



## KATHLEEN GRACE SMART

### PROFESSIONAL STATEMENT

*My interest is in understanding and monitoring the fluxes and soil-plant-atmosphere feedbacks within social-ecological systems, and how these insights are applicable within sustainable management and restoration approaches.*

*I am interested in systems questions and answering them at multiple scales using a variety of techniques including remotely sensed data, primary production modelling, stable isotope analysis, eddy covariance, biometeorology, and fieldwork.*

*I love data and I am passionate about sharing this love with students so they can investigate and understand the world around them.*

### RESEARCH INTERESTS

- Systems ecology
- Plant ecophysiology
- Biogeochemistry and biophysics
- Natural resource management
- Global environmental change
- Land-cover/land-use change

### CURRENT POSITION

June 2022 onwards: **Landscape Scientist, Biogeochemistry** in the Expanded Freshwater and Terrestrial Environmental Observation Network (EFTEON) hosted by SAEON, being developed under the South African Research Infrastructure Roadmap (SARIR) and a programme of the National Research Foundation (NRF).

### TERTIARY EDUCATION PROFILE

#### Rhodes University, Makhanda, South Africa

**2021** WRC funded Post-Doctoral position, project lead (April 2021 – ongoing)

Host: Prof C. Palmer, Institute for Water Research

Topic: *Water Use Efficiency of Cannabis sativa in the Eastern Cape and KwaZulu Natal*

**2019** DEFF-NRM funded Post-Doctoral Fellow (April 2019 – March 2021)

Host: Rhodes Restoration Research Group, Department of Environmental Science

Topic: *Research and monitoring of Thicket vegetation*

**2018** Claude Leon Post-doctoral Fellow (April 2018 – March 2019)

Host: Prof. Brad Ripley, Botany

Topic: *The influence of CO<sub>2</sub> and silica on C<sub>4</sub> grass structure, palatability and drought resistance*

**2016** Global Change Grand Challenge Post-Doctoral Fellow (October 2016 - 2018)

Host: Prof. Brad Ripley and Dr Tony Palmer, Botany

Topic: *Impacts of changing CO<sub>2</sub> concentrations on plant growth, structure and function*

#### University of the Witwatersrand, Johannesburg, South Africa

**2016** PhD awarded

School of Animal, Plant & Environmental Sciences (AP&ES)

Topic: *The role of vegetation in regional climate regulation feedback processes*

### REFERENCES

**Dr Tony Palmer**

**Post-doctoral research host**  
tonypalmer345@gmail.com

**Prof Sally Archibald**

**Mentor**  
Sally.archibald@wit.ac.za

**Prof Guy Midgley**

**Mentor**  
gfmidgley@sun.ac.za

# WORK EXPERIENCE

## PAST POSITIONS

- Course administrator and coordinator for the Masters in Environmental Sciences and Interdisciplinary Global Change Studies Programmes, Animal, Plant and Environmental Science, Wits University, January - June 2016.
- Ad hoc consultant for IUCN Climate Change Specialist Group, April 2015 - onwards.
- Student helper at the Faculty of Science, Wits University, February - May 2014.
- Student helper at the Global Change and Sustainability Institute, Wits University, March-August 2012 and February - May 2014.
- Ad hoc consultant for ActionAid International, October 2013 - onwards.
- CSIR studentship program, Natural Resources and the Environment, 2008 - July 2012.
- Editor and organiser of the Assessment of South African Elephant Management, March 2007 - December 2008.

## RESEARCH PROFILE & ASSOCIATED EXPERIENCE

### OUTPUTS JOURNAL PUBLICATIONS, BOOK CHAPTERS, BOOKS & REPORTS

- Weideman, C., Smart, K., Palmer, A.R. (in progress). Declines in Carbon Sequestration and Ecosystem Water Use Efficiency Following Woody Encroachment by *Vachellia karroo* in a Native Semi-Arid South African Grassland, *Frontiers in Soil Science* (accepted abstract for special edition).
- Palmer, A.R., Gwate O., Gibson, L., Smart K., Choruma, D. (in progress). Carbon fluxes over the Albany Thicket Biome, South Africa: towards confirming the value of Albany Thicket restoration and opportunity for C sequestration *Frontiers in Soil Science* (accepted abstract for special edition).
- Cockburn et al. (under review). Pandemic Care in Higher Education. *Internet and Higher Education*.
- Chapman, A., Midgley, G. and Smart, K. 2021. Diverse trends in observed pan evaporation in South Africa suggest multiple interacting drivers. *South African Journal of Science*.117 (7/8) Art#7900.
- Smart, K. 2020. On the importance of considering land surface reflectance in earth system studies. *Clean Air Journal*, 30:1.
- de Satgé, R., Powell, M., Smart, K., Nowell, T., Zenani, K., St Quintin, G-A. 2020 Towards national interdisciplinary extension support: Rapid status quo review. Working paper. DEFF-NRM.
- Grant-Biggs et al. 2019 Thicket Research Agenda. DEFF-NRM.
- Foden, W. and Smart, K. 2016. Climate Change Vulnerability Assessment Report for Integrated land use planning for biodiversity and climate change in Zambia's Nsama and Mpulungu districts. A Report for IUCN-ESARO. 44pp.
- Foden, W. and Smart, K. 2015. Climate Change Information Pack for Integrated land use planning for biodiversity and climate change in Tanzania's Nkasi and Mpanda districts. A Report for IUCN-ESARO. 35pp.
- Scholes, R.J. and Smart, K.G. 2013. Carbon storage in terrestrial systems. In: *Ecosystem Functioning*, R. A. Pielke Sr, T. Seastedt, K. Sunding. (Eds.) Academic Press, Oxford, p 93-108. <http://dx.doi.org/10.1016/B978-0-12-384703-4.00411-1>
- Mennell, K.G, and Scholes, R.J. 2010. The succulent thicket of South Africa as a climate regulator. *Integrated Land Ecosystem-Atmosphere Processes Study Newsletter*, Issue No. 9 (April 2010): 42-43.
- Kirton, A., Scholes, R.J., Verstraete, M., Archibald, S., Mennell, K. and Asner, G.: 2009. Detailed structural characterisation of the savanna flux site at Skukuza, South Africa. *Proceedings of the International Geoscience and Remote Sensing Symposium*, University of Cape Town South Africa, July 12-17 2009.
- Scholes, R.J. and Mennell, K.G. (Eds) 2008. *Elephant Management: A Scientific Assessment for South Africa*. Wits University Press, Johannesburg, ISBN: 1868144798, 645pp.
- Scholes, R.J. and Mennell, K.G. 2008. *Elephant Management: An Assessment for South Africa, Summary for Policymakers*. Wits University Press, Johannesburg, 18pp.

- RECENT CONFERENCE PRESENTATIONS (please inquire for a complete list)
  - Smart et al.: *Long-term monitoring and open access data by EFTEON*. Thicket Forum 2023, Addo Elephant Park, South Africa, 5-8 June 2023.
  - Palmer, T. Weidman, C. and Smart. K.: *Carbon uptake in trees versus grassland*. Savanna Science Network Meeting, Skukuza, 6-10 March 2023.
  - Feig et al. 2023: *South Africa's Expanded Freshwater and Terrestrial Environmental Monitoring Research Infrastructure*. Joint iLEAPS – OzFLUX meeting. New Zealand, 1-4 February 2023.
  - Smart et al.: *EFTEON has a catchment partner*. Upper uThukela Catchment Partnership Meeting. Bergville Municipality. 10 November 2022.
  - Palmer et al.: *Some realities of the primary production and water use of semi-arid rangelands in the Eastern Cape: preliminary results from eddy covariance towers in the Great Fish Thicket, Bhisho Thornveld and Bedford Dry Grassland*. Grassland Society of Southern Africa Congress, virtual, 2021.
  - Smart, K., Archibald, S., Venter, N. and Cowie, B.: *The unexpected response of spekboom to CO<sub>2</sub> and drought*. Thicket Forum 2019, Addo Elephant Park, South Africa, 12-14 June 2019.
  - Powell, M. and Smart, K.: *Manipulating soil moisture release from heavy clay soils for improved restoration success*. Thicket Forum 2019, Addo Elephant Park, South Africa, 12-14 June 2019.
  - Smart, K.: *Climate potential of future novel ecosystems*. Invited oral presentation. SASUF Wilder rangelands workshop 2019, 6-7 May 2019.
  - Smart, K., Palmer T. and Ripley, B. *Carbon vs Water; Bush encroachment in the Thicket*. Savanna Science Network Meeting, Skukuza, Kruger National Park, South Africa, 3-8 March 2019.
  - Smart, K. and Palmer, T.: *Using paired eddy covariance towers to assess the impacts of bush encroachment*. Invited oral presentation. Carbon Connections meeting, Cathedral Peak, 10-14 September 2018.
  - Smart, K.: *Spekboom growth under past, present and future CO<sub>2</sub> levels*. Thicket Forum, Addo Elephant Park, South Africa, 14-16 June 2018.
  - Scholes, R.J. and Smart, K.: *The Primary Productivity of Thicket Vegetation*. Thicket Forum, Addo Elephant Park, South Africa, 14-16 June 2018.
  - Smart, K. Scholes, R.J. and Woodbourne, S.: *Using tree rings structure and isotopes to reconstruct production dynamics of the facultative CAM plant Portulacaria afra (Jacq.)*. International Longer-Term Ecological Research Network (ILTER) 1<sup>st</sup> Open Science Meeting, Skukuza, Kruger National Park, South Africa, 9-13 October 2016. Awarded best poster presentation.
  - Smart, K.: *Spekboom-related changes to Thicket ecosystem service delivery*. Invited plenary talk. Thicket Forum, Addo Elephant Park, South Africa, 21-23 June 2016.

## SKILLS DEVELOPMENT

- **EMSAfrica Winter School**, Intensive virtual short course on Eddy Covariance Systems 24-26 November 2021.
- **Strengthening Postgraduate Supervision programme**, an intensive short course accredited through the Centre of Higher Education and Learning (CHERTL), Rhodes University. November 2017- January 2018.
- **High-Level System Analysis Capacity Strengthening Three-Week Programme, South African Systems Analysis Centre (SASAC)**, University of the Witwatersrand (Johannesburg) and the Wits Rural Facility (Polokwane), 21 August - 9 September 2016.
- **MISR-HR Seminar and Workshop**, by M. M. Verstraete (JCR) and L. A. Hunt (NASA Langley and SSAI), hosted at South Africa National Space Agency (SANS) Training Centre, Hartebeeshoek, South Africa, 23 November 2011.
- **Environmental Skills Summit** by the Biodiversity Human Capital Development Programme, the Department of Environmental Affairs, the Department of Water Affairs, and the Department of Science and Technology, hosted at the Innovation Hub, Pretoria, South Africa, 2-3 March 2011.
- **Integrated Land Ecosystem-Atmosphere Processes Study (iLEAPS) Early Career Scientist Workshop**, hosted by University of Melbourne, Australia, 20-22 August 2009.
- **Biological Data Analysis and Informatics using R workshop** by Q. Wills (Oxon) and C. Mitchell (Cantab), hosted by Wits University, Johannesburg, South Africa, 29 June - 3 July 2009.

- **Trends in Plant Ecophysiology and Ecosystem Ecology Research** by D. Baldocchi (University of California Berkley) and P.S. Nobel (University of California Los Angeles), hosted at University of Palermo, Sicily, 23-27 June 2008.
- **RECENT WORKSHOP ATTENDANCE** (please inquire for a complete list)
  - **Thicket management and carbon... xxx 2023**
  - **UNCCD COP 14 Planning Meeting**, Pretoria, 20 June 2019.
  - **Albany Thicket Research Framework and Praxis Workshop**, hosted by Rhodes Restoration Group, Addo Elephant Park, 10-12 May 2019.
  - **SASUF Workshop: Climate Change Mitigation and Adaptation Benefits of Wilder Rangelands**, hosted by Nelson Mandela University, Port Elizabeth, 6-7 May 2019.
  - **Albany Thicket Research Framework Workshop**, hosted by Rhodes Restoration Group, Rhodes University, Grahamstown, 23-24 October 2018.
  - **Carbon Connections Workshop**, joint SAEON and EFTEON workshop, Cathedral Peak, South Africa 11-14 September 2018.
  - **Land Cover Change Consortium workshop: “Biophysical feedbacks of land cover change in South Africa and their consequences for climate and hydrology”**, Skukuza, South Africa, 14-16 October 2016.
  - **4<sup>th</sup> GEOLAM Rangeland and Pasture Productivity (RAPP) Workshop**, by the South African National Space Agency (SANSA) and Council for Scientific and Industrial Research Organisation (CSIRO), hosted by the City of Tshwane, Pretoria, 20-21 June 2016

## TEACHING EXPERIENCE

### Supervision

I currently supervise the following students:

- Toka Mosikidi (2023 onwards). PhD student, University of Free State. ‘Soundscape dynamics of the Northern Drakensberg’.
- Kamva Zenani (2021 onwards). MSc student, Institute for Water Research, Rhodes University. ‘Water Use Efficiency of *Cannabis sativa* and its viability as a stable small grower crop.’
- Neha Kooverjee (2021 onwards). MSc student, Animal Plant and Environmental Science, Wit University. ‘Landscape-scale carbon stocks in the Albany thicket biome in the Baviaanskloof, South Africa.’

My past students include:

- Bronwyn Trafford (2020-2022). MSc, ‘Implications of changing land use and introducing extralimital herbivores on vegetation in the subtropical thicket, South Africa’. Department of Zoology and Entomology, Rhodes University.
- Dylan Baldwin (2021). Honours, ‘Germination survivorship and stress of Eastern Cape landrace *Cannabis sativa*.’ Department of Environmental Science, Rhodes University.
- Yenziwe Mbuyisa (2020). Honours, ‘Climate records and land management insights for the Baviaanskloof using the Baviaans Cedar, *Widdringtonia schwarzii*.’ Department of Environmental Science, Rhodes University.
- Kamva Zenani (2019). Honours, ‘Soil Nutrient Levels: The difference between Intact and Transformed Thicket’. Co-supervised with Dr Rina Grant-Biggs. Department of Environmental Science, Rhodes University.
- Putuma Balintulo (2019). Honours, ‘Differences in the vegetation cover of the transformed and intact thicket, GAENP, Eastern Cape’. Co-supervised with Dr Rina Grant-Biggs. Department of Environmental Science, Rhodes University.
- Chelsea Botha (2019). Honours, ‘Carbon modelling *Portulacaria afra* (Spekboom)’. Department of Environmental Science, Rhodes University.
- Bronwyn Trafford (2019). Honours, ‘The use of remote sensing and ground-truthing to analyse the effects of land transformation on Thicket’. Co-supervised with Dr Kaera Coezter-Hanack. Department of Environmental Science, Rhodes University.

## Interns

- Georgia-Ann St Quintin (2020) Groen Sabenza intern with a focus on systems analysis.
- Kamva Zenani (2020) Groen Sabenza intern with a focus on soils and plant physiology.
- Yenziwe Mbuyisa (2019) Groen Sabenza intern with a focus on plant traits and anatomy.

## Young scientists

- Craig Mahlasi (2019-present). PhD student, UCT. Thesis: 'RReTool: Rapid and repeatable tools for monitoring Near-real time detection of clearing of Albany Thicket'. SAEON SASSCAL Project with Glenn Moncrieff.
- Craig Weideman (2019-present) PhD student, Rhodes University. Thesis: 'Hydrological impacts of Woody Encroachment'. SAEON ESSRP Project with Michele Toucher and Tony Swemmer.
- Yondela Masande Norman (2019-present). PhD student, Rhodes University. Thesis: 'Modifying the current planting protocol to improve the establishment of *Portulacaria afra* in Albany Thicket Biome (ATB) of the Baviaanskloof, Eastern Cape.'

## Postgraduate teaching

- *Quantitative and Qualitative Statistics*, The African Research Universities Alliance, 2021-2022.
- *Environmental Science Honours: R programming and Statistics*, Rhodes University, 2020-2022.
- *Environmental Science Honours: Reflective Learning*, Rhodes University, 2020-2021.
- *Environmental Science Honours: Restoration Ecology*, Rhodes University, 2019-2020.
- *Environmental Science Masters Course: Maintaining Ecosystem Processes: Foundations*, Wits University, Associate Lecturer, 2013-2018.

## Undergraduate teaching

I have taught components of various courses at 2<sup>nd</sup> and 3<sup>rd</sup> year levels of undergraduate study. These have included discipline-specific theory as well as analytical skills:

- *Research Design and Philosophy*, Environmental Science III, Department of Environmental Science, Rhodes University, 2022.
- *Monitoring and Evaluation*, Environmental Science III, Department of Environmental Science, Rhodes University, 2021-2022
- *Environmental Science III*, Rhodes University: Guest lecturer, Systems Ecology and biogeochemistry of restoration 2019-2021.
- *Research design III*, Botany Department, Rhodes University: Guest lecturer, R programming and Statistics, 2017-2019.
- South African Biomes talk and hike, Furman University abroad course hosted at Rhodes University: Guest lecturer, 2017 and 2019.
- *Plant Diversity I*, Rhodes University: Locum lecturer, 2013.
- *Functional Ecology III*, Wits University: Guest Lecturer, carbon cycle and photosynthesis, 2013, 2015.
- *Trends in Biology II*, Wits University. Guest Lecturer, biophysics and earth's radiation budget, 2013.
- *Systems Ecology III*, Wits University. Guest Lecturer, ecosystem services. 2010, 2013, 2015, 2016.

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## ACADEMIC CITIZENSHIP AND OUTREACH

### ● PRAXIS

- I have contributed to workshops to discuss conservation area expansion of the Addo to Great Fish project.
- As part of my position funded by National DEFF-NRM, I worked with provincial and national agencies and stakeholders including the Green Scorpions, WWF and SANBI to protect Thicket vegetation.
- Presentation and engagement at the Annual State of Environment Information Community of Practice workshop, 16-17 February 2023.

### ● CONFERENCE ORGANISATION

- Member of the FLUXNET organising committee 2023
- Member of the Thicket Forum steering committee, 2017 onwards.

- Part of the organising committee for the *Workshop on the Development of an Experimental Global Drought Information System (GDIS)*, Frascati, Italy, 11-13 April 2012.
- Organiser of the SAEON WiSA CSAG *Workshop on high-resolution climate change data for southern Africa*, hosted by Wits University, 27 March 2007.

- **SCIENCE COMMUNICATION**

Writer for the European Commission AfriCAN Climate Project Portal, June-September 2014.

- **REVIEWER**

I have reviewed manuscripts for PLOS ONE, PeerJ, South Africa Journal of Botany, Namibian Journal of Environment, and African Journal of Ecology.