

CV Rainer M. Krug

PERSONAL DETAILS

Name	Rainer M. Krug
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Year of birth	1968
Civil status	married, one daughter

QUALIFICATIONS

Postgraduate

- 2008 PhD in Conservation Ecology**, Stellenbosch University, South Africa
Thesis Title: Modelling seed dispersal in restoration and biological invasion.
- 1997 MSc Conservation Biology**, University of Cape Town, South Africa
Thesis topic: The Genetic Diversity in a Founded Population of the African buffalo (*Syncerus caffer*): an example of an Artificial Bottleneck.
- 1995 Diplom (MSc equivalent) in Physics**, Philips-Universität Marburg, Germany
Thesis Title: Der Einfluss von Habitat Heterogenität auf die mittlere Überlebensdauer von Populationen (The influence of habitat heterogeneity on the mean survival time of populations)
Subjects for oral examination: Experimental Physics, Theoretical Physics, Ecological Modelling, Biology

Undergraduate

- 1992 Vor-Diplom (BSc equivalent) in physics**, Philips-Universität Marburg, Germany
Subjects for oral examination: Experimental Physics, Theoretical Physics, Mathematics, Chemistry.

TODO AREAS OF INTEREST AND EXPERTISE

- spatial modelling of pattern and processes on regional to local scale
- scenarios and models on local scales
- linking and implementing simulation models in management and policy
- using open source tools to develop models
- linking R and GRASS GIS for simulation and analysis

RESEARCH

- 08/2015 – 09/2015 Laboratoire Ecologie, Systematique et Evolution, Paris Sud**
Analyze measured vertical wind profiles to improve the performance of a forest growth model (CASTANEA) in regards to energy balance.
- 11/2014 – 12/2014 Laboratoire Ecologie, Systematique et Evolution, Paris Sud**
Develop proof of concept for assessing multi species forest community productivity. This was done in co-operation with
- 09/2013 – 11/2013 Laboratoire Ecologie, Systematique et Evolution, Paris Sud**
Adapt the framework developed to simulate the alien spread in the Western Cape for management of invasive alien species in the Drakensberg in Southern Africa. This included adding of new species and modification of processes parameter. The final product was a framework for further development.
- 2008 – 2012 DST-NRF Centre of Excellence for Invasion Biology, Stellenbosch University**
Investigating the temporal dynamics and the spread of biocontrol agents and their host plants on a landscape scale using a GIS based ecological simulation model, as well a non-spatial approach to understand diverse aspects of the interaction between biocontrol agent and host plant and how these interactions influence the effectiveness of biocontrol agents in halting the spread of invasive species. Results from the project were used to inform implementing agencies and are communicated in the form of contributions to a handbook.

Modelling the spread of alien species in the Western Cape with the aim of optimising the alien management strategies. This project included aspects ranging from using an Analytical Hierarchical Process to capture and quantify the subjective decision making process of prioritizing, translating this into a spatial simulation model, developing a spatial-temporal simulation model which included fire, alien plant management, different dispersal vectors (wind, water, birds) and to use high performance computing infrastructure (cluster) to run the simulations and to develop a package for R to compare the different resulting prioritisation maps spatially.

Investigating the spread of invasive species under different climate change scenarios. This involved developing the spread models (population based as well as probabilistic) which included climatic suitability maps to project the observed distribution under different climate change scenarios to identify risk areas and to assess the invasive potential of these species.

Assessing the viability of pine plantations under different (and changing) fire regimes using a basic modelling approach.

2007 – 2008 Plant Conservation Unit, University of Cape Town

Analyzing the population dynamics of *Aloe pillansii*, a tree aloe, with focus on the recruitment events and their reconstruction.

2000 – 2007 Conservation Ecology and Entomology department, Stellenbosch University

Modelling the role of seed dispersal in restoration and biological invasion, and investigating factors influencing the spread of a species. I have developed rule-based simulation models based on data collected in the field and experts estimates to predict the rate of spread of a species depending on dispersal ability, competition experienced in establishment, and the effects of biocontrol agents.

1996 – 1997 Percy FitzPatrick Institute of African Ornithology, University of Cape Town

Investigated the genetic heterogeneity of three populations of African Buffalo using microsatellites

GIS based conservation planning exercise in which species presence absence data was used to identify areas most relevant for conservation.

Participated in analysis of the financial value of the Good Hope Environmental Education Centre. It included, among others, questionnaires to tourists and schools concerning their willingness of paying to visit the centre.

1995 – 1995 Department of Physics, Philipps-Universität Marburg

Developed simulation model focussing on the effect of habitat use on the mean survival time of populations. This research was conducted in co-operation with a biologist who was involved in the planning of the project and in the formulation of the questions. Building a simulation model of the population investigated provided important insights in the importance of different habitat types for the survival and conservation of the species.

WORK EXPERIENCE

08/2011 – Research Associate at the NRF-DST Centre of Excellence for Invasion Biology.

06/2008 – 06/2008 Postdoctoral Research Fellow at the NRF-DST Centre of Excellence for Invasion Biology, hosted by Prof. Dave Richardson.

06/2007 – 06/2008 Postdoctoral Research Fellow at the Plant Conservation Unit, University of Cape Town, hosted by Prof. Timm Hoffman, and at the DST-NRF Centre of Excellence for Invasion Biology, Stellenbosch University, hosted by Prof. Dave Richardson.

ADDITIONAL SKILLS

Computer	Operating System Expert Linux user; advanced Mac and Windows user Programming Languages Extensive experience in programming in R, Delphi / Pascal; user of L ^A T _E X; basic usage of C Programs Extensive experience in R, GRASS; Daily Emacs user; MS Office programs / Libre Office; basic experience of QGIS and Arc-GIS
Language	German home language English reading, writing and speaking fluent French reading, writing and speaking fair

GRANTS

2009 – 2010	NRF Freestanding Postdoctoral Fellowship awarded
1999 – 2000	Deutscher Akademischer Austauschdienst (DAAD: German Academic Exchange Service) grant to conduct fieldwork for PhD at Gobabeb, Namibia.
1996 – 1997	Deutscher Akademischer Austauschdienst (DAAD: German Academic Exchange Service) grant to attend MSc in Conservation Biology course at UCT.

TEACHING EXPERIENCE

From 1997 – 2007, I taught the module "Introduction to True Basic", a one-week introductory course to the ecological modelling module as part of the MSc Conservation Biology at the University of Cape Town. For the same course, I assisted in lecturing the module "Ecological Modelling" for three years.

In 2004, I taught a seven week course including assignments on models in ecology as part of the BWE 424 course in the Department of Conservation Ecology, as well as additional lectures on models in ecology, and I regularly assisted in teaching Leslie Matrix modelling in a module on sustainable harvesting.

In addition, I taught six practicals for the Population and Conservation Ecology undergraduate course at the Stellenbosch University.

During my PhD I co-supervised an MSc student who investigated seed dispersal in Renosterveld by conducting seed trapping experiments.

In 2007, 2008 and 2009 I taught R introductory R block courses to students from postgraduate to postdoctoral level (between 2 and 3 days each).

In 2008 and 2009 I was involved in conducting the Tygerberg Olympiad, a project for grade nine to eleven learners, in which they are taught aspects ranging from ecological, legal, archeological aspects concerning the region (Tygerberg). At the end, they are expected to give a short presentation and prizes are handed out.

OTHER EXPERIENCE

During my time at the desert research station Gobabeb (1997 2000), I was involved in conducting participatory workshops with the local communities on

PUBLICATIONS

Peer-reviewed Journals

- Krug, R. M., Richardson, D. M., apr 2014. Modelling the effect of two biocontrol agents on the invasive alien tree *Acacia cyclops* — Flowering, seed production and agent survival. *Ecological Modelling* 278, 100–113.
URL <http://dx.doi.org/10.1016/j.ecolmodel.2014.01.028><http://linkinghub.elsevier.com/retrieve/pii/S0304380014000714><http://www.sciencedirect.com/science/article/pii/S0304380014000714>
- Krug, R. M., Roura-Pascual, N., Richardson, D. M., jul 2010. Clearing of invasive alien plants under different budget scenarios: using a simulation model to test efficiency. *Biological Invasions* 12 (12), 4099–4112.
URL <http://www.springerlink.com/index/E342L4008P462563.pdf><http://www.springerlink.com/content/e342l4008p462563>
- Le Maitre, D. C., Krug, R. M., Hoffmann, J. H., Gordon, A. J., Mgidi, T. N., 2008. *Hakea sericea*: Development of a model of the impacts of biological control on population dynamics and rates of spread of an invasive species. *Ecological Modelling* 212 (3–4), 342–358.
URL <http://www.sciencedirect.com/science/article/pii/S0304380007006059>
- Marques, A., Pereira, H. M., Krug, C., Leadley, P. W., Visconti, P., Januchowski-Hartley, S. R., Krug, R. M., Alkemade, R., Bellard, C., Cheung, W. W. L., Christensen, V., Cooper, H. D., Hirsch, T., Hoft, R., van Kolck, J., Newbold, T., Noonan-Mooney, K., Regan, E. C., Rondinini, C., Sumaila, U. R., Teh, L. S., Walpole, M., oct 2014. A framework to identify enabling and urgent actions for the 2020 Aichi Targets. *Basic and Applied Ecology* 15 (8), 633–638.
URL <http://www.sciencedirect.com/science/article/pii/S1439179114001261><http://linkinghub.elsevier.com/retrieve/pii/S1439179114001261><http://dx.doi.org/10.1016/j.baae.2014.09.004>
- Privett, S. D. J., Krug, R. M., Forbes, G., Gaertner, M., sep 2014. Wild flower harvesting on the Agulhas Plain, South Africa: Impact of harvesting intensity under a simulated commercial harvesting regime for two re-seeding and two re-sprouting fynbos species. *South African Journal of Botany* 94, 270–275.
URL <http://linkinghub.elsevier.com/retrieve/pii/S025462991400129X><http://www.sciencedirect.com/science/article/pii/S025462991400129X>
- Richardson, D., Iponga, D., Roura-Pascual, N., Krug, R., Milton, S., Hughes, G., Thuiller, W., 2010. Accommodating scenarios of climate change and management in modelling the distribution of the invasive tree *Schinus molle* in South Africa. *Ecography* 33 (July), 1049–1061.
URL <http://onlinelibrary.wiley.com/doi/10.1111/j.1600-0587.2010.06350.x/full>
- Roura-Pascual, N., Bas, J. M., Thuiller, W., Hui, C., KRUG, R. M., Brotons, L., 2009a. From introduction to equilibrium: reconstructing the invasive pathways of the Argentine ant in a Mediterranean region. *Global Change Biology* 15 (9), 2101–2115.
URL <http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2486.2009.01907.x/full>
- Roura-Pascual, N., Krug, R. M., Richardson, D. M., Hui, C., apr 2010. Spatially-explicit sensitivity analysis for conservation management: exploring the influence of decisions in invasive alien plant management. *Diversity and Distributions* 16 (3), 426–438.
URL <http://www.sciencemag.org/content/312/5781/1715><http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2486.2009.01907.x/full>

wiley.com/doi/10.1111/j.1472-4642.2010.00659.x/full<http://doi.wiley.com/10.1111/j.1472-4642.2010.00659.x>

Roura-Pascual, N., Richardson, D. M., Chapman, R. A., Hichert, T., Krug, R. M., 2011. Managing biological invasions: charting courses to desirable futures in the Cape Floristic Region. *Regional Environmental Change* 11 (2), 311–320.

Roura-Pascual, N., Richardson, D. M., Krug, R. M., Brown, A., Chapman, R. A., Forsyth, G. G., Le Maitre, D. C., Robertson, M. P., Stafford, L., van Wilgen, B. W., Wannenburgh, A., Wessels, N., 2009b. Ecology and management of alien plant invasions in South African fynbos: accommodating key complexities in objective decision making. *Biological Conservation* 142, 1595–1604.

Singer, A., Johst, K., Banitz, T., Fowler, M. S., Groeneveld, J., Gutiérrez, A. G., Hartig, F., Krug, R. M., Liess, M., Matlack, G., Meyer, K. M., Pe'er, G., Radchuk, V., Voinopol-Sassu, A.-J., Travis, J. M., dec 2015. Community dynamics under environmental change: How can next generation mechanistic models improve projections of species distributions? *Ecological Modelling* in press.

URL <http://dx.doi.org/10.1016/j.ecolmodel.2015.11.007><http://linkinghub.elsevier.com/retrieve/pii/S0304380015005281>

Book Chapters

Hui, C., Krug, R. M., Richardson, D. M., 2011. Fifty Years of Invasion Ecology: The Legacy of Charles Elton. Wiley-Blackwell, Oxford, Ch. Models spr, pp. 329–343.

Krug, C. B., Krug, R. M., 2007. Old fields: Dynamics and restoration of abandoned farmland. Island Press / Society for Ecological Restoration, Washington, Ch. Restoratio.

Maertens, B., Henle, K., Kuhn, W., Krug, R. M., Johst, K., Grosse, W.-R., Wissel, C., 1996. Species Survival in Fragmented Landscapes. In: Settele, J., Margules, C., Poschlod, P., Henle, K. (Eds.), *Species Survival in Fragmented Landscapes*. Vol. 35 of The GeoJournal Library. Springer Netherlands, Dordrecht, pp. 241–247.

URL <http://link.springer.com/10.1007/978-94-009-0343-2>

Marques, A., Krug, C., Regan, E., Bowles-Newark, N., Burgess, N., Visconti, P., Walpole, M., Tittensor, D., Pereira, H., Leadley, P., Krug, R. M., 2014. Integrated Analysis of the 2020 Strategic Goals: Time Lags, Indicators and Interactions. In: Leadley, P., Krug, C., Alkemade, R., Pereira, H., U.R., S., Walpole, M., Marques, A., Newbold, T., Teh, L., van Kolck, J., Bellard, C., Januchowski-Hartley, S., Mumby, P. (Eds.), *Progress towards the Aichi Biodiversity Targets: An Assessment of Biodiversity Trends, Policy Scenarios and Key Actions*. Secretariat of the Convention on Biological Diversity, Montreal, Canada., Ch. 21, pp. 441–467.

Conference proceedings

Krug, C. B., Krug, R. M., Midoko Iponga, D., Walton, B. A., Milton, S. J., Newton, I. P., Farley, N., Shiponeni, N. N., 2004a. Restoration of West Coast Renosterveld: facilitating the return of a highly threatened vegetation type. In: Arianoutsou, M., Papanastasis, V. P. (Eds.), *Ecology, Conservation and Management of Mediterranean Ecosystems. Proceedings of the 10th International Conference on Mediterranean Ecosystems*, April 25 – May 1, 2204, Rhodes, Greece. Millpress, Rotterdam, pp. 1–12.

Krug, R. M., Johst, K., Wissel, C., Maertens, B., 1996. Wirkung der räumlichen Heterogenität innerhalb eines Habitats auf die mittlere Überlebensdauer einer Zauneidechsen-Population. *Verhandlungen der Gesellschaft fuer Oekologie* 26, 447–454.

Krug, R. M., Krug, C. B., Midoko Iponga, D., Walton, B. A., Milton, S. J., Newton, I. P., Farley, N., Shiponeni, N. N., 2004b. Reconstructing West Coast Renosterveld: past and present

- ecological processes in a Mediterranean shrubland of South Africa. In: Ecology, Conservation and Management of Mediterranean Ecosystems. Proceedings of the 10th International Conference on Mediterranean Ecosystems, April 25 – May 1, 2004, Rhodes, Greece. No. 1999. pp. 1–12.
- Krug, R. M., Roura-Pascual, N., Richardson, D. M., 2009. Prioritising areas for the management of invasive alien plants in the CFR: different strategies, different priorities? *South African Journal of Botany* 75 (2), 408–409.
- Roura-Pascual, N., Krug, R. M., Richardson, D. M., 2009. Identifying priority areas for the management of invasive alien plants in the Cape Floristic Region. In: *South African Journal of Botany*. Vol. 75. p. 439.

Software Packages

- Krug, R. M., Eddelbuettel, D., 2009. earthmovdist: Wrapper to the Emd-L1 library by Haibin Ling and Kazunori Okada.
URL <http://earthmovdist.r-forge.r-project.org/>

Guest lectures

- Krug, C. B., Krug, R. M., 2004. West Coast Renosterveld: Ökologische Prozesse und Restaurierung (West Coast Renosterveld: Ecological Processes and Restoration).
- Krug, R. M., 2004. Ecological Modelling — A Taxonomy.