



**Nelson Mandela African Institution of Science and Technology,
Arusha, Tanzania
Sept 3rd – Sept 14th, 2018**

**Introduction to Computational and Mixed Models in Wildlife and
Resource Conservation**



By

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FIRST WEEK COURSE CONTENT

The course will provide an induction into how computational models can be formulated and applied to address problems in wildlife and bio-resource conservation and management. Topics covered include the descriptive and structured equations, simulation models, scenario assessment, harvest strategies, population viability analysis, herbivore-vegetation interactions and vegetation dynamics. The approach will emphasise particularly how models can accommodate the consequences of climatic variability and spatial heterogeneity.

SECOND WEEK COURSE CONTENT

This course is a gentle introduction to mixed models. Mixed models are appropriate for a wide variety of problems in biology, ecology, conservation, environmental science and other scientific disciplines. For example, mixed models are appropriate for data sets containing nested data, temporal correlation, spatial correlation, data with many zeros, etc. The course will adopt a tutorial style and use example data sets to explain and illustrate concepts, models and methods. Example analyses will be based on code written in R. Strong emphasis will be placed on understanding when the methods are needed, how to implement the methods (in R) and how to interpret the results. Many worked examples in R will be used to illustrate insights that can be obtained from using these models.

Agenda overview

Monday Sept 3rd:

- **INTRODUCTION: Why develop a model?**
- **DESCRIPTIVE EQUATIONS: Forms of density dependence**
- **MATRIX PROJECTIONS: Age vs stage structure**

Tuesday Sept 4th:

- **ASSESSING UNDERSTANDING: Simulation models**
- **EXPLORING OPTIONS: Scenario models**

Wednesday Sept 5th:

- **ADAPTIVE MANAGEMENT: Harvesting strategies**
- **RISK ASSESSMENT: Population viability analysis**

Thursday Sept 6th:

- **VEGETATION MANAGEMENT: Contingencies and disturbances**
- **HABITAT MANAGEMENT: Patch states and transitions**

Friday Sept 7th:

- **FITTING MODELS TO DATA: Model selection statistics**
- **OPEN TOPIC**

Saturday and Sunday, Sept 8th and 9th: free

Monday Sept 10th:

- **EXPLORING DATA**

Tuesday Sept 11th:

- **LINEAR REGRESSION MODELS**
- **LINEAR MIXED MODELS (LMMs)**

Wednesday Sept 12th:

- **GENERALIZED LINEAR MODELS (GLMS)**
- **GENERALIZED LINEAR MIXED MODELS (GLMMs)**

Thursday Sept 13th:

- **GENERALIZED ADAPTIVE MODELS (GAMS)**
- **GENERALIZED ADDITIVE MIXED MODELS (GAMMs)**

Friday Sept 13th:

- **ZERO-INFLATED GENERALIZED LINEAR MODELS**
- **ZERO-INFLATED POISSON GLMs**
- **ZERO-INFLATED NEGATIVE BINOMIAL GLMs**

DETAILS ABOUT THE COURSE:

The host, CREATES in NM-AIST, will provide free lunch, dinner and teas for all course days. In addition, shuttle transfer from your place of accommodation to the course site at NM-AIST will be provided.

REGISTRATION FEES:

- Participants from NM-AIST are free of charge
- Participants from Tanzania shall pay 100 \$US
- Participants from the African region (outside of Tanzania) shall pay 150 \$US

Further, all participants are required to pay for their own travels and accommodation.

HOW TO APPLY:

Please send an email to: anna.treydte@nm-aist.ac.tz

Attach an updated CV and a letter of motivation why you think you should participate in this course and how it will help your current / future research activities.

Send these documents no later than July 25th, 2018!

SUPPORTING TEXT

Introduction to Modeling in Wildlife and Resource Conservation

by Norman Owen-Smith (Wiley-Blackwell 2007).

Either purchase the book or obtain copies of the book chapters on CD. Explanatory chapters are supported by appendices outlining steps in the formulation of models in Excel spreadsheets, plus source code and executable versions of models written in the programming language True BASIC.

OTHER MODELLING TEXTBOOKS

Bolker, B.M. (2008) *Ecological Models and Data in R*. Princeton University Press.

Burgman, M. A., S. Ferson & H. R. Akcakaya (1993) *Risk Assessment in Conservation Biology*. Chapman and Hall

Hilborn, R. & M. Mangel. (1997) *The Ecological Detective. Confronting Models with Data*. Princeton Univ. Press

Milner-Gulland, E. J. & R. Mace. (1998) *Conservation of Biological Resources*. Blackwell, Oxford.

Owen-Smith, N. (2002) *Adaptive Herbivore Ecology. From Resources to Populations in Variable Environments*. Wiley-Blackwell

Sinclair, A.R.E., Fryxell, J.M. & Caughley, G. (2005) *Wildlife Ecology, Conservation and Management*. 2nd edn. Blackwell, Oxford.

Starfield, A. M. & A. L. Bleloch (1991). *Building Models for Conservation and Wildlife Management*. 2nd edn. Burgess, Minnesota

Williams, B.K., Nichols, J.D. & Conroy, M.J. (2002) *Analysis and Management of Animal Populations*. Academic Press