

# Matrix Population Models

SECOND  
EDITION

CONSTRUCTION, ANALYSIS, AND INTERPRETATION



HAL CASWELL

# Matrix Population Models Construction Analysis And Interpretation

**Marc Kéry, J. Andrew Royle**



## **Matrix Population Models Construction Analysis And Interpretation:**

**Matrix Population Models** Hal Caswell, 1989 Emphasizes the construction of models either from actual data or as an expression of hypotheses about the life cycle mathematical analysis of the models and the biological interpretation of the results Annotation copyrighted by Book News Inc Portland OR

**Modeling Demographic Processes in Marked Populations** David L. Thomson, Evan G. Cooch, Michael J. Conroy, 2008-12-11 Here biologists and statisticians come together in an interdisciplinary synthesis with the aim of developing new methods to overcome the most significant challenges and constraints faced by quantitative biologists seeking to model demographic rates

Matrix Population Models Hal Caswell, 1989

Applied Hierarchical Modeling in Ecology: Analysis of Distribution, Abundance and Species Richness in R and BUGS Marc Kéry, J. Andrew Royle, 2020-10-10 Applied Hierarchical Modeling in Ecology Analysis of Distribution Abundance and Species Richness in R and BUGS Volume Two Dynamic and Advanced Models provides a synthesis of the state of the art in hierarchical models for plant and animal distribution also focusing on the complex and more advanced models currently available The book explains all procedures in the context of hierarchical models that represent a unified approach to ecological research thus taking the reader from design through data collection and into analyses using a very powerful way of synthesizing data Makes ecological modeling accessible to people who are struggling to use complex or advanced modeling programs Synthesizes current ecological models and explains how they are inter connected Contains numerous examples throughout the book walking the reading through scenarios with both real and simulated data Provides an ideal resource for ecologists working in R software and in BUGS software for more flexible Bayesian analyses

*Population Viability in Plants* Christy A. Brigham, Mark W. Schwartz, 2013-06-29 Providing a quantitative assessment of threatened plant populations that holds for varying management scenarios has become an essential part of conservation planning Here renowned plant ecologists provide information on major threats to plants when and where to conduct a plant viability assessment PVA what type of PVA to conduct what alternative options to PVA are available what information is required for which kind of viability assessment what attributes of the population in question should be considered and what the limits of the PVA would be As such this volume can be used as a training tool for the environmental manager or a teaching aid for reviewing the current state of knowledge on plant population viability

**International Handbook of Health Expectancies** Carol Jagger, Eileen M. Crimmins, Yasuhiko Saito, Renata Tiene De Carvalho Yokota, Herman Van Oyen, Jean-Marie Robine, 2020-03-18 This handbook presents global research on health expectancies a measure of population health that examines the interaction between quantity and quality of life With data from Europe North America Asia and beyond it explains how to define and measure health and morbidity and how to integrate these measurements with mortality Coverage first highlights long term trends in longevity and health It also considers variations across and within countries inequalities and social gaps as well as micro and macro level determinants Next the handbook deals with the methodological

aspects of calculating health expectancies It compares results from different methods and introduces tools such as decomposition tool for decomposing gaps an attrition tool for attributing a medical cause to reported disability and a tool for measuring policy impact on health expectancies It introduces methods of forecasting health expectancies The handbook then goes on to examine the synergies and or trade off between longevity and health as well as considers such topics as the compression versus the expansion of morbidity disability and the health survival paradox The last section considers new concepts and dimensions of health and more broadly well being which can be used in summary measures of population health including psychological factors Researchers clinicians demographers and health planners will find this handbook an essential resource to this increasingly important public health and social policy tool It will help readers gain insight into changes in health over time as well as inequalities between countries regions and population subgroups *Applied Mathematical Demography* Nathan Keyfitz, Hal Caswell, 2005-11-14 Focuses on applications of demographic models This book introduces the life table to describe age specific mortality and uses it to develop theory for stable populations and the rate of population increase This theory is then revisited in the context of matrix models for stage classified as well as age classified populations *Complex Population Dynamics* Peter Turchin, 2013-02-15 Why do organisms become extremely abundant one year and then seem to disappear a few years later Why do population outbreaks in particular species happen more or less regularly in certain locations but only irregularly or never at all in other locations Complex population dynamics have fascinated biologists for decades By bringing together mathematical models statistical analyses and field experiments this book offers a comprehensive new synthesis of the theory of population oscillations Peter Turchin first reviews the conceptual tools that ecologists use to investigate population oscillations introducing population modeling and the statistical analysis of time series data He then provides an in depth discussion of several case studies including the larch budmoth southern pine beetle red grouse voles and lemmings snowshoe hare and ungulates to develop a new analysis of the mechanisms that drive population oscillations in nature Through such work the author argues ecologists can develop general laws of population dynamics that will help turn ecology into a truly quantitative and predictive science Complex Population Dynamics integrates theoretical and empirical studies into a major new synthesis of current knowledge about population dynamics It is also a pioneering work that sets the course for ecology's future as a predictive science *Encyclopedia of Ecology* Brian D. Fath, 2014-11-03 The groundbreaking Encyclopedia of Ecology provides an authoritative and comprehensive coverage of the complete field of ecology from general to applied It includes over 500 detailed entries structured to provide the user with complete coverage of the core knowledge accessed as intuitively as possible and heavily cross referenced Written by an international team of leading experts this revolutionary encyclopedia will serve as a one stop shop to concise stand alone articles to be used as a point of entry for undergraduate students or as a tool for active researchers looking for the latest information in the field Entries cover a range of topics including Behavioral Ecology Ecological Processes Ecological

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**Modelling Population Dynamics** K. B. Newman, S. T. Buckland, B. J. T. Morgan, R. King, D. L. Borchers, D. J. Cole, P. Besbeas, O. Gimenez, L. Thomas, 2014-07-16 This book gives a unifying framework for estimating the abundance of open populations populations subject to births deaths and movement given imperfect measurements or samples of the populations The focus is primarily on populations of vertebrates for which dynamics are typically modelled within the framework of an annual cycle and for which stochastic variability in the demographic processes is usually modest Discrete time models are developed in which animals can be assigned to discrete states such as age class gender maturity population within a metapopulation or species for multi species models The book goes well beyond estimation of abundance allowing inference on underlying population processes such as birth or recruitment survival and movement This requires the formulation and fitting of population dynamics models The resulting fitted models yield both estimates of abundance and estimates of parameters characterizing the underlying processes

**Ecological Modeling in Risk Assessment** Robert A. Pastorok, Steven M. Bartell, Scott Ferson, Lev R. Ginzburg, 2016-04-19 Expanding the risk assessment toolbox this book provides a comprehensive and practical evaluation of specific ecological models for potential use in risk assessment Ecological Modeling in Risk Assessment Chemical Effects on Populations Ecosystems and Landscapes goes beyond current risk assessment practices for toxic chemicals as applied to individual organism endpoints to describe ecological effects models useful at the population ecosystem and landscape levels The authors demonstrate the utility of a set of ecological effects models eventually improving the ecological relevance of risk assessments and making data collection more cost effective

*Population Ecology* John H. Vandermeer, Deborah E. Goldberg, 2013-08-25 The essential introduction to population ecology now expanded and fully updated Ecology is capturing the popular imagination like never before with issues such as climate change species extinctions and habitat destruction becoming ever more prominent At the same time the science of ecology has advanced dramatically growing in mathematical and theoretical sophistication Here two leading experts present the fundamental quantitative principles of ecology in an accessible yet rigorous way introducing students to the most basic of all ecological subjects the structure and dynamics of populations John Vandermeer and Deborah Goldberg show that populations are more than simply collections of individuals Complex variables such as distribution and territory for expanding groups come into play when mathematical models are applied Vandermeer and Goldberg build these models from the ground up from first principles using a broad range of empirical examples from animals and viruses to plants and humans

They address a host of exciting topics along the way including age structured populations spatially distributed populations and metapopulations This second edition of Population Ecology is fully updated and expanded with additional exercises in virtually every chapter making it the most up to date and comprehensive textbook of its kind Provides an accessible mathematical foundation for the latest advances in ecology Features numerous exercises and examples throughout Introduces students to the key literature in the field The essential textbook for advanced undergraduates and graduate students An online illustration package is available to professors

### **Quantitative Ecotoxicology** Michael C.

Newman,2012-08-29 Quantitative Ecotoxicology Second Edition explores models and methods of quantitative ecotoxicology at progressively higher biological scales using worked examples and common software packages It complements the author's previous books Fundamentals of Ecotoxicology Third Edition and Ecotoxicology A Comprehensive Treatment Encouraging a more r

Methods and Models in Mathematical Biology Johannes Müller,Christina Kuttler,2015-08-13 This book developed from classes in mathematical biology taught by the authors over several years at the Technische Universität München The main themes are modeling principles mathematical principles for the analysis of these models and model based analysis of data The key topics of modern biomathematics are covered ecology epidemiology biochemistry regulatory networks neuronal networks and population genetics A variety of mathematical methods are introduced ranging from ordinary and partial differential equations to stochastic graph theory and branching processes A special emphasis is placed on the interplay between stochastic and deterministic models

### **Species Conservation and Management** H. Resit Akcakaya,Mark A.

Burgman,Oskar Kindvall,Chris C. Wood,Per Sjogren-Gulve,Jeff S. Hatfield,Michael A. McCarthy,2004-10-07 This edited volume is a collection of population and metapopulation models for a wide variety of species including plants invertebrates fishes amphibians reptiles birds and mammals Each chapter of the book describes the application of RAMAS GIS 4.0 to one species with the aim of demonstrating how various life history characteristics of the species are incorporated into the model and how the results of the model have been or can be used in conservation and management of the species The book comes with a CD that includes a demo version of the program and the data files for each species

### **Theory of Wildlife**

**Population Ecology** Bruce D. Leopold,2018-10-25 Understanding wildlife population ecology is vital for all wildlife managers and conservation biologists Leopold draws on 30 years of research and teaching experience to give students and natural resource professionals the foundation they need to effectively manage wildlife populations He begins with the key statistical concepts and research approaches necessary to gain insight into various models of population dynamics The many factors that influence wildlife populations are thoroughly explored and their consequences are investigated In addition the author presents techniques for analyzing wildlife harvest data and a lucid discussion of valuable wildlife census methods Frequent examples of foundational literature supplement each chapter with applications of the theories and provide a concise compendium of fundamental concepts of population ecology Abundant statistical exercises reinforce students

learning throughout the text

**Gender-structured Population Modeling** M. Iannelli, M. Martcheva, F. A.

Milner, 2005-01-01 Gender Structured Population Modeling gives a unified presentation of and mathematical framework for modeling population growth by couple formation. It provides an overview of both past and present modeling results. The authors focus on pair formation, marriage, and two sex models with different forms of the marriage function, the basis of couple formation, and discuss which of these forms might make a better choice for a particular population, the United States. The book also provides results on model analysis, gives an up to date review of mathematical demography, discusses numerical methods, and puts deterministic modeling of human populations into historical perspective.

**Modelling**

**Complex Ecological Dynamics** Fred Jopp, Hauke Reuter, Broder Breckling, 2011-02-11 Model development is of vital importance for understanding and management of ecological processes. Identifying the complex relationships between ecological patterns and processes is a crucial task. Ecological modelling, both qualitatively and quantitatively, plays a vital role in analysing ecological phenomena and for ecological theory. This textbook provides a unique overview of modelling approaches. Representing the state of the art in modern ecology, it shows how to construct and work with various different model types. It introduces the background of each approach and its application in ecology. Differential equations, matrix approaches, individual based models, and many other relevant modelling techniques are explained and demonstrated with their use. The authors provide links to software tools and course materials. With chapters written by leading specialists, *Modelling Complex Ecological Dynamics* is an essential contribution to expand the qualification of students, teachers, and scientists alike.

**Integrated Population Biology and Modeling Part B**, 2019-02-05 Integrated Population Biology and

Modeling Part B Volume 40 offers very delicately complex and precise realities of quantifying modern and traditional methods of understanding populations and population dynamics with this updated release focusing on Prey-predator animal models, Back-projections, Evolutionary Biology, computations, Population biology of collective behavior, and bio-patchiness. Collective behavior, Population biology through data science, Mathematical modeling of multi-species mutualism, new insights, remaining challenges, and applications to ecology. Population Dynamics of Manipur, Stochastic Processes, and Population Dynamics Models. The Mechanisms for Extinction, Persistence, and Resonance, Theories of Stationary Populations, and association with life lived and life left, and more. Studies human and animal models that are studied both separately and throughout chapters. Presents a comprehensive and timely update on integrated population biology.

**Encyclopedia of**

**Theoretical Ecology** Alan Hastings, Louis J. Gross, 2012-05-31 A bold and successful attempt to illustrate the theoretical foundations of all of the subdisciplines of ecology, including basic and applied, and extending through biophysical, population, community, and ecosystem ecology. *Encyclopedia of Theoretical Ecology* is a compendium of clear and concise essays by the intellectual leaders across this vast breadth of knowledge. Harold Mooney, Stanford University. A remarkable and indispensable reference work that also is flexible enough to provide essential readings for a wide variety of courses. A

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Simon A Levin Princeton University Theoretical ecologists exercise their imaginations to make sense of the astounding complexity of both real and possible ecosystems Imagining a real or possible topic left out of the Encyclopedia of Theoretical Ecology has proven just as challenging This comprehensive compendium demonstrates that theoretical ecology has become a mature science and the volume will serve as the foundation for future creativity in this area Fred Adler University of Utah  
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