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Pretoria, South Africa

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

by

Dean Howard Kenneth Fairbanks

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in

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## VITA

### Dean Howard Kenneth Fairbanks

**Born:** February 22, 1969, Lompoc, CA United States of America

**Education:** 1991 Bachelor of Arts in Geography, University of California, Santa Barbara, USA  
1993 Master of Arts in Geography, University of California, Santa Barbara, USA  
2001 Ph.D. in Sustainable Ecological Management, University of Pretoria, Pretoria, South Africa

#### Professional Experience:

Map and Imagery Laboratory, Davidson Library, University of California, Santa Barbara, USA  
Student Research Assistant, 1989 to 1991

Remote Sensing Research Unit, Dept. of Geography, University of California, Santa Barbara, USA  
Student Research Associate, 1990 to 1991  
Graduate Student Researcher, 1991 to 1993

Council for Scientific and Industrial Research, Division of Water, Environment and Forestry, Pretoria, South Africa  
Research Scientist, 1994 to 1999

SA Biodiversity Monitoring and Assessment Program, C/o Conservation Planning Unit, Dept. of Zoology and Entomology, University of Pretoria, South Africa  
Senior Research Officer, 1999 to 2001

#### Peer Reviewed Publications:

Fairbanks, D.H.K., 2000. Physio-climatic classification of South Africa's woodland biome. *Plant Ecology*, 149:71-89.

Fairbanks, D.H.K. and Benn, G.A., 2000. Deriving the landscape structure of a region for biodiversity conservation planning: a case study from KwaZulu-Natal, South Africa. *Landscape and Urban Planning*, 50 (4):237-257.

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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**

**Student:** Dean H.K. Fairbanks

**Supervisor:** Prof. Albert S. van Jaarsveld

**Department:** Zoology and Entomology, University of Pretoria, South Africa

**Degree:** Doctor of Philosophy (Sustainable Ecological Management)

### **Abstract**

The conservation of biotic diversity is a growing challenge within southern Africa at the beginning of the 21<sup>st</sup> 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 a 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.