015-2018	Land use and sustainable development
Cherie Forbes	2016-2019	Palaeoecology
Kirsti Nghidinwa	2016-2019	Environmental history
Rebecca Karpul	2016-2019	Land use and sustainable development
Wesley Bell	2016-2019	Land use and sustainable development

<u>MSc (Dissertation only)</u>

Sam Jack	2008-2010	Land use and sustainable development
Rahab Kinyanjui	2010-2012	Palaeoecology
Zoe Poulsen	2010-2012	Environmental history
Claire Davis	2011-2013	Environmental history
Robyn Powell	2011-2013	Environmental history
De Souza NR	2012-2014	Biocontrol
Cherie Forbes	2012-2014	Palaeoecology
Kim Konings	2014-2016	Conservation assessment
Hana Petersen	2015-2017	Land use and sustainable development
Liesl Eichenberger	2015-2017	Land use and sustainable development
Randall Josephs	2015-2017	Environmental history
Tanya Scott	2015-2017	Environmental history
Andriantsilavo Razafimanantsoa	2016-2018	Palaeoecology

<u>MSc (Coursework & Dissertation)</u>

Dane Marx	2010-2011	Land use and sustainable development
Petra de Abreu	2010-2011	Restoration ecology
Brett Reimers	2011-2012	Environmental history
Wesley Bell	2013-2014	Biocontrol
Katherine Forsythe	012-2013	Restoration ecology
Kirsten Gallaher	2013-2014	Environmental history
Amy Murray	2014-2015	Environmental history
Alexandra Russo	2014-2015	Conservation assessment
Kate Cronin	2014-2015	Conservation assessment
Wataru Tokura	2015-2016	Environmental history
Hermenegildo Matimele	2015-2016	Conservation assessment
Gabriela Fleury	2015-2016	Environmental history

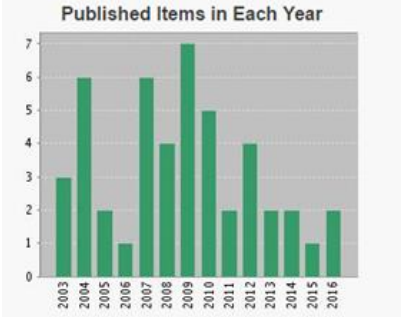
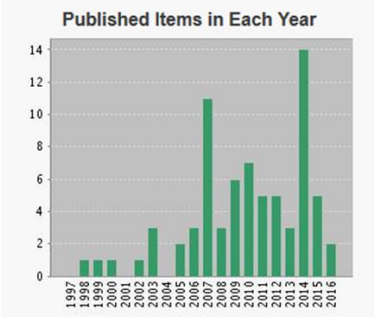
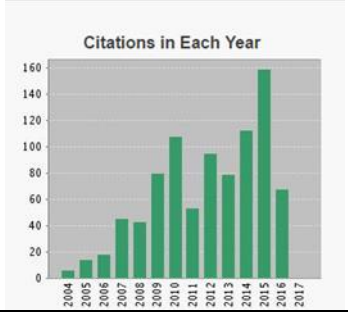
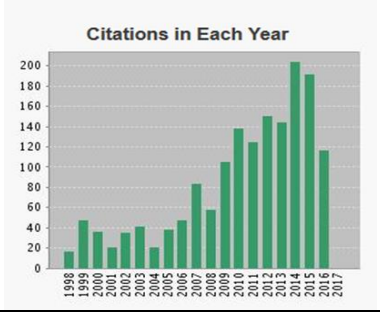
Elelwani Nenzhelele	2016-2017	Land use and sustainable development
BSc (Hons)		
Eleanor Shadwell	2011	Land use and sustainable development
Kirsten Packer	2011	Environmental history
Kirsten Retief	2011	Environmental history
Joseph White	2013	Environmental history
Justin van Blerk	2013	Land use and sustainable development
Kate Cronin	2013	Environmental history
Lesego Taukobong	2013	Land use and sustainable development
Nicola Kuhn	2013	Environmental history
Randall Josephs	2014	Environmental history
Daniel Poultney	2014	Environmental history
Kirtanya Lutchminarayan	2014	Land use and sustainable development
Yolanda Chirango	2014	Palaeoecology
Christian Setzer	2014	Palaeoecology
Hana Petersen	2015	Environmental history
Nicola Rule	2015	Biocontrol
Toni Olsen	2015	Palaeoecology
Odwa Mtembu	2015	Environmental history
Scott Richardson	2015	Land use and sustainable development
Rio Button	2016	Environmental history
Ruan de Wet	2016	Environmental history
Kakale Munamati	2016	Environmental history

NRF Rating of scientists at the PCU

Only the permanent academic members of staff are rated by the NRF. The definitions for each NRF rating category described below are taken from http://www.nrf.ac.za/sites/default/files/documents/Rating%20Categories%202014.pdf where further sub-category details can be found.

Both Timm Hoffman and Lindsey Gillson were rated B3 by their peers in 2012. The definition for the B category is: "*Researchers who enjoy considerable international recognition by their peers for the high quality and impact of their recent research outputs*" while the sub-category B3 suggests that "*Most of the reviewers are convinced that the applicant enjoys considerable international recognition for the high quality and impact of his/her recent research outputs.*" Key indicators of their scientific output are listed in Table 2 below. These indicators reflect their scores for peer-reviewed journal articles only and exclude citations from peer-reviewed books and book chapters.

Table 2. Key research indicators for PCU academic staff derived from Web of Science.

Research Indicator	**Lindsey Gillson**	**Timm Hoffman**
No. of papers	47	98
No. citations	881	1769
Excluding self-citations	813	1551
Citing articles	726	1214
Ave. citations/item	18.74	18.05
h-index	18	25
Published items by year		
No. citations by year		

1.5 Governance

The PCU is located in the Department of Biological Sciences. The key management components affecting the unit are the Dean of the Faculty of Science, the Head of the Department of Biological Sciences (HoD) and the Director of the PCU (Leslie Hill Chair of Plant Conservation). The primary functions of the Director of the PCU are to:

- Provide leadership and support for all programmes carried out by the unit;
- Keep the HoD informed on all activities within the PCU;
- Establish and maintain mutually beneficial relationships with government departments, organisations, institutes and individuals that may affect the PCU;
- Identify and develop sources of funds required for carrying out the PCU's programmes;
- Represent the PCU in the national and international community;

Job descriptions for other PCU staff are developed internally and performance is evaluated on a regular basis according to University protocols.

The staff and students of the PCU meet weekly to discuss matters of governance, academic and strategic importance as they affect the unit. The PCU also tables a written report at the monthly Department of Biological Sciences staff meetings which details our activities in the following key areas: Staff, students and visitors, Research (Outputs, Activities and Funding), Teaching, Social Responsiveness and Outreach.

1.6 Infrastructure and facilities

The Plant Conservation Unit is situated within the Department of Biological Sciences in the H.W. Pearson Building on University Avenue (Upper Campus). It occupies 300 m^2 of floor space and is comprised of an entrance foyer, 7 offices, a computer room and a large open plan conference room (with printer, drawing table, conference table, bench space, map cabinet, projection screen and kitchen facilities). In addition, a dedicated palaeoecology laboratory, with facilities for extracting fossil pollen and other palynomorphs from sediments is available. The laboratory is equipped with an HF-safe fume hood, centrifuge and water purifying system, and constitutes a significant enhancement to the PCU's infrastructure and ability to train postgraduate students in laboratory techniques. We also have our own pollen reference collection, which focuses mainly on savanna and fynbos biomes. It is currently being digitised and will become an online pollen reference database in 2016. The database will form part of a "virtual lab" which will form a research and training network for palaeoecology students at UCT, UKZN, University of Uppsala, and University of Stockholm.

Our communally-used computer room contains five computers which are regularly updated and linked via UCT's network to a laserjet printer in the conference room as well as to the University's library and internet facilities. A Nikon 9000 image scanner and an Epson V-70 document scanner are available for high quality scans of historical photographs and archival documents. Standard Microsoft Windows software is supported by the University of Cape Town and the PCU has paid for licenses for additional specialist software such as ArcViewGIS, PC-ORD and Adobe Photoshop CS4. In response to the recommendations of the review team for the 2005-2010 period he PCU has purchased 10 TB of back-up space from ICTS and uses this to secure archive copies of important data sets managed by the unit such as the PCU's historical and repeat photograph collections.

The PCU maintains a research house in the village of Paulshoek where Timm Hoffman is a 'registered occupier' in terms of the conditions set out by the Kamiesberg Municipality. The house is used by students both from the PCU and other university departments (e.g. Anthropology, Chemistry) when carrying out their field work in and around the village commons.

The PCU owned a 4x4 double-cab research vehicle (Mazda BT-50) until February 2016 when it was destroyed during protests on UCT's Upper Campus. More than 30 students used the vehicle to obtain their degrees over the course of six years and its destruction has proven a major setback for our field-based research. However, thanks to generous

support from the Dean of the Science Faculty as well as the Dean's Advisory Committee the PCU is in the process of replacing the vehicle. We acknowledge with gratitude the on-going support provided by the Dean to the activities of the PCU.

1.7 Social media and communication

The PCU has an active website (www.pcu.ac.za) with links to Facebook and Twitter. News items reflecting recent student and staff activities are posted regularly on these platforms. The move to the Drupal programming format provided PCU staff with autonomy over the unit's website content and has been instrumental in our ability to keep the site fresh and active. We maintain a second internet platform linked to our citizen science project, rePhotoSA (http://rephotosa.adu.org.za), which is also associated with Facebook, Twitter and Instagram postings.

2. RESEARCH

2.1 Research programmes

The PCU's main research programmes and their promoter for the period 2011-2015 can be grouped as follows:

- Applied palaeoecology and ecosystem change (Lindsey Gillson)
- Environmental history (Timm Hoffman)
- Land use and sustainable development (Timm Hoffman)
- Conservation assessment (Timm Hoffman)
- Disturbance and restoration ecology (Peter Carrick)
- Biocontrol (John Hoffmann)

These programmes cover a range of time scales from the past to the present and include theoretical as well as applied aspects of conservation biology and ecosystem management, into the future (see Figure 1).

The boundaries between these programmes are permeable and students with an interest in undertaking interdisciplinary work are accommodated within the PCU, with outside advice and supervision where appropriate. The research activities within each programme are managed on a project-by-project basis according to the university requirements as well as the requirements of individual donors. Although programme leaders are listed separately above, in reality there is considerable shared responsibility and collaborative interaction between Timm Hoffman and Lindsey Gillson in the course of their programme activities, student supervision and teaching commitments. Programme leaders also collaborate with colleagues from across the Department of Biological Sciences, UCT and internationally. The number of graduates and peer reviewed publications within each programme is listed in Table 3 while a detailed summary of the objectives, focus and future direction of each programme follows below.

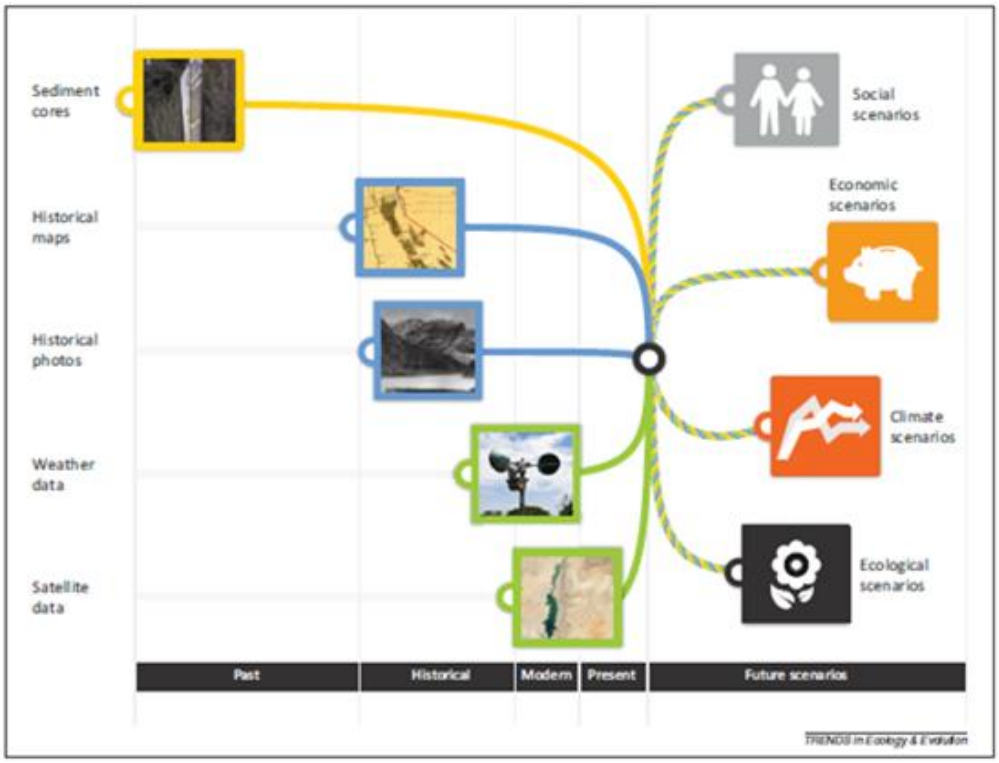


Figure 1. How different environmental proxies combine to reconstruct climate and ecosystem dynamics through time (after Gillson & Marchant, 2014).

Table 3. The number of postgraduate theses completed and peer-reviewed publications produced within each of the Plant Conservation Unit's main research programme for the period 2011-2015.

Programme	No. Honours/ MSc/ PhD theses	No. peer-reviewed publications
Applied palaeoecology & ecosystem change	3 / 2 / 0	17
Environmental history	9 / 8 / 1	22
Land use and sustainable development	5 / 2 / 2	23
Disturbance and restoration ecology	0 / 2 / 0	5
Biocontrol	1 / 2 / 0	5
Other (e.g. Conservation assessment)	0 / 4 / 0	1
Total	**18 / 20 / 3**	**73**

2.1.1 Applied Palaeoecology and Ecosystem Change

This programme investigates the application of long-term data from palaeoecological records in conservation biology and ecosystem management. Research integrates palaeoecological data into the improved understanding of long-term landscape dynamics. Projects utilise a range of palaeoecological proxies, including fossil pollen, charcoal, fungal spores, and diatoms in order to reconstruct changes in vegetation, fire, herbivory and climate over time. These multi-proxy data sets enable researchers to investigate how multiple interacting drivers affect ecosystem dynamics over time. The two main research strands are:

- Biome boundaries and tipping points. This programme is developing a network of palaeoecological sites throughout southern Africa, with a focus on biome boundaries. It is at the boundaries between different biomes that ecosystems are at their ecological or environmental limits, and are thus most sensitive to changes in climate or disturbance. Long-term records from these sites allow researchers to investigate when ecosystems responded or were resilient or resistant to environmental change, and when critical thresholds of interacting drivers were reached. These projects have strong links to theoretical ecology, particularly the literature on resilience and thresholds.

- Application of palaeo-ecological data in biodiversity conservation and ecosystem management. The dynamic nature of ecosystems raises complex issues for conservationists and natural resource managers who must deal with a complexity present and an uncertain future. Long-term data can help to inform conservation and management baselines, targets, and likely future scenarios. Understanding the historical range of variability and the response of ecosystems to past warm climates, and human impacts can help to develop management strategies that conserve resilience, ecosystem function and adaptive capacity. Used as part of a multi-disciplinary approach, long-term data can help stakeholders to examine their expectations of landscapes and to develop a deeper understanding of the range of ecologically possible management options.

At least five PhD students should graduate from this programme over the next reporting period. These include studies on the palaeoecology of Fynbos/Succulent Karoo and Fynbos/Forest ecotones as well grassland/wetland environments. Other projects address the role of fire, climate change and pastoralism on the vegetation of Namibia and Madagascar in relation to palaeoecological interpretations of long-term vegetation dynamics of these regions. This programme is also currently developing plans to work with modellers on using these data to simulate combinations of drivers that cause ecosystem shifts, and to predict when such changes might occur in the future.

2.1.2 Environmental history

Palaeoecological perspectives are critical for the conservation and management of South Africa's biodiversity and ecosystems. An understanding of the immediate historical past

provides further insights into long-term changes evident in natural environments. The period since colonial occupation of the Cape in particular, has had a lasting impact on the landscapes of the Greater Cape Floristic Region through altered fire regimes, grazing, cultivation, hunting and the construction of agricultural infrastructure including fences, boreholes and farm dams. Understanding the nature, extent and rate of vegetation change in response to these historical colonial impacts is important for the development of appropriate management responses. The tools of environmental history provide one way in which to better understand and interpret the landscape. In this programme, archival sources and historical photographs have been used extensively to understand the changes that have occurred in southern Africa over the last century. The PCU has developed the field of repeat ground photography and in some cases aerial photography to address several important issues in most of southern Africa's biomes. Projects undertaken within this programme have been carried out across southern Africa and include work on bush encroachment, desertification, and the impact of land use and climate change on populations of key indicator species such as *Encephalartos* spp. (cycads), *Widdringtonia cedarbergensis* (cedars), *Aloe dichotoma* (quiver tree) and *Protea caffra*. Some emphasis has also been placed on historical changes in fynbos vegetation of the Cape Peninsula and the Groot Winterhoek Wilderness Area in response to changing land use and fire management policy.

Support from UCT's Humanitec project has been instrumental in the establishment of a digital archive of about 20,000 historical photographs some of which have now been placed online. Through our projects more than 1600 historical photographs have now been repeated and in collaboration with the Animal Demography Unit a citizen science project, rePhotoSA (http://rephotosa.adu.org.za) has been established in order to build the collection of repeat photographs for South Africa (see later).

Enough material has been collected to consider the publication of an edited volume of several case studies associated with this programme. This will be the focus over the next year together with building the citizen science project mentioned above.

2.1.3 Land use and sustainable development

While palaeo- and historical perspectives provide a long-term view of ecosystem change which is essential for the conservation and sustainable management of ecosystems, an understanding of the impact of current land use practices is equally important. In this regard, the mandate of the Leslie Hill Chair of Plant Conservation is to focus on the former Cape Province with a particular emphasis on the winter rainfall regions. The land use and sustainable development programme is directed by this mandate and the majority of the projects are therefore centered in the Greater Cape Floristic Region (i.e. the Succulent Karoo and Fynbos biomes). Maintenance of the long-term research project in the village of Paulshoek, Namaqualand remains a particular focus for this programme and provides opportunities for PCU students to train and contribute to our understanding of human impacts on the vegetation of the Succulent Karoo. PCU research assistant, Marianna Lot lives in the village and maintains a number of long-term databases established in and around the village commons. These data sets deal with land use and

sustainable development issues in the heavily utilised communal areas of Namaqualand and provide insights into the impacts of heavy grazing on biodiversity and vegetation composition. Over the reporting period other projects in the village and in the broader Kamiesberg region have focused on the sustainable use of medicinal plants, the dynamics and impact of livestock herding on the vegetation of the region and the loss of agricultural livelihoods as a result of meso-predators such as caracal and jackal. Several permanent plots have also been established in the village commons to understand the long-term impact of land use on the vegetation of the Succulent Karoo biome.

This programme continues to attract students and has been a productive contributor to the PCU over the last five years. It also contributes significantly to our social responsiveness profile since liaison with local farmers and interaction with communal area inhabitants is central to most of the work carried out within this programme. Several new projects have recently been started in Namaqualand as well as in the Greater CFR. Similar questions about the impact of land use (especially grazing) on the biodiversity of the region are being asked in both the Succulent Karoo and Fynbos biomes. Closer synergies with the activities of the Leslie Hill Succulent Karoo Trust (see later) are currently being developed to provide an even greater practical and conservation-relevant focus to this programme.

2.1.4 Conservation assessment

Several students from the Percy Fitzpatrick Institute's Conservation Biology taught Master's programme are interested in projects of a botanical nature. Although they are often not accommodated within our main research programmes we take on responsibility for these student projects often in a co-supervisory capacity. Contributions to this programme over the last five years have included the assessment of endemic plants from the Maputaland regional centre of endemism as well as an investigation into the efficacy of trade records kept by CITES. The understanding by nursery managers and impact of the new alien plant regulations on their trade was also investigated by one of the MSc students as part of her mini-thesis. The PCU has also supported the assessment of ecological conditions within several key rivers of the Western Cape and conducted a census of the Gariep River. These river assessment have also established long-term monitoring sites for future research. The projects within this programme are interesting and often very applied and make an important contribution to our overall commitment to focus on conservation-related research. While we have little direct expertise in the fields advanced by the student projects in this programme we will continue to support such work particularly if we are part of larger supervisory teams of colleagues from other universities and research institutions.

2.1.5 Disturbance and restoration ecology

This programme was conceived and managed by Peter Carrick who is an Honorary Research Associate with the PCU. The main focus has been on developing the intellectual tools for rehabilitating and restoring degraded mining areas and overgrazed communal areas of Namaqualand. Practical tools for restoring the overgrazed and

depauperate, post-cultivation rangelands of the Leliefontein communal areas have been investigated and appropriate protocols developed. For the last five years Peter has taught a dedicated three-week bloc on the Conservation Biology MSc course at UCT. This includes a week-long field trip where students conduct a field-study and write it up as scientific paper. Peter has also organised or facilitated week-long research and information sharing workshops between researchers and practitioners of ecological restoration in southern Africa, Australia and USA. In recognition of his achievements in the field Peter won the 2012 NSTF-BHP Billiton Award for his *"…outstanding contribution to Science Engineering Technology and Innovation (SETI) leading to innovation in an NPO organisation.*" The programme leader's involvement in the day-to-day activities of the PCU is relatively low although he supervises a PhD student working in the Kamiesberg region. Emphasis over the next five years will be on the production of a popular book outlining the key restoration practices for the rehabilitation of degraded arid landscapes.

Included in this programme is the PCU's contribution, at the start of the five year period, to RENU-KAROO, a restoration initiative led by Sue Milton and Richard Dean from Prince Albert in the southern Karoo. Renu-Karoo makes indigenous seeds available for restoration and develops local skills to restore mining and overgrazed areas in the Karoo. Considerable emphasis is also placed on sharing the financial and educational benefits of the indigenous nursery and restoration business with the local community. The PCU's contribution has been both financial and academic. We donated funds to Renu-Karoo and have also supervised a restoration project at the MSc level (Petra de Abreu) in the little Karoo. We also collaborated with colleagues from the University of KwaZulu-Natal in 2011 and supervised another MSc student (Dane Marx) with an interest in the restoration of the grassland environments of the Drakensberg communal areas.

2.1.6 Biological control of invasive tree species

For many years, Emeritus A/Prof John Hoffmann led the informally named "Weed Biocontrol Unit" which was located in the Zoology Department at UCT. Upon his retirement from the university in December 2013 the WBU was transferred to the PCU by agreement with the staff of the WBU and the Dean of the Faculty of Science. The staff complement includes Emeritus A/Prof John Hoffmann who acts in an advisory capacity and remains active in research, and two research officers (Carien Kleinjan and Fiona Impson). This programme is funded through the South African Department of Environmental Affairs, National Resource Management Programmes and is focused on the biological control of invasive tree species, particularly Australian acacias.

Countrywide, invasive tree species have profound negative impacts on water resources and biodiversity. The scale of invasion is such that management, through mechanical and chemical interventions alone is not feasible. Biological control offers the only alternative to obtaining a sustainable solution to the management of these species. There is currently a suite of 11 biological control agents deployed against 10 of the 16 Australian acacias declared invasive in South Africa. The majority are seed-reducing agents that do not impact negatively on vegetative growth of their host plants. This is a deliberate strategy

that preserves the useful attributes of these species while making their management more tractable.

The research in this programme encompasses all aspects weed biological control including surveys for candidate agents, importation and assessment of risk, obtaining requisite permission to release agents, evaluation of their efficacy once established and knowledge transfer to managers and policy makers. The goals of this programme are facilitated through close co-operation with the Agricultural Research Council, Plant Protection Research Institute, in Stellenbosch. Carien Kleinjan works from the PCU offices at UCT while Fiona Impson is based at the station in Stellenbosch. In addition to her research activities, she provides an interface for the public, stakeholders, NRMP Biodiversity Officers and Biological Control Implementation Teams. The weed biological control fraternity, both locally and internationally, is a close-knit and collaborative community. With the assistance of their South African counterparts, both Portugal and Israel have recently embarked on a biological control programme targeting Australian acacia species.

Evaluating the impacts of biological control on long-lived perennial trees, such as the Australian acacias, is of necessity long-term and several studies are ongoing. Efforts are currently underway to achieve establishment of an additional gall-forming agent, which has been approved for release in South Africa. Further to this, the suitability of another gall-forming candidate agent is being assessed.

The programme also has an interest in the biological control of *Prosopis* spp. which are highly invasive in the Karoo. An impasse currently exists with regard to obtaining the necessary permits. It is hoped that this situation will be resolved enabling continuation of this project. Follow up on a project for biological control of *Pinus pinaster* is also envisaged, subject to resolution of a conflict of interest between environmental and economic concerns. John Hoffmann retains an interest in biological control of Cactus weeds.

2.2 Research output

The PCU's research focus is on producing high quality peer-reviewed publications and on successful graduation of Honours, MSc and PhD candidates. Between 2011 and 2016, our publications include 1 book and 1 edited book volume, 60 papers, 11 book chapters and a few popular articles and scientific reports. A total of 3 PhD, 8 MSc, 11 MSc + Course Work and 18 Honours students graduated over the period of reporting (see Table 4, Appendices 1-4).

Publications equate to an average of 8 chapters or papers per academic staff member per year. The average journal impact factor is 2.7 with a range from 0.5-16.7 (see Appendix 4). The number of graduands equates to c. 4 MSc per year (where 4 Honours students = 1 MSc, 2 MSc mini-theses = 1 MSc and 1 PhD = 4 MSc graduates). These outputs are consistent with expectations for a small research and teaching unit, with two full-time academic staff.

A highlight of our outputs for the reporting period was the publication of Lindsey Gillson's book on palaeoecology and conservation. The book was Lindsey's main project on her sabbatical of 2013, and was published in 2015 by Oxford University Press. It is a synthesis of the applications of palaeoecology and other long-term data in biodiversity conservation and ecosystem management. It has had favourable reviews in *Trends in Ecology and Evolution*, *Ecology* and the *Anthropocene Review*. One example will suffice: "*Gillson does a laudable job explaining how "environmental archives" – the treasure trove of insights provided by palaeoecologists – can illuminate current conservation issues, shedding a rare light on the path forward*" (Fleischer, 2016: *Ecology*).

Another major landmark in this period was the launch of rePhotoSA (http://rephotosa.adu.org.za). This is a web-based platform which involves citizen scientists in the use of historical landscape photography to document environmental changes in southern Africa. This initiative is explored more comprehensively in the section on Social Responsiveness.

Table 4. Summary of the research outputs (publications and graduands) of the Plant Conservation Unit for the years 2011-2016.

Category	2011	2012	2013	2014	2015	2016	Total (2011-2016)
PUBLICATIONS							
Book/Edited book	0	0	0	1	1	0	2
Journal articles (ISI)	6	7	7	15	12	13	60
Book chapters	5	1	1	3	1	0	11
Book reviews	0	1	0	0	0	0	1
Professional Reports	0	0	0	0	1	0	1
Popular articles	0	0	0	0	2	1	3
Total publications	**11**	**9**	**8**	**19**	**17**	**14**	**78**
GRADUANDS							
PhD theses	0	1	1	1	0	0	3
MSc theses	0	2	3	2	0	1	8
MSc mini-theses	2	1	0	2	3	3	11
Honours theses	3	0	5	5	5	3	21
Total Graduands	**5**	**4**	**9**	**10**	**8**	**7**	**43**

We believe that activities summarised for the current reporting period have addressed the constructive criticisms raised in the previous review. One of the suggestions was that our research efforts should have a greater focus on the winter rainfall fynbos biome. We have done this through several Honours level studies, two MSc dissertations (Zoe Poulsen and Robyn Powell) and two PhD theses (James MacPherson and Petra de Abreu/Holden) as well as publications arising from this work.

An additional comment was that the PCU would do well to attract more post-doctoral candidates to the unit's research programmes. We have made a modest start in this regard and have worked with three post-docs during the reporting period. Much depends on the availability of post-doctoral fellowships which now amount to over R300,000 per annum. Our collaboration with SANBI has been successful in this regard.

In terms of statistical support for the research carried out in the PCU successful collaborations have been developed with the Department of Statistics in the Faculty of Science at UCT. Dr Vernon Visser, Prof Res Altwegg and Dr Ian Durbach in particular have been very helpful in supporting students and staff in the analysis of complex data sets. These relationships are mutually beneficial and colleagues from the statistical sciences also benefit from publications and student supervision.

2.3 Future research directions within the PCU

The main research programmes have delivered good results for the PCU. Rather than making any fundamental change in direction our focus for the next five years will be on a few strategic emphases within some of these programmes. The first is that we need to ensure that our current registered PhD and MSc students submit their thesis on time and without delay. For several reasons our PhD students in particular have taken longer than the recommended three years to complete their studies and we have not been able to address the criticisms raised about this issue in the previous review. Despite financial, intellectual and logistic support as well as engaged mentorship many students have made slower progress that expected. However, we are confident that in the next five years all of the PhD students listed in Table 1 will have graduated. Not only will this improve our throughput rate but it should also provide a major impetus to our publication output. In order to facilitate this, we have initiated a mid-year review process which assesses student progress in relation to the PPA (Planned Progress and Activities) agreement, which is developed at the start of each year. We hope that this will help to identify problems early on, and assist students get back on track to meeting their annual targets.

A second focus will be on producing a few high impact publications similar to what Lindsey Gillson was able to achieve for the current reporting cycle. This will be achieved through synthesis of the bigger ecological and conservation stories that emerge from the diverse range of PCU studies. In this regard, an edited volume of repeat photography case studies is also envisioned. The PCU has, over the years, maintained a steady output of repeat photography studies at all levels from Honours to PhD. These disparate studies

need to be brought together in a single volume and a larger narrative about environmental change in southern Africa needs to be told.

Somewhat aligned to this initiative is the citizen science rePhotoSA project. It has started well but needs to be sustained if the number of participants is to grow and the number of photographs uploaded to the website is to be increased. It is the only project of its kind in the world and we would like to build it as a model project that other research groups could emulate. rePhotoSA relies heavily on the availability of historical photographs and the full complement of historical images in the PCU collection need to be prepared and uploaded to the website.

Timm Hoffman will also request sabbatical leave in 2018. The time will be spent on preparing a biography of John Acocks who contributed significantly to the development of South African ecology in the 20th century. The work will be contextualised within key local and international degradation debates and the ideas around rangeland management which emerged in the 1060s and continue to the present.

The Leslie Hill Succulent Karoo Trust makes a significant contribution to the conservation of the Succulent Karoo biome. Besides purchasing land for conservation the LHSKT also supports several stewardship initiatives in the Northern and Western Cape provinces. The Leslie Hill Chair of Plant Conservation and Director of the PCU is also an ex-officio Trustee of the LHSKT and has responsibility for leading the research work of the trust. A new research initiative is being planned to support the work of the trust and should provide several opportunities for renewed effort in the Succulent Karoo biome. This will build the land use and sustainable development programme and will provide some bursary opportunities for our students as well as those from other universities.

In terms of applied palaeoecology and long-term landscape dynamics, several initiatives are planned, with the broad aim of "mainstreaming" palaeoecology into the broader ecological, conservation and sustainability literature. A special issue on biodiversity and palaeoecology is currently in prep for PAGES magazine (past global changes), and a special issue of Anthropocene on Palaeoecology and Sustainability is also planned. In keeping with the philosophy of long-term data as part of a past-present-future continuum, more collaboration with modellers is planned, specifically Sally Archibald (Wits) and John Dearing (Southampton). We also continue to develop integrative, multidisciplinary projects which combine palaeoecology as one strand in developing nuanced narratives of landscape change.

2.4 Research partners

Research at the PCU draws heavily on an extensive collaborative network at local, national and international levels (Table 5).

Table 5. Main research partners of the PCU between the period 2011-2015.

Level/Institution	Department/Institution	Person(s)
LOCAL		
University of Cape Town	Biological Sciences	Jeremy Midgley, William Bond, Mike Cramer, Ed February, Adam West, Samson Chimphango, Mike Picker, Charles Griffiths
University of Cape Town	Environmental & Geographical Science	Mike Meadows, Pippin Anderson, Frank Eckhardt, Gina Ziervogel
University of Cape Town	Chemistry	David Gammon
University of Cape Town	Anthropology	Leslie Green
University of Cape Town	Manuscripts & Archives	Renate Meyer, Paul Weinberg
University of Stellenbosch	Centre for Invasion Biology	Heidi Hirsch, Jaco le Roux, John Wilson
REGIONAL		
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
University of KZN	Biology	Dave Ward, Mathieu Rouget
University of the Witwatersrand	Biology	Sally Archibald
Iziko Museums	West Coast Fossil Park	Pippa Haarhoff
Western Cape Agriculture	Elsenburg	Mike Wallace
NATIONAL		
Agricultural Research Council	Range and Forage Institute	Igshaan Samuels
Agricultural Research Centre	Plant Protection Institute	
Council for Scientific and Industrial Research	Natural Resources section	Brian van Wilgen, Wesley Roberts, Claire Davis, Benis Egoh
Department of Environment Affairs	National Biodiversity Research Programmes	
Ford Motor Company	Mazda Wildlife Fund	Humphrey le Grice

Rhodes University	Environmental Science	James Gambiza
South African National Biodiversity Institute	Kirstenbosch Research Centre	John Donaldson
South African National Environmental Observation Network	Arid Lands Node, Fynbos Node, Grasslands Node	Simon Todd, Helga van der Merwe, Jasper Slingsby, Tim O'Connor, William Bond
South African National Parks	Tokai Research Centre	Mmoto Masubelele
Department Science & Technology	SAEON	Tim O'Connor, Simon Todd, Helga van der Merwe

INTERNATIONAL

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
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 and Ancient History	Anneli Ekblöm
University of York	Environment Department	Rob Marchant

2.5 Research and service to society

2.5.1 The scientific community

Staff and students of the PCU have contributed extensively to the broader scientific community in the last five years. This takes the form of regular attendance and presentation at conferences, seminars and workshops at both local and international venues (Appendix 5). The basic statistics reflect that PCU staff and students have attended and presented papers and posters at 21 international, 70 national and 35 local conferences and workshops over the period of review. Some of the main local conferences include the Fynbos Forum, Arid Zone Ecology Forum, Savanna Science Networking Meetings and the South African Association of Botanists. Both Lindsey Gillson and Timm Hoffman have been invited keynote speakers at several local and international conferences including meetings held in Germany, Sweden, France, United Kingdom, U.S.A. Lindsey Gillson, in particular, has travelled widely internationally and has been a part of international workshops and special sessions of conferences. Some of the PCU's PhD students have also had the opportunity to present their work at international conferences.

Through its focus on Southern Africa's arid and semi-arid regions the Plant Conservation Unit has also taken a special interest in the Arid Zone Ecology Forum (AZEF). This is a dedicated forum for researchers and especially students to meet once a year and share their research findings. Timm Hoffman serves on the Organising Committee of the forum and the PCU has contributed R20,000 each year since 2014 to support the activities of AZEF.

Significant contributions have also been made via our involvement in the editorial and peer-reviewed process for national and high-ranking international journals (e.g. Journal of Applied Ecology, Ecological Applications, Journal of Biography, Journal of Vegetation Science). Lindsey Gillson was on the Editorial Board of the journal *Landscape Ecology* from 2005-2009 and is now Associate Editor of *The Anthopocene*. Timm Hoffman is on the editorial board of the Pastoralism Journal as well as on *Ecosphere*, an Ecological Society of America, peer-reviewed, open-access publication. John Hoffmann is an editor for the Journal *Biological Control*, he is also involved in examining theses and reviewing research proposals. Fiona Impson (chair), Carien Kleinjan (Scientific Programme) and John Hoffmann served on the organizing committee for the XIV International Symposium on the Biological Control of Weeds. Skukuza, Kruger National Park, South Africa. 2-7 March 2014 and were the editors of the proceedings.

Lindsey Gillson serves on various University Committees, including the Science Faculty Animal Ethics Committee, and the Environment and Management Working Group. She is currently Deputy HoD with responsibility for the Major in Applied Biology. She is on the Steering Committee for the African Climate and Development Initiative, and leads a Faculty Strategic Impact Area initiative on Biodiversity and Environmental Change in the Cape Floristic Region. Nationally, she was involved in the Land Cover Change

Consortium, and was co-Theme Leader for ACCESS sustainability and ecosystem services theme until 2015. Internationally, she is a member of the Palaeo-neo Ecosystem Network, an international panel hosted in the USA, working at the interface between palaeoecology and ecosystem ecology. She is on the Scientific Steering Committee of PAGES (Past Global Changes) and is a lead author on the Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES) Africa Regional Report. Timm Hoffman also serves on several UCT committees including the Institutional Forum. He is also chair of the Science Faculty's Research Ethics Committee.

Lindsey Gillson and Timm Hoffman have examined more than 15 MSc and PhD theses over the period of review including PhD theses from Norway and Sweden which required travelling to the host country to examine the student in a public oral examination. Timm Hoffman also served on the NRFs Plant Sciences Assessment Panel for the NRF Rating system in 2011 and as an external examiner for the Botany Department of Venda University in 2012 and 2013. Both Timm and Lindsey also both regularly review research proposals from local and international funding agencies.

2.5.2 Industry and government

The PCU serves the conservation industry through participation in scientific and civil forums, workshops, committees and direct contact with decision makers at local, provincial and national government levels.

One area where the Institute has made a significant contribution to the conservation industry is via the Leslie Hill Succulent Karoo Trust. This trust is administered by WWF-SA and is dedicated to the development of a network of conservation areas to conserve the diversity of particularly the succulent flora of the region. One of the responsibilities of the person holding the Leslie Hill Chair of Plant Conservation at UCT is to be a Trustee on the LHSKT. This work entails the attendance of Trust meetings (usually three times a year) where strategic decisions are made, together with the leading conservation agencies in the region (e.g. CapeNature, South African National Parks) concerning the identification and possible purchase of key conservation properties. These decisions need to be made in accordance with the best biological information available. The development of an overall strategic plan to guide the LHSKT is one of the tasks of the Leslie Hill Chair of Plant Conservation at UCT. In addition, regional conservation plans and the review of scoping studies all form part of the work of the Trustee. Visits to assess the value of specific properties also need to be made. Attendance at various opening ceremonies, which commemorate and acknowledge the work of the Trust, also forms part of the Trustee's duties. The disbursement of significant financial resources to the Trust in 2004 following Mr Hill's death in January 2003 has increased the activities of the LHSKT over the last five years. The focus of the Trust's work remains primarily on the Knersvlakte and the conservation planning studies undertaken by Philip Desmet as part of his PhD thesis undertaken as a student of the PCU still guide the activities of the Trust in this regard. The Director of the PCU, in his capacity as a Trustee of the LHSKT is also responsible for leading the research committee. This is a new initiative within the LHSKT and the first research projects should start in 2017.

2.5.3 Civil Society

Many of our projects bring the PCU into direct contact with civil society. Our work at Paulshoek, for example, includes the employment of a member from the community (Marianna Lot) who acts as a research assistant for the land use and sustainable development programme. Marianna's role is to assist researchers and post-graduate students who work in the village and surrounding commons and to share with them her knowledge of the area. She has also assisted PhD student Nicola Wheat with her research and helped to gather information on medicinal plant use in the village.

The PCU has also provided funding to several projects and individuals over the course of the reporting period. These include RENU-KAROO a section-21 company led by Sue Milton and Richard Dean focused on the restoration of degraded Karoo environments of the southern Cape. Funding from the PCU ended in 2011 but was used to support three people from the local Prince Albert community over a four year period. This initiative has now grown to support 14 people in the business and makes a significant contribution to a community where unemployment is over 65%.

A major new initiative of the PCU is the launch of the citizen science project rePhotoSA. This is a collaboration between the PCU and the Animal Demography Unit at UCT and citizen scientists. Full details of the project can be found at http://rephotosa.adu.org.za including instructions on how to re-take historical photographs and upload them to the website. The aim of the project is to build a network of active citizen scientists willing to travel to locations where historical photographs have been taken and to retake the same view and upload the photograph to a searchable website. Since the launch of the project about 65 repeat photographs have been uploaded by citizen scientists. We see great potential in this project and are looking for ways to build its value in school curricula and local environmental interest groups.

As part of the DEA-NRMP contract, established for the biocontrol programme there is a strong emphasis on capacity building and implementation of biological control. Together with a colleague at ARC–PPRI, Fiona Impson is directly involved with the training and overseeing of two implementation teams in the Western Cape. The teams are based in Grabouw and George and provide employment for 18 previously disadvantaged individuals. The teams are responsible for collecting, redistribution and monitoring of biological control agents in the province. In order to bridge the gap between research and implementation at a national level, there are regular interactions between researchers and NRMP Biodiversity officers (who are stationed in each Province). There are also quarterly local stakeholder's meetings (involving ARC-PPRI, Cape Nature, SANParks, City of Cape Town) to discuss problems and progress in biocontrol implementation.

3. DEVELOPING CAPACITY IN PLANT CONSERVATION RESEARCH

3.1 Undergraduate and postgraduate teaching

Together the two permanent academic staff members at the PCU are supposed to contribute one full teaching load in the Department, though in reality, however, this is probably closer to two. PCU undergraduate teaching in ecology, global change and conservation creates a through-flow of our ideas and presence, leading in to Honours, where we run a Dynamic Landscape Module, and Masters where we contribute to the Conservation Biology Masters teaching programme. Staff and occasionally postgraduate students of the PCU have taught and lectured on the following courses within UCT's Faculty of Science which includes several courses outside of the Department of Biological Sciences.

- BIO3013F Global Change
- BIO3014S Conservation Biology (Course Convenors)
- BIO3015F Ecosystem Ecology
- BOT400W: Honours module shared by Lindsey and Timm on Conserving Dynamic Landscapes
- BIO5007W Masters in Conservation Biology (PCU staff teach a total of six weeks on this course, covering Biodiversity and Climate Change (Gillson), Community Ecology (Hoffman) and Disturbance & Restoration Ecology (Carrick).

Engagement in undergraduate teaching helps to enthuse students and build appreciation of the relevance of long-term studies in landscape ecology, biodiversity conservation and ecosystem management. This enthusiasm is a foundation for many research projects at Honours, Masters and PhD levels.

During postgraduate studies, we equip our students with a range of skills. We provide training in repeat photography, palynology, charcoal analysis and other palaeoecological proxies. In addition, we run occasional training workshops in collaboration with outside contributors. Examples include phytolith training by Carlos Cardova and Spore analyses by Anneli Ekblom. Training in statistical techniques is also available through collaboration with SEEC.

3.2 Research culture, mentorship and support

The PCU offers a supportive environment where postgraduates can interact freely and engage in peer learning. We maintain an active and vibrant research culture through a research-centred PCU meeting each Monday at lunch. This provides an opportunity for postgraduate students to present their results, practice conference presentations, or discuss the interpretation of data; either their own or data from a published article. Students and staff take turns to lead the discussion at the weekly meetings. This format encourage students to engage actively with the literature, to develop the art of constructive criticism, and to see the wider context and significance of their research, as

well as building confidence, encouraging scientific rigour and strengthening presentation skills. One example where this has proven successful is the work of Hana Petersen which was presented to PCU staff and colleagues prior to the recent Arid Zone Ecology Forum meeting in Prince Albert. Because of the trial presentation and subsequent critique Hana's presentation won the prize for the Best Oral Presentation at the meeting. We also bring this research culture into our undergraduate teaching and occasionally ask our MSc and PhD students to talk about their research to third year or honours level students.

All Postgraduates sign a Memorandum of Understanding that establishes clearly the responsibilities of supervisors and students. Timm Hoffman and Lindsey Gillson meet regularly with students and in addition are available for informal meetings on an ad hoc basis. Students are encouraged to regularly produce written work so that writing skills are honed throughout the MSc and PhD process. A formal update on progress is held twice a year with students when reference to the MoU is made.

Informal interactions are facilitated by the availability of our own tearoom and kitchen facilitates, which create a friendly and welcoming environment that encourages discussion. In addition, PCU students are part of the wider Department of Biological Sciences postgrad community, through which there are further opportunities to discuss relevant literature, find out about careers in science, attend seminars, and socialise with colleagues.

We also accompany students into the field where the techniques and practices of the particular task are demonstrated. Where applicable, training in laboratory techniques is provided.

4 FUNDING

4.1 For the period 2011-2015

The Plant Conservation Unit has three investment funds and several project income funds. The investment funds are held in three separate Portfolios (1-3). The main investment fund is the R5 million endowment given to the University of Cape Town by Mr Leslie Hill in 1992 over which the PCU has no involvement or say. This fund is managed by the university's Joint Investment Committee (JIC). Disbursements to the PCU from this fund are used to pay the Director's salary. Since the fund has grown faster than the rise in the Director's salary the Dean of the Faculty of Science has arranged that the excess can be used at the Director's discretion to pay for additional contract staff at the PCU. These funds have made a significant contribution to the output and proper functioning of the PCU and the decision and support of the Dean in this regard is acknowledged with gratitude.

By agreement with the Dean of Science in 2005 (Professor Daya Reddy) and the Head of the then Botany Department (Prof Jeremy Midgley) the Deputy Director's salary has been paid from the General Operating Budget (GOB) of the Faculty since her arrival in

April 2006. In exchange, the PCU Director and Deputy Director contribute to the Department of Biological Sciences through a shared teaching and administrative load.

Two other investment funds (Portfolios No. 2 and No. 3) provide for some of the contract staff, bursary and major capital expenses of the PCU (No. 2) as well as a vehicle replacement fund (No. 3). Money from this fund will now be used to replace the research vehicle that was destroyed in the recent protests. In addition, funds which have been generously provided to the PCU by the Dean of the Faculty of Science and which are acknowledged with gratitude will also be used. These funds have grown primarily through fees charged to projects using the Mazda Wildlife Vehicle and from consultancies, overhead and salary fees charged to funders for project management. Both of these funds have been used relatively sparingly over the reporting period.

The bulk of the PCU's income is derived from income funds from project proposals written by permanent and contract staff of the Unit. Most of the contributions are from national sources while the NRF and UCT have made important contributions to some of the programmes over the last five years. A summary of these funds is outlined in Table 6 below.

Table 6. Balance sheet for main income funds at the PCU for the period 2011-2015 and the main expenditure for these funds (in ZAR).

Hoffman (Income)						
Source of Funding	**2011**	**2012**	**2013**	**2014**	**2015**	**TOTAL**
Leslie Hill Endowment						
Industrial funding						
NRF						
URC						
TOTAL						
Hoffman (Expenditure)						
Expenditure	**2011**	**2012**	**2013**	**2014**	**2015**	**TOTAL**
Staffing						
Bursaries						
Travel: Local						
Travel: International						
Conferences						
Equipment						
Software						
Running costs						
Cost recovery						
Infrastructure						
TOTAL						

Gillson (Income)						
Source of funding	**2011**	**2012**	**2013**	**2014**	**2015**	**TOTAL**
Industrial						
NRF						
ACDI						
ACCESS						
URC						
TOTAL						
Gillson (Expenditure)						
Category	**2011**	**2012**	**2013**	**2014**	**2015**	**TOTAL**
Staffing						
Travel: Local						
Travel: International						
Conferences						
Equipment						
Software						
Running costs						
Cost recovery						
Infrastructure						
Bursaries						
TOTAL						

Appendix 1. Successful postdoctoral and postgraduate students at the Plant Conservation Unit who graduated during the period 2011-2016.

Name	Research Topic	Graduation Date	Supervisor(s)
Postdoctoral Fellow			
Desale Okubamichael	Historical repeat photography of Cycad populations and vegetation change	2014-16	Donaldson (SANBI) & Hoffman
Malika Virah-Sawmy	Long-term drivers of vegetation change on the Mahafaly Plateau, Madagascar	2013-14	Gillson
Valerie Clark	rePhotoSA: A new citizen science project using historical landscape photography	2013-14	Hoffman
PhD			
Nicola Wheat	An ethnobotanical, phytochemical and metabolomics investigation of plants from the Paulshoek Communal Area, Namaqualand	2014	Gammon & Hoffman
Igshaan Samuels	Pastoral mobility in a variable and spatially constrained South African environment	2013	Allsopp & Hoffman
Mmoto Masubelele	Understanding the past to conserve the future: Long-term environmental and vegetation change in the Karoo Midlands, South Africa over the 20th century	2012	Hoffman & Bond
MSc (Dissertation only)			
Kim Konings	Life history traits of South African Encephalartos spp. (Zamiaceae) and their implications for understanding population structure, responses to threats and effective conservation action	2016	Donaldson (SANBI) & Hoffman
Cherie Forbes	Benchmarks for the future: Long-term vegetation change derived from palaeoecological techniques for West-Coast Renosterveld, South Africa	2014 (Distinction)	Gillson & Hoffman
De Souza NR	Host plant associations of two cochineal insect species, *Dactylopius ceylonicus* and *D. opuntiae* (Dactylopiidae: Hemiptera), on the invasive cactus species *Opuntia*	2014	Hoffmann

	monacantha, *O. ficus-indica* and a possible hybrid cactus, in South Africa.		
Robyn Powell	Long-term vegetation change in the Cape of Good Hope Section of Table Mountain National Park in response to climate, fire and land use.	2013	Hoffman & Gillson
Claire Davis	Trends in vegetation productivity and seasonality for Namaqualand, South Africa between 1986 and 2011: an approach combining remote sensing and repeat photography.	2013	Hoffman & Roberts (CSIR)
Zoe Poulsen	Change in distribution of indigenous forest in Table Mountain National Park from 1880-2012.	2013	Hoffman
Rahab Kinyanjui	Phytolith analysis as a palaeoecological tool: Middle-Late Pleistocene environments in the Olorgesailie Rift Basin, Kenya	2012	Gillson & Meadows (EGS)
Sam Jack	Revisiting Aloe dichotoma's suitability as an indicator of climate change in South Africa.	2012	Hoffman & Rohde
MSc (Course work & dissertation)			
Gabriela Fleury	Environmental change in Riemvasmaak, Northern Cape, South Africa twenty years after resettlement	2016	Hoffman & Todd (SAEON)
Hermenegildo Matimele	An assessment of the distribution and conservation status of endemic and near endemic plant species in Maputaland	2016	Raimondo (SANBI), Hoffman, et al.
Wataru Tokura	Understanding changes in plant productivity using EVI satellite data in Tswalu Kalahari Reserve	2016	Hoffman, Jack & Anderson
Kate Cronin	Aliens in the nursery: Assessing the awareness and attitude of Cape Town nursery managers in regard to invasive species regulations	2015	Hoffman & Kaplan
Alexandra Russo	The prevalence of documentation errors in CITES (Convention on the International Trade in Endangered Species Trade data for shipments exported out of Africa between the years 2003 and 2012.	2015	Hoffman & Burgener (SANBI)
Amy Murray	A socio-ecological analysis of environmental change in the Kannaland	2015	Hoffman & Wynberg

	Municipality of the Klein Karoo, South Africa, over the last 100 years		(EGS)
Kirsten Gallaher	The influence of rainfall seasonality and climate change on the demography of Aloe dichotoma, a long-lived succulent tree from semi-arid southern Africa	2014	Hoffman, Jack & Rebelo (SANBI)
Wesley Bell	Pheromonal responses of *Dactylopius opuntiae* males in cross pairings of two female biotypes.	2014	Hoffmann
Katherine Forsythe	Exploring the relationship between restored ecosystem function and species composition.	2014	Amar & Carrick
Brett Reimers	Historical changes on rocky shores in the Western Cape, as revealed by repeat photography.	2012	Griffiths & Hoffman
Dane Marx	An assessment of the ecological impacts of community-based rehabilitation on communal grasslands in the Drakensberg foothills.	2011	Everson (UKZN) & Hoffman
Petra de Abreu	The effect of rehabilitation on ecosystem services in the semi-arid Succulent Karoo lowlands of the Little Karoo, South Africa.	2011	Milton (SU), Hoffman & le Maitre (CSIR)
BSc(Honours)			
Scott Richardson	Aerial photographs suggest that some bald heuweltjies are permanently damaged	2015	Midgley, Cramer & Hoffman
Odwa Mtembu	Long term changes in the gully systems of the Groot Winterhoek Wilderness (Protected) Area (1948-2010) in relation to soil type	2015	Eckardt (EGS), Hoffman & Holden
Toni Olsen	Dung fungal spores as a proxy for herbivore abundance	2015	Gillson & Dabengwa
Nicola Rule	The suitability of the cochineal insect, *Dactylopius opuntiae*, for the biological control of *Opuntia humifusa*	2015	Hoffmann & Hoffman
Hana Petersen	In retrospect: How the vegetation of the Tanqua Karoo has changed over the last century	2015	Hoffman
Christian Setzer	Macro-charcoal as an indicator of fire history in NE Namibia	2014	Gillson & Humphrey
Yolanda Chirango	Is diet in lacewings phylogenetically constrained?	2014	Gillson & Picker
Kirtanya Lutchminarayan	Predation impacts on livestock in a communal area of Namaqualand,	2014	Hoffman & Cristescu

	Northern Cape, South Africa		
Daniel Poultney	Changes in density and distribution of *Protea caffra* in the central and northern Drakensberg Reserve as a consequence of climate and land use change	2014	Hoffman, February, Rebelo (SANBI), Puttick & Jack
Randall Josephs	Population history of *Aloidendron pillansii* from phylogeography and molecular analysis	2014	Hedderson & Hoffman
Nicola Kuhn	Long-term (1973-2013) vegetation change in the Groot Winterhoek Wilderness Area	2013	Hoffman & Jack
Lesego Taukobong	Comparison of discrimination and classification methodology in assessing cause of death for Quiver trees	2013	Lubbe (Statistics)
Kate Cronin	Reconstructing the Late Pleistocene palaeoenvironment of the Richtersveld using fossil charcoal	2013	Hoffman & February
Justin van Blerk	A simulated history of Aloe dichotoma recruitment and its link to rainfall: Insights from an isolated population near Kenhardt	2013	Hoffman & Jack
Joseph White	Analysis of long-term changes in populations of the Clanwilliam Cedar (*Widdringtonia cedarbergensis*) using repeat photography	2013	Hoffman, Jack & February
Kirsten Retief	Influence of fire severity on fynbos plant communities and mode of regeneration in the southern Cape Peninsula	2011	Hoffman
Kirsten Packer	Preliminary analysis of charcoal deposits from Spitzkloof Rockshelter, Richtersveld - South Africa, in relation to current vegetation of the area	2011	Hoffman & February
Eleanor Shadwell	Rockiness and Response to Rest: How do semi-arid perennial species respond over the short-term to rest from grazing, along a gradient of rockiness?	2011	Hoffman

Appendix 2. Students currently supervised at the Plant Conservation Unit and their expected graduation date.

Student name	Research Topic	Expected Graduation Date	Supervisors/ Collaborators
PhD			
James MacPherson	Ecological Resilience at Semi-arid and Temperate Ecotones of the Mediterranean-type Fynbos Biome, South Africa, in the Holocene	2016	Gillson & Hoffman
Hayley Clements	Multi-scale, social-ecological influences on private land conservation in South Africa	2016	Cumming & Hoffman
Abraham Dabengwa	Long-term climate and disturbance controls on herbaceous biomass and nutrient cycling at wetland-landscape interface key resources use areas along an altitude gradient in KwaZulu-Natal Province	2017	Gillson & Bond
James Puttick	The extent, rate and drivers of change across grassland, savanna and forest boundaries in the mesic eastern region of South Africa over the last century	2017	Hoffman & O'Connor
Carina Becker	The ecological restoration of semi-arid communal rangelands in Namaqualand, South Africa	2017	Carrick & Hoffman
Petra Holden	A social-ecological approach to understanding drivers and effects of conservation in mountain catchments important for water supply in South Africa	2017	Hoffman et al.
Glynis Humphrey	Social, ecological and historical determinants of fire management in NE Namibia	2018	Gillson
Estelle Razanatsoa	Climate change and pastoralism as drivers of vegetation change on the Mahafaly Plateau, Madagascar	2018	Gillson
Megan Loftie-Eaton	Bush encroachment and its impact on bird distributions and diversity in Limpopo and Mpumalanga Province, South Africa	2018	Underhill & Hoffman
Zoe Poulsen	Restoring grazing potential in Overberg Renosterveld	2018	Chimphango, Hoffman, et al.

Cherie Forbes	A long-term palaeoecological perspective on natural resource management in the Groot Winterhoek Wilderness Area	2019	Gillson & Hoffman
Kirsti Nghidinwa	Legends of Namaqualand: Population ecology and extinction risk of Halfmens (*Pachypodium namaquanum*) in the Lower Orange River Valley.	2019	Hoffman
Rebecca Karpul	A multi-biome experiment testing sensitivity of different life history stages to changes in rainfall seasonality in the Cape Floristic Region	2019	West, Hoffman & February
Wesley Bell	Assessing the threats to, and opportunities for, conservation of the Succulent Karoo	2020	Hoffman
MSc (Dissertation only)			
Andriantsilavo Razafimanantsoa	Climate change and ecosystem dynamics in the Central Highlands of Madagascar	2018	Gillson & Bond
Hana Petersen	An environmental gradient analysis of the vegetation types of the Upper Karoo Hardeveld	2017	Todd & Hoffman
Liesl Eichenberger	The long-term impact of herbivory on the vegetation of Sanbona Wildlife Reserve	2017	Todd & Hoffman
Randall Josephs	Holocene climate change and the population history of *Aloidendron pillansii*	2017	Hedderson & Hoffman
Tanya Scott	The impact of bush encroachment on the avifauna of Limpopo	2017	Underhill & Hoffman
MSc (Coursework & dissertation)			
Elelwani Nenzhelele	Long-term impacts of livestock grazing in the Succulent Karoo: A 20-year overview	2017	Todd & Hoffman
BSc(Honours)			
Kakale Munamati	Changes from 2000-2015 in the structure and production of Sand Forest vegetation in the Maputaland region of northern KwaZulu-Natal as determined from	2017	Tokura & Hoffman

	remoting sensing techniques		
Rio Button	Holocene palaeoenvironmental reconstruction of the West Coast using fossil charcoal	2017	February, Jerardino & Hoffman
Ruan de Wet	Long-term (2003-2016) change in the woody and herbaceous vegetation of Sabi Sand Game Reserve	2017	Hoffman

Appendix 3: Publications of the staff, students and research associates of the Plant Conservation Unit for the period 2011-2016.

(i) Book

1. Gillson L 2015. *Biodiversity Conservation and Environmental Change: using palaeoecology to manage dynamic landscapes in the Anthropocene*. Oxford University Press, Oxford. 215pp

(ii) Journal articles

2. Anderson PML and Hoffman MT 2011. Grazing response in the vegetation communities of the Kamiesberg, South Africa: adopting a plant functional type approach. *Journal of Arid Environments* 75(3): 255-264. DOI: 10.1016/j.jaridenv.2010.10.012.

3. Breman E, Gillson L and Willis K 2012. How fire and climate shaped grass-dominated vegetation and forest mosaics in northern South Africa during past millennia. *The Holocene* 22:1427-1439. DOI: 10.1177/0959683611400196.

4. Cardoso AW, Geldenhuys CJ, Hoffman MT and Midgley JJ 2017. Temperate forest dynamics: A 26 year case study from Orangekloof Forest, Cape Peninsula, South Africa. *Southern Forests: A Journal of Forest Science* 79. [In press].

5. Carrick PJ 2016. Australia – still leaders, but the vanguard has been lost. *Journal of Cleaner Production* 84: 41. DOI: 10.1016/j.jclepro.2014.08.099.

6. Carrick PJ and Forsythe KJ 2013. New ecological understanding from old restoration sites: unifying concepts, relationships and thresholds among ecosystem processes. *South African Journal of Botany* 876: 144. DOI: 10.1016/j.sajb.2013.02.025.

7. Carrick PJ, Erickson T, Becker C, Mayence E and Bourne A 2015. Comparing ecological restoration in South Africa and Western Australia: the benefits of a 'travelling workshop'. *Ecological Management and Restoration* 16: 86-94. DOI: 10.1111/emr.12169/full.

8. Cramer MD and Hoffman MT 2015. The consequences of precipitation seasonality for Mediterranean-ecosystem vegetation of South Africa. *PLoS ONE* 10(12): e0144512. DOI: 10.1371/journal.Pone.0144512.

9. Cronin K, Kaplan H, Gaertner M, Irlich U and Hoffman MT 2016. Aliens in the nursery: Assessing the attitudes of nursery managers to invasive species regulations. *Biological Invasions*. [In press].

10. Davis C, Hoffman MT and Roberts W 2016. Long-term trends in vegetation phenology over Namaqualand using GIMMS AVHRR NDVI3g dataset from 1982-2011. *South African Journal of Botany*. [In press].

11. Davis C, Hoffman MT and Roberts W 2016. Recent trends in the climate of Namaqualand, a megadiverse arid region of South Africa. *South African Journal of Science* 112(3/4), Art. 2015-0217, 9 pages. http://dx.doi.org/10.17159/sajs.2016/20150217

12. de Souza NR and Hoffmann JH 2015. Testing the hypothesis that a cochineal insect species (Hemiptera: Dactylopiidae) may have been displaced by a congeneric biological control agent from a different cactus host. *Biological Control* 85: 25–29. DOI: 10.1016/j.biocontrol.2015.03.003.

13. Ekblom A, Gillson L and Notelid M 2011. A Historical Ecology of the Limpopo and Kruger National Parks and Lower Limpopo Valley. *Journal of Archaeology and Ancient History* 1:1-29. http://urn.kb.se/resolve?urn=urn:nbn:se:uu:diva-159364

14. Ekblom A, Gillson L, Risberg J, Holmgren K and Chidoub Z 2012. Rainfall variability and vegetation dynamics of the lower Limpopo Valley, Southern Africa, 500 AD to present. *Palaeogeography, Palaeoclimatology, Palaeoecology* 363-364: 69-78. DOI: 10.1016/j.palaeo.2012.08.015.

15. Gillson L 2013. Patch Dynamics. Oxford Bibliographies in Ecology. Ed. David Gibson. New York:Oxford University Press, 30/9/2013. DOI: 10.1093/OBO/9780199830060-0008.

16. Gillson L 2015. Evidence of a Tipping Point in a southern African savanna? *Ecological Complexity* 21, 78-86. DOI: 10.1016/j.ecocom.2014.12.005.

17. Gillson L and 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. DOI: 10.1016/j.tree.2014.03.010.

18. Gillson L, Dawson TP, Jack S and McGeoch MA 2013. Accommodating climate change contingencies in conservation strategy. *Trends in Ecology & Evolution* 28(3): 135-142. DOI: 10.1016/j.tree.2012.10.008.

19. Gillson L, Midgley GF and Wakeling JL 2012. Exploring the significance of land-cover change in South Africa. *South African Journal of Science* 108: 3 Pages. DOI: 10.4102/sajs.v108i5/6.1247.

20. Green L, Gammon DW, Hoffman MT, Cohen J, Hilgart A, Morrell RG, Verran H and Wheat N 2015. Plants, people and 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.

21. Hoffman MT 2014. Changing patterns of rural land use and land cover in South Africa and their implications for land reform. *Journal of Southern African Studies* 40(4): 705-725. DOI: 10.1080/03057070.2014.943525.

22. Hoffman MT and Rohde RF 2011. Rivers through time: Historical changes in the riparian vegetation of the semi-arid, winter rainfall region of South Africa in response to climate and land use. *Journal of the History of Biology* 44(1): 59-80. DOI 10.1007/s10739-010-9246-4.

23. Hoffman MT, Cramer M, Gillson L and Wallace M. 2011. Pan evaporation and wind run decline in the Cape Floristic Region of South Africa (1974-2005). *Climatic Change* 109(3): 437-452. DOI: 10.1007/s10584-011-0030-z. [See also Erratum in *Climatic Change* 2011 109: 453-454].

24. Jack SL, Hoffman MT, Rohde RF and Durbach I 2016. Climate change sentinel or false prophet? The case of Aloe dichotoma. *Diversity and Distributions.* First published online: 2 April 2016. DOI: 10.1111/ddi.12438.

25. Jack SL, Hoffman MT, Rohde RF, Durbach I and Archibald M 2014. Blow me down! A new perspective on *Aloe dichotoma* mortality as a result of windthrow. *BMC Ecology* 14:7. DOI: 10.1186/1472-6785/14/7.

26. James JJ and Carrick PJ 2016. Toward quantitative dryland restoration models. *Restoration Ecology* 24: 85–90. DOI: 10.1111/rec.12393.

27. Jerardino A, Wiltshire N, Webley L, Tusenius M, Halkett D, Hoffman MT and Maggs T 2014. Site distribution and chronology at Soutpansklipheuwel, a rocky outcrop on the West Coast of South Africa. *Journal of Island & Coastal Archaeology* 9(1): 88-110. DOI: 10.1080/15564894.2013.840872.

28. Joubert DF, Smit GN and Hoffman MT 2012. The role of fire in preventing transitions from a grass dominated to a bush thickened state in arid savannas. *Journal of Arid Environments* 87: 1-7. DOI: 10.1016/j.jaridenv.2012.06.012.

29. Joubert DF, Smit GN and Hoffman MT 2013. The influence of rainfall, competition and predation on seed production, germination and establishment of an encroaching *Acacia* in an arid Namibian savanna. *Journal of Arid Environments* 91: 7-13. DOI: 10.1016/j.jaridenv.2012.11.001.

30. Joubert DF, Zimmerman I, Fendler J, Winschiers-Theophilus H, Graz FP, Smit GN and Hoffman MT 2014. The development of an expert system for arid rangeland management in central Namibia with emphasis on bush thickening. *African Journal of Range & Forage Science* 31(2): 161-172. DOI: 10.2989/10220119.2014.899271.

31. Klein H, Hoffmann JH, Neser S and Dittrich-Schröder G 2015. Evidence that Quadrastichodella nova (Hymenoptera: Eulophidae) is the only Gall Inducer among Four Hymenopteran Species Associated with Seed Capsules of Eucalyptus camaldulensis (Myrtaceae) in South Africa. *African Entomology* 23: 207-223. DOI: 10.4001/003.023.0117.

32. Kranabetter JM, McLauchlan KK, Enders SK, Fraterrigo JM, Higuera PE, Morris JL, Rastetter EB, Barnes R, Buma B, Gavin DG, Gerhart LM, Gillson L, Hietz P, Mack MC, McNeil B, and Perakis S 2016. A Framework to Assess Biogeochemical Response to Ecosystem Disturbance Using Nutrient Partitioning Ratios. *Ecosystems* 19:387-395. DOI: 10.1007/s10021-015-9934-1.

33. Kunz NS, Hoffman MT and Weber B 2012. Effects of heuweltjies and utilization on vegetation patterns in the Succulent Karoo, South Africa. *Journal of Arid Environments* 87: 198-205. DOI: 10.1016/j.jaridenv.2012.05.007.

34. Marchante H, Marchante E, Freitas H and Hoffmann JH 2015. Temporal changes in the impacts on plant communities of an invasive alien tree, *Acacia longifolia*. *Plant Ecology* 216:1481. DOI: 10.1007/s11258-015-0530-4.

35. Masubelele ML, Hoffman MT and Bond WJ 2015. A repeat photograph analysis of long-term vegetation change in semi-arid South Africa in response to land use and climate. *Journal of Vegetation Science* 26(5): 1013-1023. DOI: 10.1111/jvs.12303/full.

36. Masubelele M, Hoffman MT and Bond WJ 2015. Biome stability and 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.

37. Masubelele ML, Hoffman MT, Bond WJ and Burdett P 2013. Vegetation change (1988-2010) in the Camdeboo National Park, South Africa using fixed-point photo monitoring: The role of herbivory and climate. *Koedoe - African Protected Area Conservation and Science* 55(1), Art. #1127, 16 pages. DOI: 10.4102/koedoe.v55i1.1127-1.

38. Masubelele ML, Hoffman MT, Bond WJ and 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.

39. McAuliffe J, Hoffman MT, McFadden L and King M 2014. Role of aeolian sediment accretion in the formation of *heuweltjie* earth mounds, western South Africa. *Earth Surface Processes and Landforms* 39(14): 1900-1912. DOI: 10.1002/esp.3583.

40. McGeoch MA, Dawson TP and Gillson L 2013. Accommodating the human response for realistic adaptation planning: response to Watson and Segan. *Trends in Ecology and Evolution* 28(10): 574-575. DOI: 10.1016/j.tree.2013.07.001.

41. Mokotjomela TM, Hoffmann JH and Downs CT 2015.The potential for birds to disperse the seeds of Acacia cyclops, an invasive alien plant in South Africa. *Ibis*. DOI: 10.1111/ibi.12260.

42. Moran VC and Hoffmann JH 2015. The fourteen International Symposia on Biological control of Weeds, 1969-2014: Delegates, demographics and inferences from the debate on non-target effects. *Biological Control* 87: 23-31. DOI: 10.1016/j.biocontrol.2015.04.008.

43. O'Connor TG, Puttick JR and Hoffman MT 2014. Bush encroachment in southern Africa: changes and causes. *African Journal of Range and Forage Science* 31(2): 67-88. DOI: 10.2989/10220119.2014.939996.

44. Okubamichael DY, Jack SL, de wet Bosenberg J, Hoffman MT and Donaldson JS 2016. Repeat photography confirms alarming decline in South African cycads. *Biodiversity and Conservation*. First published online: 1 August 2016. DOI: 10.1007/s10531-016-1183-x.

45. Okubamichael DY, Griffiths ME and Ward D 2016. Host specificity in parasitic plants – perspectives from mistletoes. *AoB Plants* plw069. DOI: 10.1093/aobpla/plw069.

46. Peters DPC, Belnap J, Ludwig JA, Collins SL, Paruelo J, Hoffman MT and Havstad KM 2012. How can science be general, yet specific? The conundrum of rangeland science in the 21st century. *Rangeland Ecology and Management* 65: 613-622. DOI: 10.2111/REM-D-11-00178.1.

47. Philippon N, Martiny N, Camerlin, Hoffman MT and Gond V 2014. Timing and patterns of ENSO impacts in Africa over the last 30 years: insights form Normalized Different Vegetation Index data. *Journal of Climate* 27: 2509-2532. DOI: hal-00668118.

48. Poulsen Z and Hoffman MT 2015. Changes in the distribution of indigenous forest in Table Mountain National Park during the 20th century. *South African Journal of Botany* 101: 49-56. DOI: 10.1016/j.sajb.2015.05.002.

49. Puttick JR, Hoffman MT and Gambiza J 2011. Historical and recent land-use impacts on the vegetation of Bathurst, a municipal commonage, Eastern Cape, South Africa. *African Journal of Range and Forage Science* 28(1): 9-20. DOI: 10.2989/10220119.2011.570946.

50. Puttick JR, Hoffman MT and Gambiza J 2014. The impact of land use on woody plant cover and species composition on the Grahamstown municipal commonage: implications for South Africa's land reform programme. *African Journal of Range and Forage Science* 31(2): 123-133. DOI: 10.2989/10220119.2014.910835.

51. Puttick JR, Hoffman MT and Gambiza J 2014. The influence of South Africa's post-apartheid land reform policies on bush encroachment and range condition: A case

study of Fort Beaufort's Municipal Commonage. *African Journal of Range and Forage Science* 31(2): 133-145. DOI: 10.2989/10220119.2014.880943.

52. Reimers B, Griffiths CL and Hoffman MT 2014. Repeat photography as a tool for detecting and monitoring historical changes in South African coastal habitats. *African Journal of Marine Science* 36(3): 387-398. DOI: 10.2989/1814232X.2014.954618.

53. Rohde RF & Hoffman MT 2012. Historical ecology of Namibian rangelands: Vegetation change since 1876 in response to local and global drivers. *Science of the Total Environment* 416: 276-288. DOI: 10.1016/j.scitotenv.2011.10.067.

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

55. Seddon AWR, Mackay AW, Baker AG et al. 2014. Looking forward through the past: identification of 50 priority research questions in palaeoecology. *Journal of Ecology* 102: 256-267. DOI: 10.1111/1365-2745.12195/full.

56. Shiponeni N, Allsopp N, Carrick PJ and Hoffman MT 2011. Competitive interactions between grass and succulent shrubs at the ecotone between an arid grassland and succulent shrubland in the Karoo. *Plant Ecology* 212(5): 795-808. DOI: 10.1007/s11258-010-9864-0.

57. Shiponeni N, Carrick P, Allsopp N and Hoffman MT 2014. Effects of root competition and soils on seedling establishment at the ecotone between an arid grassland and succulent shrubland in South Africa. *Journal of Vegetation Science* 25: 402-410. DOI: 10.1111/jvs.12082/full.

58. Van Wilgen BW, Caruthers J, Cowling RM, Esler KJ, Forsyth AT, Gaertner M, Hoffman MT, Kruger FJ, Midgley GF, Palmer G, Pence G, Raimondo DC, Richardson DM, van Wilgen J and Wilson JRU 2016. Ecological research and conservation management in the Cape Floristic Region between 1945 and 2015: History, current understanding and future challenges. *South African Journal of Science.* [In press].

59. Virah-Sawmy M, Gillson L, Gardner CJ, Anderson A, Clark G and Haberle S 2016. A landscape vulnerability framework for identifying integrated conservation and adaptation pathways to climate change: the case of Madagascar's spiny forest. *Landscape Ecology* 31:637-654. DOI: 10.1007/s10980-015-0269-2.

60. Ward D, Hoffman MT and Collocott SJ 2014. The influence of local and global drivers on a century of woody plant encroachment in the dry Kimberley savanna of

South Africa. *African Journal of Range and Forage Science* 31(2): 107-121. DOI: 10.2989/10220119.2014.914974.

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

(**iii) <u>Book chapters</u>**

62. Altwegg R, West A, Gillson L and Midgley GF 2014. Impacts of climate change in the Greater Cape Floristic Region. In: (Eds) Allsopp N, Colville JF and Verboom GA. *Fynbos: Ecology, Evolution, and Conservation of a Megadiverse Region*. Oxford University Press. ISBN: 978-0-19-967958-4.

63. Boardman J, Hoffman MT, Holmes PJ and Wiggs GFS 2012. Soil erosion and land degradation. In: (Eds) Holmes PJ and Meadows ME. *Southern African geomorphology: Recent trends and new directions.* Sunmedia, Bloemfontein. Pp. 305-328. ISBN: 978-1-920382-02-5.

64. Gillson L, Ladle RJ and Araújo MB 2011. Baselines, patterns and process. In: (Eds) Ladle RJ and Whittaker RJ. *Conservation Biogeography*. Blackwell Publishing Ltd, Oxford. Pp 31-44. ISBN: 978-1-4443-3503-3.

65. Haimbili EN, Carrick PJ and Shiponeni N 2014. Establishment of woody savanna species on various mined substrates: toward restoring self-sustaining plant communities at Navachab Gold Mine, Namibia. In: (Eds) Mucina L, Price JN and Kalwij JM. *Biodiversity and vegetation: patterns, processes, conservation*. p.105. Kwongan Foundation, Perth, Australia. ISBN: 978-0-9584766-5-2.

66. Hoffman MT 2011. Introduction to rangelands. In: (Ed) Zietsman L. *Observations on environmental change in South Africa*. Sunmedia, Stellenbosch. Pp. 71-73. ISBN 978-1-920338-24-4.

67. Hoffman MT 2015. Environmental change in twentieth-century South Africa and its implications for land reform. In: (Eds) Cousins B & Walker C. *Land divided, land restored: Land reform in South Africa for the 21st Century.* Jacana, Cape Town. Pp. 58-70. ISBN: 978-1-4314-0967-9.

68. Hoffman MT and Rohde R 2011. Long-term changes in the vegetation of southern Africa as revealed by repeat photography. In: (Ed) Zietsman L. *Observations on environmental change in South Africa*. Sunmedia, Stellenbosch. Pp. 79-83. ISBN 978-1-920338-24-4.

69. Hoffman MT and Todd SW 2013. Impact of environmental change on ecosystem services and human well-being in Africa. In: (Eds) Adegoke J and Wright CY.

Climate vulnerability: Understanding and addressing threats to essential resources. Elsevier Inc., Academic Press, San Diego. Pp. 49-67. ISBN: 978-0-1238-4703-4.

70. Impson FAC, Kleinjan CA and Hoffmann JHH (Eds.) 2014. Proceedings of the XIV International Symposium on the Biological Control of Weeds. 232pp. Skukuza, Kruger National Park, South Africa. 2-7 March 2014. http://www.isbcw2014.uct.ac.za/proceedings_final.pdf

71. Ladle RJ, Jepson P and Gillson L 2011. Social values and conservation biogeography. In: (Eds) Ladle RJ and Whittaker RJ. *Conservation Biogeography*. Blackwell Publishing Ltd., Oxford. Pp 13-30. ISBN: 978-1-4443-3503-3.

72. Richardson FR and Hoffman MT 2011. Using models to predict the probability of degradation of rangelands when subjected to different management strategies. In: (Ed) Zietsman L. *Observations on environmental change in South Africa*. Sunmedia, Stellenbosch. Pp. 109-115. ISBN 978-1-920338-24-4.

73. Rouget M, Barnett M, Cowling RM, Cumming T, Daniels F, Hoffman MT, Knight A, Manuel J, Parker A, Raimondo D and Rebelo T 2014. Conserving the Cape Floristic Region. In: (Eds) Allsopp A, Colville JF and Verboom GA. *Fynbos: Ecology, Evolution, and Conservation of a Megadiverse Region.* Oxford University Press. Pp. 321-336. ISBN: 978-0-19-967958-4.

(iv) Popular articles and professional communications

74. Anonymous 2013. First full eco-census of !Gariep. Monday Paper, University of Cape Town. 15-28 April 2013.

75. Anonymous. Scientists brave SA's mightiest river to kayak from source to sea. The Water Wheel July/August 2013. 18-23.

76. Gillson, L 2016. Can re-wilding the uplands help to prevent flooding in the lowlands? Oxford University Press Blog. http://blog.oup.com/2016/02/uplands-flooding-lowlands/

77. Hoffman MT 2012. Book Review. Richardson DM (Ed). Fifty years of invasion ecology: The legacy of Charles Elton. Chichester, Blackwell Publishing, Chichester. 2011. 432 pp. ISBN 978-1-4443-3586-6. *Transactions of the Royal Society of South Africa* 67(3):167-168.

78. Poulsen ZC and Hoffman MT 2015. The camera never lies: Using repeat photography to document forest change in Table Mountain National Park. *Veld & Flora* 101(1): 23-25. March 2015. http://www.biologicalsciences.uct.ac.za/sites/default/files/image_tool/images/75/documents/Poulsen-Hoffman_Veld_and_Flora_Mar2015.pdf

79. Stevens N, Bond W, Hoffman T and Midgley G 2015. *Change is in the air: Ecological trends and their drivers in South Africa*. South African Environmental Observation Network (SAEON), Pretoria. Pp. 1-32. http://www.saeon.ac.za/Change%20is%20in%20the%20air_WEB%20VERSION.pdf

(v) Professional reports

80. Diamond RE and Jack SL 2014. Evaporation and abstraction on the Gariep River, South Africa. Unpublished manuscript. Department of Geological Sciences, University of Cape Town. 17pp.

81. Jack SL and Els Y 2013. Final report on the Gariep mega-transect diatom data collection project. Plant Conservation Unit, University of Cape Town, Cape Town. See also www.senu2sea.wordpress.com)

82. Jack SL and Nicolson G 2015. Twenty-four rivers: A basic vegetation survey.

83. Jack SL, Nicolson G and Durbach I 2016. Upper Olifants River survey: An assessment of woody riparian and alien vegetation. Plant Conservation Unit, University of Cape Town, Cape Town. 14pp.

84. Kleinjan CA 2015. Report to the Department of Agriculture, Forestry and Fisheries, Republic of South Africa, To apply for: Permission to import and subsequently release from quarantine facilities at ARC-PPRI Stellenbosch, the seed-reducing midge *Dasineura pilifera* (Diptera: Cecidomyiidae), for the biological control of *Acacia baileyana* and *Acacia decurrens* (Leguminosae: Mimosoideae). 33pp.

Appendix 4. A list of the journals and their impact factors in which PCU staff and students published their research between 2011-2016.

Journal	**Impact Factor**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**
African Entomology	0.521					1		1
African Journal of Marine Science	1.058				1			1
African Journal of Range & Forage Science	1.250	1		1	5			7
AoB Plants	2.097						1	1
Biodiversity and Conservation	2.258						1	1
Biological Control	2.012					2		2
Biological Invasions	2.855						1	1
BMC Ecology	2.724				1		1	2
Climate Change	3.344	1						1
Diversity and Distributions	4.566						1	1
Earth Surface Processes and Landforms	3.505				1			1
Ecological Complexity	1.797					1		1
Ecological Management & Restoration	1.200					1		1
Ecosystems	3.751						1	1
Ibis	1.804					1		1
Journal of Archaeology and Ancient History	N/A	1						1
Journal of Arid Environments	1.623	1	2	1	1			5
Journal of Cleaner Production	4.959						1	1
Journal of Climate	4.850				1			1
Journal of Ecology	6.180				1			1
Journal of Island & Coastal Archaeology	1.960				1			1
Journal of Southern African Studies	0.537				1			1
Journal of the History of Biology	0.897	1						1
Journal of Vegetation Science	3.151				1	1		2

Koedoe - African Protected Area Conservation & Science	0.810			1				1
Landscape Ecology	3.657						1	1
Palaeogeography, Paleoclimatology, Palaeoecology	3.070		1					1
Plant Ecology	1.490	1				1		2
PLoS ONE	3.057					1		1
Rangeland Ecology and Management	1.810		1					1
Restoration Ecology	1.891						1	1
Science of the Total Environment	3.976		1					1
South African Journal of Botany	1.244			1		2	1	4
South African Journal of Science	0.902		1			1	2	4
Southern Forests: A Journal of Forest Science	0.696						1	1
The Holocene	2.135		1					1
Transactions of the Royal Society of South Africa	0.790		1					1
Trends in Ecology & Evolution	16.735			2	1			3
Mean and totals	2.741	6	8	6	15	12	9	60

Appendix 5. Workshops and presentations of the staff and students of the Plant Conservation Unit over the period 2011-2016.

WORKSHOPS AND CAPACITY BUILDING

Gillson L 2012. Invited Chair and theme convenor of the Conservation Working Group for workshop on 50 Key Questions in Palaeoecology, University of Oxford, UK, 13-14 December, 2012.

Gillson L 2013. Palaeo techniques training workshop held at the University of Cape Town, South Africa. Hosted workshop together with Anneli Ekblom (University of Uppsala).

Gillson L 2013. ACCESS Theme 4 Student Workshop and Steering Committee Meeting (Organizer), Noordhoek, Cape Town.

Gillson L 2014. Phytolith Training Workshop. University of Cape Town, South Africa. Co-hosted workshop with Carlos Cordova (Oklahoma State University).

Gillson L 2015. Southern African-Nordic Centre (SANORD) Workshop: Towards a palaeoecological regional centre of competence in southern Africa. University of Cape Town, South Africa. (Co-host)

Gillson L 2016. Biodiversity and Environmental Change in the Cape Floristic Region. Convenor of Faculty Strategic Impact Area Workshop held at the University of Cape Town, 8 February 2016.

Gillson L 2016. African Mountains Workshop. Co-organiser at World University Network (WUN) Workshop, University of Cape Town, Cape Town, June 2016. (http://www.pcu.uct.ac.za/news/african-mountains-research)

Gillson L 2016. Palaeoecology, resilience, and sustainability. Session Convenor and Chair of Session at 5th International EcoSummit Congress, Montpellier, France, 29 August – 1 September 2016.

PRESENTATIONS

International conferences and workshops

Dabengwa A 2015. Untangling herbivore and fire patterns in human-affected landscapes from a sedimentary fossil record: a case study from KwaZulu-Natal, South Africa. Paper presented at the XIX International Union for Quaternary Research (INQUA) Congress, Nagoya, Japan, 26 July – 2 August 2015.

Gillson L and Marchant R 2015. Invited paper: Towards Sustainability? Using long-term data to manage ecosystem services. Part of a symposium on Paleoecological patterns, ecological processes, modeled futures: Crossing scales to understand an uncertain future. Ecological Society of America Annual Meeting, Baltimore, Maryland, USA, 9 – 14 August 2015.

Gillson L 2011. Resilience of Forest Savanna Mosaics in Past Millennia. Paper presented at the Joint International Meeting of the Association for Tropical Biology and Conservation and the Society for Conservation Biology (Africa Section): Adaptability to Climate Change and Attaining the Millennium Development Goals for Tropical Ecosystems. Arusha, Tanzania.

Gillson L 2013. Land Cover Change in South Africa. Invited paper presented at the PAGES Theme 4 Human Climate Ecosystem Interactions Summit Meeting, Bern, Switzerland, July 2013.

Gillson L 2013. Invited paper presented at the 1st NOVUS Workshop on "Nutrient responses to ecosystem disturbances from annual to multi-millennial timescales", Oregon, USA, 21-25 May 2013.

Gillson L 2013. Bridging the Gap: What have we learned from 10 years palaeoecology in the Kruger National Park, South Africa. Invited paper presented at the World University Network (WUN) Research Mobility Visit, University of York, UK.

Gillson L 2016. Biodiversity Conservation and Environmental Change. University of Uppsala, Sweden. Invited seminar presented to Environmental History Masters class who have Lindsey
Gillson's (2015) book as set text, May 2016.

Gillson L 2016. A safe operating space for humanity? How palaeoecology can help us to plant the seeds of a good Anthropocene. Invited keynote paper presented at PAGES Regional Integration Working Group Workshop. Dynamics of socio-ecosystems on a changing Earth: sustainability or collapse? Chambéry, Savoie Mont Blanc, France, 30 May – 2 June 2016.

Gillson L 2016. Palaeo-perspectives on African mountains. World University Network (WUN) Workshop, University of Cape Town, Cape Town, June 2016. (http://www.pcu.uct.ac.za/news/african-mountains-research)

Gillson L 2016. To burn or not to burn? How palaeoecology can enhance the resilience and management of fire adapted socio-ecological systems. Paper presented at 5th International EcoSummit Congress, Montpellier, France, 29 August – 1 September 2016.

Gillson L 2016. What can palaeoecology contribute to the land-sharing versus land-sparing debate? Paper presented at Central and Eastern Europe Palaeoscience Symposium, Cluj-Napoca, Romania, 23-24 May 2016.

Hoffman MT 2014. Long-term vegetation change in the Thicket and Arid Zone biomes of Southern Africa and its implications for conservation. Seminar presented in Geography Department at Ghent University, Belgium, 16 October 2014.

Hoffman MT 2014. Measuring long-term vegetation change in southern Africa in response to land use. Paper presented at Caatinga workshop in Kaiserslautern, Germany, 21 October 2014.

Hoffmann JH 2015. Biological control of invasive alien plants: any delay is opportunity lost. Keynote address presented to the 13th International Conference on Ecology and Management of Alien plant Invasions (EMAPI), Waikoloa, Hawaii, 14-20 September 2015.

Humphrey, GJ 2013. Current and future service of a Regional Fire Resource Centre. Concept, vision and mission presented at the 9th Southern African Fire Network (SAFNet) Meeting, Tanzania Forestry Research Institute (TAFORI), Morogoro, Tanzania. 5 – 7 February 2013.

Humphrey, GJ 2013. FireWise Tanzania & South Africa: Lessons Learnt presented at the 9th Southern African Fire Network (SAFNet) Meeting, Tanzania Forestry Research Institute (TAFORI), Morogoro, Tanzania. 5 – 7 February 2013.

Okubamichael DY, Jack SL, Bösenberg DW, Hoffman MT & Donaldson J 2015. An investigation of cycad populations in South Africa using repeat photography. Paper presented at the 10th International Conference on Cycad Biology, Medellin, Columbia, 16 -21 August, 2015.

Rohde RF and Hoffman MT 2016. The fog of historical ecology: vegetation change, sea-surface temperatures and climate change in the Namib desert. Paper presented at conference "Anthropology, weather and climate change", British Museum, London, 27-29 May 2016.

Rohde RF and Impey A 2014. FogLife and Visual/Soundscapes: Exploring the past and future ecology of the Namib through photography and acoustics. Paper presented at the FogLife colloquium, Gobabeb, Namibia, 11-13 November 2014.

National conferences and workshops

Becker C, Coetsee C and Cowling RM 2013. The influence of soil factors on the distribution of Portulucaria afra in Subtropical Thicket, South Africa. Poster presented at Biodiversity Southern Africa conference, Cape Town, 2 – 6 December 2013.

Becker C, Coetsee C and Cowling RM 2013. The influence of soil factors on the distribution of Portulucaria afra in Subtropical Thicket, South Africa. Poster presented at the Arid Zone Ecology Forum, Kimberley, 2-5 September 2013.

Becker C 2013. Restoration in Namaqualand, what can we expect? Paper presented at the Arid Zone Ecology Forum, Kimberley, 2-5 September 2013.

Carrick PJ 2015. Are we there yet? Using reference conditions and setting end targets for ecological restoration. Paper presented at the Arid Zone Ecology Forum, 4-10 October 2015, Springbok.

Carrick PJ 2011. New ecological understanding from restoration: unifying concepts in disturbance, succession, degradation and the thresholds between them. Paper presented at the Arid Zone Ecology Forum, Nieuwoudtville, 3-6 October, 2011.

Dabengwa A 2015. Untangling herbivore and fire patterns in human-affected landscapes from a sedimentary fossil record: a case study from KwaZulu-Natal, Poster presentation. Poster presented at the 13th Annual Savanna Science Networking Meeting hosted by SANParks' Scientific Services, 8 - 12 March 2015, Kruger National Park.

Dabengwa, D. 2015. Re-evaluating the use of critical thresholds in ecosystem management: Lessons from multiple and asynchronous ecological regimes shifts from a palaeoecological record. Paper presented at the SAEON GFW Drakensberg Global Change Monitoring Platform Mini Symposium 28-29 Oct 2015, Pietermaritzburg.

Davis C 2011. Determining recent trends in land cover change in Namaqualand, South Africa using Landsat-TM data." Poster presented at the Arid Zone Ecology Forum, Nieuwoudtville, 3-6 October, 2011. (Award for best Poster Presentation)

Davis C 2013. Recent trends in vegetation change in the Namaqualand region of South Africa: An approach combining repeat site photography and remote sensing. Paper presented at the Arid Zone Ecology Forum, Kimberley, 2-5 September 2013.

Davis C 2013. Recent trends in vegetation change in the Namaqualand region of South Africa: An approach combining repeat site photography and remote sensing". Paper presented at the Biodiversity Southern Africa conference, University of Cape Town, 2-6 December 2013.

Davis C, Hoffman MT and Roberts W 2012. Recent trends in vegetation change in the Namaqualand region of South Africa: an approach combining repeat site photography and remote sensing. Paper presented at the Arid Zone Ecology Forum, Worcester, 17-19 October 2012.

De Abreu P 2011. The short-term effect of seed, mulch, ripping and micro-catchment rehabilitation treatments on vegetation recovery, plant diversity and grazing services in

the Succulent Karoo lowlands of the Little Karoo. Poster presented at the Arid Zone Ecology Forum, Nieuwoudtville, 3-6 October, 2011.

Fleury G, Hoffman MT and Todd S 2015. Environmental change in Riemvasmaak: twenty years after resettlement. Poster presented at the Arid Zone Ecology Forum, 4-10 October 2015, Springbok.

Fleury G, Hoffman MT and Todd SW 2016. Environmental change in Riemvasmaak, Northern Cape, South Africa 20 years after resettlement. Paper presented at the Arid Zone Ecology Forum, Prince Albert, 3-6 October 2016.

Forbes CJ 2013, Benchmarks for the future: Long-term vegetation change derived from palaeoecological techniques in Swartland Renosterveld, Western Cape, South Africa. Poster presentation at Biodiversity SA Conference, 2-6 December 2013.

Gillson L 2015. Complexity thinking and objectives setting in complex socio-ecological systems. Paper presented at the 13th Annual Savanna Science Networking meeting, Kruger National Park, 9 – 12 March 2015.

Gillson L 2015. Palaeoecology and conservation in the Anthropocene – where are we now? Paper presented at the African Quaternary (AfQUA) conference, held at the University of Cape Town, 30 January – 7 February 2015.

Gillson L 2011. How climate and fire shaped grass dominated vegetation and forest mosaics during past millennia. Paper presented at the 37th Annual Conference of the South African Association of Botanists, Rhodes University, Grahamstown, 17-19 January 2011

Gillson L 2013. Bridging the gap between conservation, palaeo- and neo-ecology in the Kruger National Park. Paper presented at the Biodiversity Southern Africa conference, University of Cape Town, 2-6 December 2013.

Gillson L 2013. Bridging the Gap: What have we learned from 10 years palaeoecology in the Kruger National Park? Paper presented at the 11th Annual Savanna Science Networking Meeting, Kruger National Park, South Africa, 3-8 March 2013.

Gillson L 2016. Is scenario planning useful in a complex uncertain world? Paper presented at the 14th Annual Savanna Science Networking Meeting, Kruger National Park, South Africa, 13-17 March 2016.

Gillson L 2014. Can Adaptive Management Adapt? Paper presented at the 12th Annual Savanna Science Networking Meeting, Kruger National Park, South Africa, 8-12 March 2014.

Hoffman MT 2011. Vegetation change in Namaqualand over the last 100 years. Paper presented at the Arid Zone Ecology Forum, Nieuwoudtville, 3-6 October, 2011.

Hoffman MT 2012. Rethinking catastrophe? Historical trajectories and modelled future vegetation change in southern Africa. Paper presented at the 1st National Global Change Conference held at the Birchwood Hotel, Boksburg, Gauteng, 26-28 November 2012.

Hoffman MT 2012. The phenology of Succulent Karoo plants: Patterns and differences between growth forms. Paper presented at the Arid Zone Ecology Forum, Worcester, 17-19 October 2012.

Hoffman MT 2013. 20th century vegetation change along a 1,500 km gradient in South Africa. Paper presented at the Biodiversity Southern Africa conference, University of Cape Town, 2-6 December 2013.

Hoffman MT 2013. Changing patterns of rural land use and land cover in South Africa and their implications for land reform. Invited Principal Speaker at the Land Divided Conference, University of Cape Town, 24-27 March 2013.

Hoffman MT 2013. Livestock production in Paulshoek, Namaqualand. Paper presented at the Arid Zone Ecology Forum, Kimberley, 2-5 September 2013.

Hoffman MT 2014. Long-term vegetation change in the Thicket and Arid Zone biomes of southern Africa and its implications for conservation. Invited keynote paper presented at the Arid Zone Ecology Forum, Rhodes University, Grahamstown, 8-11 September 2014.

Hoffman MT 2015. The potential impact of fracking on the biodiversity of the Karoo. Paper presented at the Arid Zone Ecology Forum, Springbok, 4-10 October 2015.

Hoffman MT 2016. Extreme events and long-term changes in the biomes of the Eastern Cape. Invited keynote paper presented at the Thicket Forum, Addo Elephant National Park, 21-23 June 2016.

Hoffman MT 2016. Historical imagery as a tool for condition assessment: Different or degraded? Invited keynote paper presented at the Biodiversity Planning Forum, Wilderness, 7-10 June 2016.

Hoffman MT 2016. Historical legacies and Karoo futures: Land use and vegetation trajectories in the Karoo. Paper presented at Karoo Futures? Trajectories of change colloquium held at Stellenbosch University, 7-8 November 2016.

Hoffman MT 2016. Invited Keynote paper presented at the Green Medicine Symposium, University of the Western Cape, Bellville, 8-10 September 2016.

Hoffman MT and Gillson L 2012. Benchmarks for the future: using palaeo- and historical data in climate change research. Convenors of the workshop at the 1st National Global Change Conference held at the Birchwood Hotel, Boksburg, Gauteng, 26-28 November 2012.

Hoffman MT, Jack SL, Durbach I and Swart E 2013. The potential impact of plant removal and seedling mortality on the population dynamics of large Aloes. Paper presented at the 10th Annual Kimberley Biodiversity Research Symposium, Kimberley, 2 September 2013.

Hoffman MT, Mostert E, Navarro R, Jack S and Underhill L 2016. rePhotoSA: The repeat photograph project of South African landscapes. Seminar presented to the Mpumalanga Plant Specialist Group, Buffelskloof Nature Reserve, near Nelspruit, Mpumalanga, 14 May 2016.

Hoffman MT, Rohde RF and Gillson L 2014. 20th century vegetation change in the major biomes of southern Africa. Paper presented at conference "From past to present: Changing climates, ecosystems and environments of Arid southern Africa. A tribute to Louis Scott", Bloemfontein, 7-11 July 2014.

Hoffman MT 2015. Attendance and part of panel discussion to launch SAEON Booklet "Change is in the air: Ecological trends and their drivers in South Africa"; National Science Forum, CSIR International Convention Centre, Pretoria, 8-9 December 2016.

Impson F, Kleinjan CA and Hoffmann J 2014. Biological control of Australian wattles: Looks can be deceiving. Paper presented at the Fynbos Forum, Knysna, 4-7 August 2014.

Jack SL 2011. Aloe dichotoma and southern African climate change: Sentinel or False Prophet? Post Graduate Science Symposium, 9th September, 2011, UCT. (Poster presentation)

Jack SL 2011. Aloe dichotoma and southern African climate change: Sentinel or False Prophet? Paper presented at the Arid Zone Ecology Forum, Nieuwoudtville, 3-6 October, 2011.

Jack SL 2012. Is Aloe dichotoma a suitable sentinel for climate change in southern Africa? Paper presented at the 1st National Global Change Conference held at the Birchwood Hotel, Boksburg, Gauteng, 26-28 November 2012.

Jack SL 2015. Changes in abundance and distribution of Protea caffra in the central and northern Drakensberg as a consequence of climate and land use change. Paper presented at the SAEON GFW Drakensberg Global Change Monitoring Platform Mini Symposium, Pietermaritzburg, 28-29 Oct 2015.

Jack SL, Hoffman MT, Rohde RF and Durbach I 2012. Blow me down! A new perspective on Aloe dichotoma mortality as a result of windthrow. Paper presented at the Arid Zone Ecology Forum, Worcester, 17-19 October 2012.

Joubert D, Honsbein D, Smit GN and Hoffman MT 2012. Bush encroachment: perceived impacts on livestock production in semi arid Namibian rangelands. How real are they? Paper presented at the Arid Zone Ecology Forum, Worcester, 17-19 October 2012.

Lot J 201. The use of plants by households in Paulshoek village, Namaqualand. Poster presented at the Arid Zone Ecology Forum, Nieuwoudtville, 3-6 October, 2011.

MacPherson AJ, Gillson L and Hoffman MT 2013. Untangling the impacts of climate, fire and herbivory at biome boundaries in the Cape Floristic Region over the past 5,500 years. Poster presented at the Fynbos Forum, 7-10 October 2013, Kirstenbosch, Cape Town.

MacPherson J, Gillson L and Hoffman MT 2014. Fynbos and forest as alternative alternate states: An investigation using the fossil record. Paper presented at the Fynbos Forum, Knysna, 4-7 August 2014.

MacPherson, J. and Roberts, N. "Palaeoecological parameters for ecosystem management: An example from the Fynbos of South Africa." Paper presented at South African Association of Botanists annual conference, Rhodes University (Jan 2011).

Masubelele M 2012. Long-term vegetation change (1900-2010) in the Karoo Midlands region in response to climate and land use. Paper presented at the 1st National Global Change Conference held at the Birchwood Hotel, Boksburg, Gauteng, 26-28 November 2012.

McAuliffe J 2012. Landscape fossils in arid zones: Interpreting the ecological past and predicting the future. Invited speaker, Arid Zone Ecology Forum, Worcester, 17-19 October 2012.

McAuliffe J and Hoffman MT 2016. Whether or not heuweltjies: Context-dependent ecosystem engineering by the southern harvester termite. Invited keynote opening address presented at the Arid Zone Ecology Forum, Prince Albert, 3-6 October 2016.

Mostert EA, Hoffman MT and Jack SL 2015. rePhotoSA: engaging the public to investigate landscape change in southern Africa. Poster presented at the Arid Zone Ecology Forum, Springbok, 4-10 October 2015.

Okubamichael DY, Jack SL, Bösenberg DW, Hoffman MT and Donaldson D 2015. KwaZulu-Natal Cycads: Analyses of historical change using repeat photography and current population structure. Symposium of Contemporary Conservation Practice, Howick, 2 – 6 November, 2015.

Petersen H and Hoffman MT 2016. In retrospect: how the vegetation of the Tanqua Karoo has changed over the last century. Paper presented at the Arid Zone Ecology Forum, Prince Albert, 3-6 October 2016.

Petersen H, Jack SL and Todd SW 2016. Correlates of biodiversity in the Upper Nama Karoo. Poster presented at the Arid Zone Ecology Forum, Prince Albert, 3-6 October 2016.

Poulsen Z 2012. Twentieth century changes in the distribution of indigenous forest on the Cape Peninsula: the role of land use and climate change. Paper presented at the 1st National Global Change Conference held at the Birchwood Hotel, Boksburg, Gauteng, 26-28 November 2012.

Poulsen ZC and Hoffman MT 2013. Changes in distribution of indigenous forest in Table Mountain National Park from 1944 – 2012, Paper presented at the Fynbos Forum Annual Conference, Kirstenbosch National Botanic Gardens, Cape Town, 7-10 October 2013. (Awarded Runner-up best student talk).

Poulsen ZC and Hoffman MT 2013. Changes in distribution of indigenous forest in Table Mountain National Park from 1944 – 2012, Paper presented at the South African Association of Botanists (SAAB) Annual Conference, Drakensville, Drakensberg, January 2013

Poulsen ZC and Hoffman MT 2013. Changes in distribution of indigenous forest in Table Mountain National Park from 1944 – 2012, Poster presented at the Biodiversity Southern Africa Conference, University of Cape Town, 2-6 December 2013.

Puttick J 2013. An analysis of woody cover change in the mesic eastern region of South Africa using repeat photography. Paper presented at the Biodiversity Southern Africa conference, University of Cape Town, 2-6 December 2013.

Puttick JR, Hoffman MT and O'Connor T 2011. An analysis of woody cover change in the mesic eastern region of South Africa using repeat photography. Presented at the Annual Congress of the Grassland Society of Southern Africa, 11-15 July 2011, Middleburg.

Todd SW 2014. The potential impact of renewable energy development in South Africa. Paper presented at the Arid Zone Ecology Forum, Rhodes University, Grahamstown, 8-11 September 2014.

Todd SW 2016. A review and analysis of the past 30 years of Arid Zone Research in South Africa – movers, shakers and future directions. Paper presented at the Arid Zone Ecology Forum, Prince Albert, 3-6 October 2016.

Tokura W, Jack SL, Anderson T and Hoffman MT 2015. Long-term changes in plant productivity using NDVI satellite data in Tswalu Kalahari Reserve. Poster presented at the Arid Zone Ecology Forum, Springbok, 4-10 October 2015.

Van der Merwe H 2014. Tierberg Karoo research centre: future research possibilities. Paper presented at the Arid Zone Ecology Forum, Rhodes University, Grahamstown, 8-11 September 2014.

Van der Merwe H and Geldenhuys C 2016. Proposed long-term monitoring protocol for *Aloidendron dichotomum* populations. Paper presented at the Arid Zone Ecology Forum, Prince Albert, 3-6 October 2016.

Van der Merwe H and Milton SJ 2016. Long-term burn trials at Tierberg LTER revisited after eight years. Paper presented at the Arid Zone Ecology Forum, Prince Albert, 3-6 October 2016.

Venter S 2016. rePhotoSA: A citizen science project of repeat landscape photography. Poster presented at the Arid Zone Ecology Forum, Prince Albert, 3-6 October 2016.

Local conferences, symposia & workshops and departmental and popular talks

Dabengwa A 2015. Hunting for disturbance signals: environmental change through palaeoecological lens. Presentation at Departmental Seminar, Biological Sciences, 26 August 2015, University of Cape Town

Davis C 2013. Recent trends in vegetation change in the Namaqualand region of South Africa: An approach combining repeat site photography and remote sensing. Paper presented at the SAEON Graduate Student Network, 19-22 August, Cape Town,

Forbes CJ 2013, Benchmarks for the future: Long-term vegetation change derived from palaeoecological techniques in Swartland Renosterveld, Western Cape, South Africa. Paper presented at the ACCESS student workshops, Monkey Valley and UWC, 2-3 and 6-8 September 2013;

Gillson L 2011. Biome boundaries and the palaeorecord. Paper presented at the Biome Boundaries Project Workshop, Sports Science Institute of South Africa, Newlands, Cape Town, 20 October 2011.

Gillson L 2012. Elephant management and climate change. African Climate Change and Development Initiative, University of Cape Town, South Africa (Invited Public Lecture)

Gillson L 2016. Dynamic landscape changes in the Anthropocene. UCT Summer School. Oral contribution to lecture series on “Extinctions past and present” as part of UCT Summer School, University of Cape Town, Cape Town, January 2016.

Hoffman MT 2011. Stability and change in the vegetation of Namaqualand and southern Namibia over the last 100 years. Paper presented at the Biome Boundaries Project Workshop, Sports Science Institute of South Africa, Newlands, Cape Town, 20 October 2011.

Hoffman MT 2012. Understanding the past to manage the future: The role of historical ecology and repeat photography in conservation management. Invited paper presented at the SynBioSys Status Seminar, Kirstenbosch, Cape Town, 30 October 2012.

Hoffman MT 2013. The effect of humans and climate change on the vegetation of the Cape over the last 100 years. Invited Public Lecture, West Coast Fossil Park, Langebaanweg, 6 August 2013.

Hoffman MT 2014. Conservation through the lens: The use of repeat photography in global change research. Invited speaker to UCT's Biology Society (ZOOBOTS) Annual Meeting, University of Cape Town, 14 August 2014.

Hoffman MT 2014. Past, present and future environments of southern Africa. Seminar presented to group of visiting German environmental journalists on behalf of Marketing and Communications Department at University of Cape Town, 6 November 2014.

Hoffman MT 2014. Using the past to understand the present and future environments of southern Africa. Seminar presented at UCT Summer School Lecture Series entitled "Seeing the World Through Science", University of Cape Town, 21 January 2014.

Hoffman MT 2015. Collapse, stasis or improvement? Photographic documentation of environmental change in southern African over the last 100 years. Presentation to the Friends of Rondebosch Common, 20 October 2015.

Hoffman MT 2015. The use of photography in conservation. Presentation at the Biological Society (ZOOBOTS) Photography Event on 16 October 2015.

Hoffman MT 2015. Using repeat photography to understand long-term vegetation change in South Africa. Seminar presented to Bishops Diocesan College, Rondebosch, Cape, 11 November 2015.

Hoffman MT, Mostert E, Navarro R, Jack S and Underhill L 2014. rePhotoSA: The repeat photograph project of South African landscapes. Seminar presented at Animal Demography Unit's Citizen Science Day, Cape Town, 6 December 2014.

Hoffman MT, Mostert E, Navarro R, Jack S and Underhill L 2014. rePhotoSA: The repeat photograph project of South African landscapes. Seminar presented at Animal Demography Unit's Citizen Science Day, Cape Town, 6 June 2015.

Humphrey GJ 2013: "Exploring the role of communication through satellite and local ecological lenses in the vegetation fires of North-east of Namibia". PhD proposal presented at Applied Centre for Climate & Earth Systems Science (ACCESS) Workshop, 2 - 3 September 2013.

Humphrey, GJ 2013. Current and future service of a Regional Fire Resource Centre. Concept Note presented at Council for Scientific and Industrial Research (CSIR), Pretoria, South Africa. 27th February 2013.

Humphrey, GJ 2013. Fire networking in southern Africa: Current and future service of a Regional Fire Resource Centre. Concept Note presented at Southern African Development Community (SADC) Regional Forestry Stakeholder Workshop, Birchwood, Johannesburg, South Africa. 11 – 13 February 2013.

Jack SL 2015. Repeat photography and the Holy Grail of Semi-Automated Photo-Matching. Paper presented at the African Institute for Mathematical Sciences 'Maths in Industry Study Group', Muizenberg, Cape Town, January 2015

Jack SL 2015. Taking a repeat photograph: what you need to know. Seminar presented to Bishops Diocesan College, Rondebosch, Cape, 11 November 2015.

Carrick PJ 2013. Kamiesberg Renosterveld restoration research trials: differences with Western Cape Renosterveld? Presentation at the NRI/CSA Travelling Workshop, 5 – 11 September 2013.

MacPherson J, Gillson L and Hoffman MT 2011. Climate and land use drivers of vegetation change at the Fynbos-Succulent Karoo ecotone in the Holocene. Paper presented at the Biome Boundaries Project Workshop, Sports Science Institute of South Africa, Newlands, Cape Town, 20 October 2011.

Masubelele M.L., Hoffman, M.T and Bond, W.J. 2011. Long-term environmental and vegetation change in the Karoo Midlands over the past 100 years. Paper presented at the Biome Boundaries Project Workshop, Sports Science Institute of South Africa, Newlands, Cape Town, 20 October 2011.

Masubelele M.L., Hoffman, M.T and Bond, W.J. 2011. Long-term environmental and vegetation change in the Karoo Midlands over the past 100 years. UCT Botany Department Ecology Discussion Group. Rondebosch, Cape Town, RSA

Masubelele M.L., Hoffman, M.T, Bond, W.J, and Gambiza, J. 2011. Vegetation change (1960-2009) along an aridity gradient in the eastern Karoo and the southern Free State grasslands. Poster Presentation. Cape Research Centre Indaba. Tokai, Cape Town, RSA

Mostert E 2014. rePhotoSA: Background, current and future perspectives. Seminar presented at Animal Demography Unit's Citizen Science Day, Cape Town, September 2014.

Poulsen Z 2011. Change in distribution through time of indigenous forest on the Cape Peninsula. Paper presented at the Biome Boundaries Project Workshop, Sports Science Institute of South Africa, Newlands, Cape Town, 20 October 2011.

Powell RF, Hoffman MT and Gillson L 2011. Long-term Changes in the Cape of Good Hope Section of Table Mountain National Park. Paper presented at the Biome Boundaries Project Workshop, Sports Science Institute of South Africa, Newlands, Cape Town, 20 October 2011.

Puttick JR 2011. An analysis of woody cover change in the mesic eastern region of South Africa using repeat photography. Paper presented at the Biome Boundaries Project Workshop, Sports Science Institute of South Africa, Newlands, Cape Town, 20 October 2011.