UNIVERSITY OF PRETORIA
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A Co-evolutionary Landscape Ecology Framework for Analyzing Human Effects on KwaZulu-Natal Province Landscapes and its Relevance to Sustainable Biodiversity Conservation

by

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Submitted in partial fulfillment of the requirements for the degree

Doctor of Philosophy

in

Sustainable Ecological Management

in the Faculty of Natural & Agricultural Sciences
University of Pretoria
Pretoria

November 2000

ACKNOWLEDGEMENTS

I gratefully acknowledge the assistance of the many following individuals in providing me with guidance for this study. In particular, the support provided by Dr. Albert van Jaarsveld in both the conceptual development and his ongoing interest was critical to the accomplishment of this work. I also give special thanks to Dr. Richard Norgaard (UC Berkeley), Dr. Kurt Riitters (North Carolina State Univ.), Dr. John Estes (UC Santa Barbara), Dr. David Everard (CSIR Environmentek), Dr. Les Underhill (Avian Demography Unit, Univ. of Cape Town), Dr. Keith Bevon (University of Pretoria), Dr. Bob Pressey (New South Wales National Parks, Australia) and Dr. Raymond O'Connor (Univ. of Maine, Orono) for their early support and criticisms of my understanding of the work at hand. Special thanks as well for the exceptional contributions of Dr. Mrigesh Kshatriya (Univ. of Pretoria), Dr. Andries Engelbrecht (Univ. of Pretoria), Grant Benn (KwaZulu-Natal Nature Conservation Services) and Belinda Reyers (Univ. of Pretoria) in assisting with some of the analyses presented in this document. A timely completion would not have happened without full time financial support granted to me by the South African Biodiversity Monitoring and Assessment Program for the last two years of the study.

I also wish to thank my two independent external reviewers for their thorough examination and constructive criticisms of this thesis: Dr. Peter August (Univ. of Rhode Island) and Dr. Amanda Lombard (Univ. of Cape Town).

Increasingly, I have to acknowledge, I learned from this thesis that a project proposal and a final scientific document are two different things. The way I work is that I piece together the analyses like a jigsaw puzzle, look at it, and figure out what's missing. At that point, it's more about how the science output logically flows together rather than how the output must fit with the original proposed science plan. Evolution within bounds is good and hindsight is, as always, 20/20.

The duration of these studies and my working period for the CSIR Division of Water, Environment and Forestry Technology in South Africa was marked by growth on a personal level as well as in the academic domain. I acknowledge my international friends in South Africa and especially friends and family in the USA, for their support during this long period and in broadening my perspectives of life and what sustainability really means to an individual and in the global culture. To the South African gang who kept me in good humor: Mike Adam, Mark Thompson, Jane Thompson, Phil Plarre, Kevin Higgins, Ennio Macagnano, Stuart Martin, Patrick McKivergan, Mike Musgrave, Brett Harrison, Rose Smith, Thorsten Rosener, Barend Erasmus, Stephanie Koch, Marinda Dobson, Ian Meikeljohn, Berndt van Rensburg, and the many South Africans I have met along the way. Thanks to my parents Ron and Bonnie, and my sister Devin for all their support, teasing, and reality checks that were needed often. Yes, yes, I am finally done! Hurray for E-mail and the support of friends back in the States. Thanks Sy Henderson, Ken McGwire, David Elliott, Kevin Elliott, Jason Rogers, Susan Sullivan, Mich Taniguchi, and Eric Payne for all your support.

Most special of all I acknowledge the love and support of Portia Odessyl Ceruti. To have met her and fallen in love has been one of the most fulfilling and defining moments in my life. Its just amazing to me that we met so far from home, yet we grew up practically in each others backyards. Life has been good to me and will only get better. I am done P and now its time for me to help and support you.

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A Co-evolutionary Landscape Ecology Framework for Analyzing Human Effects on KwaZulu-Natal Province Landscapes and its Relevance to Sustainable Biodiversity Conservation

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Abstract

The conservation of biotic diversity is a growing challenge within southern Africa at the beginning of the 21st century. Growing populations and trends toward a questionable Western development model place demands on the use of land for food, fiber, and fuel production. The traditional establishment and use of formal conservation areas is being challenged against the needs of humans and the past unbalances created by colonial rule. Conservation areas, as isolated islands in a sea of change driven by interconnected economic and social systems, may not be a basis for sustainable biodiversity conservation. This thesis examines characteristics of avian species diversity response to abiotic environmental variables and land transformation. Environmental and land-use correlates of species gradients, species diversity patterns, and the spatial patterning of bird assemblages varied with location. The findings supported a conceptual model of multi-scaled controls on bird distribution, and the related notion that local community structure is the result of both regional environmental and local-scale landscape pattern that must be taken in to account in regional conservation planning assessments. An analytical framework including an landscape model, use of complementary-based reserve selection procedures, gradient analysis, and inclusion of the total spatial economy and development needs of the KwaZulu-Natal Province proved to be important for developing an integrated conservation plan for sustainable avian conservation. Pattern recognition results of the spatial economy and landscape pattern revealed the strong dichotomy in Western economic versus rural African landscapes, which have lead to strong differences in avian assemblage patterns. The research described in this thesis targets specific objectives of the Sustainable Biosphere Initiative by addressing requirements for landscape level analysis of humans and ecosystems in an integrated analytical framework. The development of a co-evolutionary landscape ecology framework for examining human-ecosystem interaction provides a strong basis for supporting targeted conservation planning within regions rather than supporting a generic conservation planning framework.

Keywords: biodiversity, birds, conservation, co-evolution, landscape ecology, gradients, spatial statistics, sustainability, KwaZulu-Natal Province, South Africa.

Disclaimer

This thesis consists of a series of chapters and appendices that have been prepared for submission to, or publications in, a range of scientific journals. As a result, styles may vary between chapters and appendices in the thesis and overlap may occur to secure publishable entities.

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Preface

The following is from a dialog between the late American journalist Bill Moyers and the late Joseph Campbell, which seems to me to nicely tie together one of the great issues of society and sustainable ecological management:

> *Moyers*: Zorba says, "Trouble? Life is Trouble."
>
> *Campbell*: Only death is not trouble. People ask me, "Do you have optimism about the world?" And I say, "Yes, it's great just the way it is. And you are not going to fix it up. Nobody has ever made it any better; it is never going to be any better. This is it, so take it or leave it. You are not going to correct or improve it."
>
> *Moyers*: Doesn't that lead to a rather passive attitude in the face of evil?
>
> *Campbell*: You yourself are participating in the evil, or you are not alive. Whatever you do is evil for somebody (or something). This is one of the ironies of the whole of creation (and the paradox of management).
>
> *Moyers*: What about this idea of good and evil in mythology, of life as a conflict between the forces of darkness and the forces of light?
>
> *Campbell*: ...In other traditions, good and evil are relative to the position in which you are standing. What is good for one is evil for the other. And you play your part, not withdrawing from the world when you realize how horrible it is, but seeing that this horror is simply the foreground of a wonder.
>
> Joseph Campbell, *The Power of Myth*, 1988.

Therefore, for conservationists and others engaged in issues of sustainability though the situation in the world may look sorrowful, it is necessary to participate in the game. It wouldn't be life if there were not temporality involved, which is sorrow—loss. It is a wonderful opera set on a diverse geographic backdrop—except that it hurts. Within conservation and sustainability circles we must affirm that this is the way it is, the challenges with re-integrating societies goals with the requirements of ecosystems will not be won or lost, but will evolve through knowledge to something that is better than it was before but never to the level that we want it to be. Affirmation is difficult, and as a discipline, we are always trying to affirm with conditions (i.e., I will affirm the world on condition that it gets to be the way Aldo Leopold said it ought to be). By accepting the evolution of societies and ecosystems and our role as conservationists, landscape ecologists, and geographers as adding components to its guidance, we will be able to make a difference in creating future landscapes with a level of ecological integrity acceptable for that time. This may be all we can accomplish, however this is a tremendous amount to accomplish, and therefore should not be seen as a loss. This thesis work provides empirical evidence of how the human socio-economic-political and ecosystem response game has been played so far in the KwaZulu-Natal Province, South Africa.