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J. Saborowski

Editors

Spatial Modelling in Forest Ecology and Management

A Case Study



Springer

Spatial Modelling In Forest Ecology And Management A Case Study

Arne Pommerening, Pavel Grabarnik



Spatial Modelling In Forest Ecology And Management A Case Study:

Spatial Modelling in Forest Ecology and Management Martin Jansen, 2002 This book focuses on the integration of spatial statistics GIS technology ecosystem studies and scenario modelling Its main aim is to extend the information gained at the stand level to larger spatial scales i e to forest districts forest landscapes or to the total area of Lower Saxony The studies demonstrate the potential and limitations of regionalization approaches for forest ecological variables The results provide valuable spatial information for forest managers and landscape planners as well as for policy makers Some spatial models outlined in this book have been implemented as useful tools in present forest management With current improvements of data quality e g from remote sensing and refined ground based inventories methods are now available to develop large scale approaches to forest ecology and management This book is an indispensable tool for scientists and those involved in forest management

Spatial Modelling in Forest Ecology and Management Martin Jansen, Michael Judas, Joachim Saborowski, 2012-04-09 At the end of the 1970s when signs of destabilization of forests became visible in Europe on a large scale it soon became obvious that the syndrome called forest decline was caused by a network of interrelated factors of abiotic and biotic origin All attempts to explain the wide spread syndrome by a single cause and there were many of them failed or can only be regarded as a single mosaic stone in the network of causes behind the phenomenon Forest ecosystems are highly complex natural or quasi natural systems which exhibit different structures and functions and as a consequence different resilience to internal or external stresses Moreover forest ecosystems have a long history which means that former impacts may act as predisposing factors for other stresses The complexity and the different history of forest ecosystems are two reasons that make it difficult to assess the actual state and future development of forests But there are two other reasons one is the large time scale in which forests react the other is the idiosyncrasy of the reactions on different sites Due to the slow reaction and the regional complexity of the abiotic environment of forest ecosystems a profound analysis of each site and region is necessary to identify the underlying causes and driving forces when attempting to overcome the destruction of forest ecosystems

Individual-based Methods in Forest Ecology and Management Arne Pommerening, Pavel Grabarnik, 2019-09-17 Model driven individual based forest ecology and individual based methods in forest management are of increasing importance in many parts of the world For the first time this book integrates three main fields of forest ecology and management i e tree plant interactions biometry of plant growth and human behaviour in forests Individual based forest ecology and management is an interdisciplinary research field with a focus on how the individual behaviour of plants contributes to the formation of spatial patterns that evolve through time Key to this research is a strict bottom up approach where the shaping and characteristics of plant communities are mostly the result of interactions between plants and between plants and humans This book unites important methods of individual based forest ecology and management from point process statistics individual based modelling plant growth science and behavioural statistics For

ease of access better understanding and transparency the methods are accompanied by R code and worked examples

Remote Sensing Handbook, Volume IV Prasad S. Thenkabail, 2024-11-29 Volume IV of the Six Volume Remote Sensing Handbook Second Edition is focused on the use of remote sensing in forestry biodiversity ecology land use and land cover and global terrestrial carbon mapping and monitoring It discusses remote sensing studies of multi scale habitat modeling forest informatics tree and stand height studies land cover and land use LCLU change mapping forest biomass and carbon modeling and mapping and advanced image analysis methods and advances in land remote sensing using optical radar LiDAR and hyperspectral remote sensing This thoroughly revised and updated volume draws on the expertise of a diverse array of leading international authorities in remote sensing and provides an essential resource for researchers at all levels interested in using remote sensing It integrates discussions of remote sensing principles data methods development applications and scientific and social context **FEATURES** Provides the most up to date comprehensive coverage of remote sensing science for forests biodiversity land cover and land use change LCLUC biomass and carbon Discusses and analyzes data from old and new generations of satellites and sensors spread across 60 years Extensive forestry LCLUC studies biomass and carbon using optical radar LiDAR and hyperspectral data Includes numerous case studies on advances and applications at local regional and global scales Introduces advanced methods in remote sensing such as machine learning cloud computing and AI Highlights scientific achievements over the last decade and provides guidance for future developments This volume is an excellent resource for the entire remote sensing and GIS community Academics researchers undergraduate and graduate students as well as practitioners decision makers and policymakers will benefit from the expertise of the professionals featured in this book and their extensive knowledge of new and emerging trends **Forest Snow and Landscape Research**, 2004 **The Forests Handbook, Volume 2** Julian Evans, 2008-04-15 The future of the world's forests is at the forefront of environmental debate Rising concerns over the effects of deforestation and climate change are highlighting the need both to conserve and manage existing forests and woodland through sustainable forestry practices The Forests Handbook written by an international team of both scientists and practitioners presents an integrated approach to forests and forestry applying our present understanding of forest science to management practices as a basis for achieving sustainability Volume One presents an overview of the world's forests their locations and what they are like the science of how they operate as complex ecosystems and how they interact with their environment Volume Two applies this science to reality it focuses on forestry interventions and their impact the principles governing how to protect forests and on how we can better harness the enormous benefits forests offer Case studies are drawn from several different countries and are used to illustrate the key points Development specialists forest managers and those involved with land and land use will find this handbook a valuable and comprehensive overview of forest science and forestry practice Researchers and students of forestry biology ecology and geography will find it equally accessible and useful **Resilient Forest Management** Philip

J. Burton, 2025-05-06 Global forest management is now grappling with ways to address the many dimensions of global change including a warming climate and increasing forest disturbance from fires and pest outbreaks along with changes in public values. However, the dominant forest management paradigms still assume a constant and predictable world in which command and control, i.e. treating long-lived forests much like short-lived agricultural crops and single value, i.e. timber optimization, still prevail. This novel text argues for new approaches to forest management that focus on resilience and embracing adaptability to the changing socio-ecological environment as it unfolds. Resilience is the ability of a system to maintain its essential attributes in the form of composition, structure, and/or function in response to stress, disruption, or disturbance. Managing a system for resilience places an emphasis on persistence rather than growth, efficiency, or profitability, which can be fulfilled by enhancing the capacity to resist change, i.e. robustness, or by enhancing the capacity to incorporate change in desirable directions, i.e. flexibility, or a combination of the two. Resilient Forest Management develops many of the same resilience-enhancing strategies for protected areas, multi-purpose forests, and timber production lands but with different degrees of emphasis. Featured prominently are practices that enhance diversity, connectivity in space and time, and adaptive management as informed by vulnerability analysis and broad stakeholder consultation. In so doing, Resilient Forest Management builds on foundational concepts of ecological forestry and our understanding of complex adaptive systems and takes sustainable forest management to the next level. Resilient Forest Management will be suitable as a primary or supplementary text in forest policy and management. It will appeal to graduate-level students and researchers in the fields of forestry and conservation, along with active policymakers in government, the forest industry, and environmental non-governmental organizations. While focused on forestry, parks managers, agriculturists, and urban planners too will find much useful insight and many creative solutions to sustainable development in a changing world. Environmental Modelling John Wainwright, Mark Mulligan, 2005-04-08 Simulation models are increasingly used to investigate processes and solve practical problems in a wide variety of disciplines, e.g. climatology, ecology, hydrology, geomorphology, engineering. Environmental Modelling: A Practical Approach addresses the development, testing, and application of such models, which apply across traditional boundaries and demonstrate how interactions across these boundaries can be beneficial. Provides a general overview of methods and approaches, as well as focusing on key subject areas, written by leading practitioners in the field. Assesses the advantages and disadvantages of different models used and provides case studies supported with data, output, tutorial exercises, and links to the model and/or model applications via the book's website. Covers major developments in the field, e.g. the use of GIS and remote sensing techniques and scaling issues. As the associated website contains colour images as well as links to www resources. **Improving GIS-based Wildlife-Habitat Analysis** Jeffrey K. Keller, Charles R. Smith, 2014-10-01 Geographic Information Systems (GIS) provide a powerful tool for the investigation of species-habitat relationships and the development of wildlife management and conservation programs. However, the relative ease of data

manipulation and analysis using GIS associated landscape metrics packages and sophisticated statistical tests may sometimes cause investigators to overlook important species habitat functional relationships. Additionally, underlying assumptions of the study design or technology may have unrecognized consequences. This volume examines how initial researcher choices of image resolution, scale of analysis, response and explanatory variables, and location and area of samples can influence analysis results, interpretation, predictive capability, and study derived management prescriptions. Overall, most studies in this realm employ relatively low resolution imagery that allows neither identification nor accurate classification of habitat components. Additionally, the landscape metrics typically employed do not adequately quantify component spatial arrangement associated with species occupation. To address this latter issue, the authors introduce two novel landscape metrics that measure the functional size and location in the landscape of taxon specific solid and edge habitat types. Keller and Smith conclude that investigators conducting GIS based analyses of species habitat relationships should more carefully 1) match the resolution of remotely sensed imagery to the scale of habitat functional relationships of the focal taxon, 2) identify attributes/explanatory variables of habitat architecture, size, configuration, quality, and context that reflect the way the focal taxon uses the subset of the landscape it occupies, and 3) match the location and scale of habitat samples, whether GIS or ground based, to corresponding species detection locations and scales of habitat use.

[Sustainable water management in the tropics and subtropics - and case studies in Brazil. VI.1](#), *Remote Sensing Handbook, Volume I* Prasad S. Thenkabail, 2024-11-29. Volume I of the Six Volume Remote Sensing Handbook, Second Edition, is focused on satellites and sensors including radar, light detection and ranging (LiDAR), microwave, hyperspectral, unmanned aerial vehicles (UAVs), and their applications. It discusses data normalization and harmonization, accuracies and uncertainties of remote sensing products, global navigation satellite system (GNSS) theory and practice, crowdsourcing, cloud computing environments, Google Earth Engine, and remote sensing and space law. This thoroughly revised and updated volume draws on the expertise of a diverse array of leading international authorities in remote sensing and provides an essential resource for researchers at all levels interested in using remote sensing. It integrates discussions of remote sensing principles, data methods, development, applications, and scientific and social context.

FEATURES Provides the most up to date comprehensive coverage of remote sensing science. Discusses and analyzes data from old and new generations of satellites and sensors. Provides comprehensive methods and approaches for remote sensing data normalization, standardization, and harmonization. Includes numerous case studies on advances and applications at local, regional, and global scales. Introduces advanced methods in remote sensing such as machine learning, cloud computing, and AI. Highlights scientific achievements over the last decade and provides guidance for future developments. This volume is an excellent resource for the entire remote sensing and GIS community. Academics, researchers, undergraduate and graduate students, as well as practitioners, decision makers, and policymakers will benefit from the expertise of the professionals featured in this book and their extensive knowledge of new and emerging trends.

Human-Environment Interactions Eduardo S. Brondízio, Emilio F. Moran, 2012-11-15 Drawing on research from eleven countries across four continents the 16 chapters in the volume bring perspectives from various specialties in anthropology and human ecology institutional analysis historical and political ecology geography archaeology and land change sciences The four sections of the volume reflect complementary approaches to HEI health and adaptation approaches land change and landscape management approaches institutional and political ecology approaches and historical and archaeological approaches

Forest Resources Resilience and Conflicts Pravat Kumar Shit, Hamid Reza Pourghasemi, Partha Pratim Adhikary, Gouri Sankar Bhunia, Vishwambhar Prasad Sati, 2021-06-24 Forest Resources Resilience and Conflicts presents modern remote sensing and GIS techniques for Sustainable Livelihood It provides an up to date critical analysis of the discourse surrounding forest resources and society illustrating the relationship between forest resources and the livelihood of local people The book is organized into four parts consisting of 31 chapters Each chapter then reviews current understanding present research and future implications Utilizing case studies and novel advances in geospatial technologies Forest Resources Resilience and Conflicts provides a timely synthesis of a rapidly growing field and stimulates ideas for future work especially considering sustainable development goals In addition the book presents the effective contribution of the forestry sector to populations livelihoods through improved collection of forestry statistics that foster the understanding and integration of the forestry sector in poverty reduction processes and the national economy to enhance its integration in national planning It is a valuable resource for researchers and students in environmental science especially those interested in forestry geography and remote sensing Demonstrates tools and techniques for measurement monitoring mapping and modeling of forest resources Explores state of the art techniques using open source software statistical programming and GIS focusing on recent trends in data mining and machine learning Addresses a wide range of issues with both environmental and societal implications Provides a global review of the multiple roles of forest resources utilizing case studies to illustrate management strategies and techniques

Comprehensive Remote Sensing Shunlin Liang, 2017-11-08 Comprehensive Remote Sensing Nine Volume Set covers all aspects of the topic with each volume edited by well known scientists and contributed to by frontier researchers It is a comprehensive resource that will benefit both students and researchers who want to further their understanding in this discipline The field of remote sensing has quadrupled in size in the past two decades and increasingly draws in individuals working in a diverse set of disciplines ranging from geographers oceanographers and meteorologists to physicists and computer scientists Researchers from a variety of backgrounds are now accessing remote sensing data creating an urgent need for a one stop reference work that can comprehensively document the development of remote sensing from the basic principles modeling and practical algorithms to various applications Fully comprehensive coverage of this rapidly growing discipline giving readers a detailed overview of all aspects of Remote Sensing principles and applications Contains Layered content with each article beginning with the basics and then moving on

to more complex concepts Ideal for advanced undergraduates and academic researchers Includes case studies that illustrate the practical application of remote sensing principles further enhancing understanding

Environmental Information Management And Analysis W K Michener, J W Brunt, S G Stafford, 1994-08-08 Most environmental studies are based upon data collected at fine spatial scales plots sediments cores etc Furthermore temporal scales of these studies have been relatively short days weeks months and few studies have exceeded three years duration the typical funding cycle Despite this history environmental scientists are now being called

Multi-objective Forest Planning Timo Pukkala, 2013-06-29 Most of the scientific methods devised for forest planning support timber production ignoring the existence of forest functions other than wood production Fortunately the realisation that the forest planning methods available today do not correspond to the needs of today's forestry has activated forest researchers to develop and adopt new methodologies and approaches which are specifically aimed at multi objective situations This book is about the quantitative approach to multi objective forest planning The emphasis is on topics that are rather new and not yet systematically applied in forest planning practice The topics and methodologies discussed in this book include measurement of preferences multiple criteria decision analysis use of GIS to support multi objective forest management heuristic optimization spatial optimisation and the measurement of non wood forest outputs By reading the book a planning specialist student or a researcher will get an insight into some of the current developments in forest planning research

The Analytic Hierarchy Process in Natural Resource and Environmental Decision Making Daniel Schmoltdt, Jyrki Kangas, Guillermo A. Mendoza, Mauno Pesonen, 2013-11-11 Decision making in land management involves preferential selection among competing alternatives Often such choices are difficult owing to the complexity of the decision context Because the analytic hierarchy process AHP developed by Thomas Saaty in the 1970s has been successfully applied to many complex planning resource allocation and priority setting problems in business energy health marketing natural resources and transportation more applications of the AHP in natural resources and environmental sciences are appearing regularly This realization has prompted the authors to collect some of the important works in this area and present them as a single volume for managers and scholars Because land management contains a somewhat unique set of features not found in other AHP application areas such as site specific decisions group participation and collaboration and incomplete scientific knowledge this text fills a void in the literature on management science and decision analysis for forest resources

Proceedings of the 5th International Workshop on The role of forests for future global development Lutz Fehrmann, Christoph Kleinn, Alina Kleinn, 2015-12-01 The sustainable management of forest resources became an indispensable prerequisite for any policy addressing the actual and future challenges of global development Forests and other tree resources are essential for the provision of ecosystem services and contribute largely to future food security livelihoods and ecosystem stability Forests and any other trees outside the forest play a relevant role all three great UN conventions on Climate Change on Biodiversity and on Combatting Desertification The

policy processes to implement the measures in these conventions on sub national national regional and international level are extremely complex This complexity comes among other factors from a blend of different sectoral and national interests from a large number of scientifically not yet entirely resolved issues and a wide range of different biophysical social cultural and political conditions all over the world

Advances in Geospatial Technologies for Natural Resource Management

Ravi Shankar Dwivedi,2024-11-19 Timely and reliable information on natural resources regarding their potential and limitations is a prerequisite for sustainable development Geospatial technologies offer immense potential in providing such information in a timely and cost effective manner Using orbital sensors data in conjunction with airborne and proximal sensors data to generate information on soils and agricultural resources forests mineral resources fossil fuel wetlands water resources and marine resources this book focuses on the advancements in technologies applicable to managing these resources It addresses global issues like climate change and land degradation neutrality and introduces spatial data infrastructure SDI as a mechanism for sharing geospatial data This book also provides an in depth discussion on drones crowdsourcing cloud computing Internet of Things machine learning and their applications FEATURES Contains a comprehensive resource on the latest developments in geospatial technologies and their use in monitoring natural resources productivity mapping and modeling Explains the geo computation methods and online algorithm developments Includes clear guidance on how best to use geospatial data for various applications Discusses case studies from a variety of fields and current trends in the management of natural resources Provides future scenarios concerning platforms sensors data analysis and interpretation techniques This book is written for remote sensing and GIS professionals in environmental institutions and government who are involved in natural resource management projects Senior undergraduate and graduate level students in Earth sciences geography or environmental management can also use this text for supplementary reading

Case Studies in Ecohealth

Susan C. Cork,Douglas P. Whiteside,2024-04-12 Case Studies in Ecohealth is primarily intended to be a student textbook using a series of case studies to illustrate key concepts applicable to EcoHealth with a focus on taking an interdisciplinary approach to solving complex problems at the interface between animals and their environment Using case studies the book will illustrate key concepts in EcoHealth allowing readers to better understand the strengths and challenges of taking an Eco Health approach Within the key themes addressed in the book the reader will gain insight into how to approach complex problems at the animal environment interface using a transdisciplinary approach Access to the case studies presented in the book along with supplementary material on line will provide the reader with good examples of current and emerging issues for discussion in the class room or for field experience programs 5m Books

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