Quantitative Methods In Landscape Ecology The Analysis And Interpretation Of Landscape Heterogeneity Ecological Studies

The urgent need for a sustainable environment has resulted in the increased recognition of the field of landscape ecology amongst policy makers working in the area of nature conservation, restoration and territorial planning. Nonetheless, the question of what is precisely meant by the term 'landscape ecology' is still unresolved. Is it, for example, an interdisciplinary approach to the study of the environment at a landscape scale? Or perhaps at the level of biological organisation? Still further, has the inseparability of landscape and culture affected the scope of 'landscape ecology'? No doubt, a proper foundation of the discipline must first be cemented. This book then develops such a foundation. In doing so it provides all the diverse applications of the discipline with a solid framework and proposes an effective diagnostic methodology to investigate the ecological state and the pathologies of the landscape.

A comprehensive overview of environmetric research and its applications... Environmetrics covers the development and application of quantitative methods in the environmental sciences. It provides essential tools for understanding, predicting, and controlling the impacts of agents, both man-made and natural, which affect the environment. Basic and applied research in this area covers a broad range of topics. Primary among these are the quantitative sciences, such as statistics, probability and applied mathematics, chemometrics, and econometrics. Applications are also important, for example in, ecology and environmental biology, public health, atmospheric science, geology, engineering, risk management, and regulatory/governmental policy amongst others. * Divided into 12 sections, the Encyclopedia brings together over 600 detailed articles which have been carefully selected and reviewed through the collaborative efforts of the Editors-in-Chief and the appropriate Section Editor * Presented in alphabetical order all the articles will include an explanatory introduction, extensive cross-referencing and an up-to-date bibliography providing literature references for further reading. Presenting state of the art information in a readable, highly accessible style, the scope and coverage provided by the Encyclopedia of Environmetrics will ensure its place as the landmark reference for the many scientists, educators, and decision-makers working across this multidisciplinary field. An essential reference tool for university libraries, research laboratories, government institutions and consultancies concerned with the environmental sciences, the Encyclopedia of Environmetrics brings together for the first time, comprehensive coverage of the full range of topics, techniques and applications covered by this multidisciplinary field. There is currently no central reference source which addresses the needs of this multidisciplinary community. This new Encyclopedia will fill this gap by providing a comprehensive source of relevant fundamental concepts in environmetric research, development and applications for statisticians, mathematicians, economists, environmentalists, ecologist, government officials and policy makers.

This series presents studies that have used the paradigm of landscape ecology. Other approaches, both to landscape and landscape ecology are common, but in the last decade landscape ecology has become distinct from its predecessors and its contemporaries. Landscape ecology addresses the relationships among spatial patterns, temporal patterns and ecological processes. The effect of spatial configurations on ecological processes is fundamental. When human activity is an important variable affecting those relationships, landscape ecology includes it. Spatial and temporal scales are as large as needed for comprehension of system processes and the mosaic included may be very heterogeneous. Intellec tual utility and applicability of results are valued equally. The Inter national Association for Landscape Ecology sponsors this series of studies in order to introduce and disseminate some of the new knowledge that is being produced by this exciting new environmental science. Gray Merriam Ottawa, Canada Foreword This is a book about real nature, or as close to real as we know - a nature of heterogeneous landscapes, wild and humanized, fine-grained and coarse-grained, wet and dry, hilly and flat, temperate and not so temper ate. Real nature is never uniform. At whatever spatial scale we examine nature, we encounter patchiness. If we were to look down from high above at a landscape of millions of hectares, using a zoom lens to move in and out from broad overview to detailed inspection of a square meter we would see that patterns visible at different scales overlay one another.

Habitat loss and fragmentation arguably pose the greatest threats to biological diversity. This title provides a blueprint for advancing understanding of conservation in agricultural regions. It combines the efforts of ecologists, economists, statisticians, mathematicians and land-use specialists.

This book describes the emergence of landscape ecology, its current status as a new integrative science, and how distinguished scholars in the field of landscape ecology view the future regarding new challenges and career opportunities. Over the past thirty years, landscape ecology has utilized development in technology and methodology (e.g., satellites, GIS, and systems technologists) to monitor large temporal-spatial scale events and phenomena. These events include changes in vegetative cover and composition due to both natural disturbance and human cause—changes that have academic, economic, political, and social manifestations. There is little doubt, due to the temporal-spatial scale of this integrative science, that scholars in fields of study ranging from anthropology to urban ecology will desire to compare their fields with landscape ecology during this intellectually and technologically fertile time. History of Landscape Ecology in the United States brings to light the vital role that landscape ecologists will play in the future as the human population continues to increase and fragment the natural environment. Landscape ecology is known as a synthesized intersection of disciplines; but new theories, concepts, and principles have emerged that form the foundation of a new transdiscipline.

For this reason he offers guidance as to when it may be appropriate for landscape architects and planners to emphasize one approach rather than another.

Currently considered a bridge between basic and Twopossibilities exist to expand landscape ecol applied ecology, landscape ecology occupies an ogy: one consists of developing new research, and important new niche in ecology,representing a new the other in developing a good educational frame star in the galaxy of the ecological sciences. work. Both are important and not in conflict. In this However, the broad spectrum of conceptual and spirit I have prepared this book, with the aim of methodological approaches has created a non summarizing the best theories, concepts, principles focused science strongly influenced by the more and methods in landscape ecology. It is an attempt dominant disciplines, such as landscape planning to reinforce the ecological research perspective, to and restoration, forest management, landscape consolidate principles and methods, validate proce architecture etc. dures and reconcile different positions, including The uncertain position of landscape ecology the geobotanic, animal and human perspectives. among the ecological disciplines is in contradiction The concept is very simple. I

have no ambition with the general recognition that landscape is a spa to present new ideas and theories: I have worked to tial dimension in which important ecological create a tool mainly for classroom use but also processes occur, and landscape is becoming very appealing to a broad range of scientists and practi popular in many ecology-related fields, from plant tioners dealing with landscape ecology and its disease to animal behaviour. problems.

Landscape ecology is an integrative and multi-disciplinary science and Principles and Methods in Landscape Ecology reconciles the geological, botanical, zoological and human perspectives. In particular ,new paradigms and theories such as percolation, metapopulation, hierarchies, source-sink models have been integrated in this last edition with the recent theories on bio-complexity, information and cognitive sciences. Methods for studying landscape ecology are covered including spatial geometry models and remote sensing in order to create confidence toward techniques and approaches that require a high experience and long-time dedication. Principles and Methods in Landscape Ecology is a textbook useful to present the landscape in a multi-vision perspective for undergraduate and graduate students of biology, ecology, geography, forestry, agronomy, landscape architecture and planning. Sociology, economics, history, archaeology, anthropology, ecological psychology are some sciences that can benefit of the holistic vision offered by this texbook.

Forest management has evolved from a mercantilist view to a multi-functional one that integrates economic, social, and ecological aspects. However, the issue of sustainability is not yet resolved. Quantitative Techniques in Participatory Forest Management brings together global research in three areas of application: inventory of the forest variables that determine the main environmental indices, description and design of new environmental indices, and the application of sustainability indices for regional implementations. All these quantitative techniques create the basis for the development of scientific methodologies of participatory sustainable forest management.

The growing popularity of the broad, landscape-scale approach to forest management represents a dramatic shift from the traditional, stand-based focus on timber production. Ecology of a Managed Terrestrial Landscape responds to the increasing need of forest policy developers, planners, and managers for an integrated, comprehensive perspective on ecological landscapes. The book examines the "big picture" of ecological patterns and processes through a case study of the vast managed forest region in Ontario. The contributors synthesize current landscape ecological knowledge of this area and look at gaps and future research directions from several points of view: spatial patterns, ecological functions and processes, natural disturbances, and ecological responses to disturbance. They also discuss the integration of landscape ecological knowledge into policies of forest management policies, particularly with respect to Ontario's legislative goals of forest sustainability. Ecology of a Managed Terrestrial Landscape is the first book to describe the landscape ecology of a continuously forested landscape in a comprehensive manner. It is written for instructors and students in forest management, wildlife ecology, and landscape ecology, and for forest managers, planners, and policy developers in North America.

Quantitative Techniques in Landscape Planning covers all aspects of landscape planning, from the initial stages of the study to the final stage of processing data and obtaining a classification of the study area. It describes the process of conducting an inventory and the methods for integrating information from the inventory into the analysis. It also discusses the application of optimization techniques for assigning significance to points in the study area according to planning objectives. Consisting of four comprehensive sections, Quantitative Techniques in Landscape Planning includes discussions on the choice of variables relevant to a particular study, and the processes, risks, methodologies, and statistical techniques of performing a landscape planning study. Systems and classifications for planning purposes, developed in the United States and abroad, are discussed and analyzed.

This book provides a current synthesis of principles and applications in landscape ecology and conservation biology. Bringing together insights from leaders in landscape ecology and conservation biology, it explains how principles of landscape ecology can help us understand, manage and maintain biodiversity. Gutzwiller also identifies gaps in current knowledge and provides research approaches to fill those voids.

In my office I am encased in bookshelves which hold an accumulation of literature on ecology that represents the papers and books over the last 50 years. My students enjoy rummaging through this collection be cause it contains a record of the history of ecology and is full of sur prises. Some of the most recent material pertains to landscape ecology, a subject that literally emerged fully active at the Veldhoven Interna tional Congress organized by the landscape ecologists of The Nether lands in 1981. The subject has developed quickly. It has one or more journals, which publish short works. It has a series of text books. And, it has just begun a series on monographs. One of the textbooks in land scape ecology is titled Principles and Methods in Landscape Ecology and was written by the Italian ecologist Almo Farina in 1998. My stu dents like this text especially well because it is direct, to the point and comprehensive. "Farina" is on loan much of the time. In the present volume Almo Farina again addresses the subject of Landscape Ecology but from a different perspective than he took in his textbook. Landscape in Action focuses on the application of the princi ples and concepts to problem solving. The two books make a pair, with the first technical and conceptual and the second applied to problems of land and water at large scale.

Landscape ecology is a relatively new area of study, which aims to understand the pattern of interaction of biological and cultural communities within a landscape. This book brings together leading figures from the field to provide an up-to-date survey of recent advances, identify key research problems and suggest a future direction for development and expansion of knowledge. Providing in-depth reviews of the principles and methods for understanding landscape patterns and changes, the book illustrates concepts with examples of innovative applications from different parts of the world. Forming a current 'state-of-the-science' for the science of landscape ecology, this book forms an essential reference for graduate students, academics, professionals and practitioners in ecology, environmental science, natural resource management, and landscape planning and design.

Geoinformatics is a component of Encyclopedia of Earth and Atmospheric Sciences in the global Encyclopedia of Life Support Systems (EOLSS), which is an integrated compendium of twenty one Encyclopedias. Geoinformatics is a science which develops and uses information science infrastructure to address the problems of geosciences and related branches of engineering. The content of the theme on Geoinformatics is organized with state-of-the-art presentations covering the following aspects of the subject: Sample Data and Survey; Remote Sensing and Environmental Monitoring; Statistical Analysis in the Geosciences; International Cooperation for Data Acquisition and Use, which are then expanded into multiple subtopics, each as a chapter.. These two volumes are aimed at the following five major target audiences: University and College Students Educators, Professional Practitioners, Research Personnel and Policy Analysts, Managers, and Decision Makers and NGOs.

Defining a research question, describing why it needs to be answered and explaining how methods are selected and applied are challenging tasks for anyone embarking on academic research within the field of landscape architecture. Whether you are an early career researcher or a senior academic, it is essential to draw meaningful conclusions and robust answers to research questions. Research in Landscape Architecture provides guidance on the rationales needed for selecting methods and offers direction to help to frame and design academic research within the discipline. Over the last couple of decades the traditional orientation in landscape architecture as a field of professional practice has gradually been complemented by a growing focus on research. This book will help you to develop the connections between research, teaching and practice, to help you to build a common framework of theory and research methods. Bringing together contributions from landscape architects across the world, this book covers a broad range of research methodologies and examples to help you conduct research successfully. Also included is a study in which the editors discuss the most important priorities for the research within the discipline

over the coming years. This book will provide a definitive path to developing research within landscape architecture.

This title meets a great demand for training in spatial analysis tools accessible to a wide audience. Landscape ecology continues to grow as an exciting discipline with much to offer for solving pressing and emerging problems in environmental science. Much of the strength of landscape ecology lies in its ability to address challenges over large areas, over spatial and temporal scales at which decision-making often occurs. As the world tackles issues related to sustainability and global change, the need for this broad perspective has only increased. Furthermore, spatial data and spatial analysis (core methods in landscape ecology) are critical for analyzing land-cover changes world-wide. While spatial dynamics have long been fundamental to terrestrial conservation strategies, land management and reserve design, mapping and spatial themes are increasingly recognized as important for ecosystem management in aquatic, coastal and marine systems. This second edition is purposefully more applied and international in its examples, approaches, perspectives and contributors. It includes new advances in quantifying landscape structure and connectivity (such as graph theory), as well as labs that incorporate the latest scientific understanding of ecosystem services, resilience, social-ecological landscapes, and even seascapes. Of course, as before, the exercises emphasize easy-to-use, widely available software. http://sarahgergel.net/lel/learning-landscape-ecology/?

Cultural landscapes are a product of the interactions between humans and natural settings. They are landscapes and seascapes that are shaped by human history and land use. Socioeconomic processes especially, but also environmental changes and natural disturbances, are some of the forces that make up landscape dynamics. To understand and manage such complex landscapes, interdisciplinary and transdisciplinary approaches are necessary, emphasizing the integration of natural and social sciences and considering multiple landscape functions. The spatial patterns of Asian landscapes are strongly related to human activities and their impacts. Anthropogenic patterns and processes have created numerous traditional cultural landscapes throughout the region, and understanding them requires indigenous knowledge. Cultural landscape ecology from a uniquely Asian perspective is explored in this book, as are the management of landscapes and land-use policies. Human-dominated landscapes with long traditions, such as those described herein, provide useful information for all ecologists, not only in Asia, to better understand the human–environmental relationship and landscape sustainability.

An insightful guide to the concepts and practices of modern landscape ecology Elements of geography, conservation biology, soil science and other disciplines factor into landscape ecology's rich analyses of the ecological and environmental forces at play across different terrains. With its unique, organism-oriented approach to the subject, Applied Landscape Ecology considers the effects of ecological processes upon particular species and places its findings within the context of larger-scale concerns. Students, researchers, and practitioners alike will find this a rewarding and instructive read that offers practical and detailed information on the latest methods and technologies used in the field today. This essential resource: Takes an interdisciplinary approach to landscape ecology Examines the subject within the contexts of specific organisms Covers cutting-edge technologies and methods Represents a collaboration between an international team of landscape ecology experts Whether new to the practice or an established ecologist, anyone with an interest in this exciting and developing field should have a copy of Applied Landscape Ecology at their disposal.

Landscape ecology has generated a wealth of knowledge that could enhance forest policy, but little of this knowledge has found its way into practice. This the first book to introduce landscape ecologists to the discipline of knowledge transfer. The book considers knowledge transfer in general, critically examines aspects that are unique to forest landscape ecology, and reviews case studies of successful applications for policy developers and forest managers in North America.

Landscape ecology is a rapidly growing science of quantifying the ways in which ecosystems interact - of establishing a link between activities in one region and repercussions in another region. Remote sensing is a fast, inexpensive tool for conducting the landscape inventories that are essential to this branch of science. However, anyone who has conducted studies in the field has already found that traditional landscape ecology metrics are not always reliable with remote images. Landscape Ecology: New Metric Indicators for Monitoring, Modeling, and Assessment of Ecosystems with Remote Sensing presents a new set of metrics that allows remotely sensed data to be used effectively in landscape ecology. This groundbreaking new work is the first to present new metrics for remote sensing of landscapes and demonstrate how they can be used to yield more accurate analyses for GIS studies. The new metrics expand the capabilities of GIS, reduce interference and incorrect readings, help ecologists better understand ecosystem relationships, and reduce study costs. This set of metrics should be adopted by the EPA and will be the standard measure for future landscape analysis. This authoritative guide assesses the current state of the field and how remote sensing and landscape metrics have been used to date. It also explains how some of the traditional metrics were developed and how they can fail in landscape studies. Once this background has been established, the new metrics are introduced and their benefits and uses explained. The information in this book has previously been available only in scattered journal articles; this is the first single source for complete background information and instructions on using the new metrics.

In recent years EU policy towards the ‘landscape’ has become better defined, whereas at the same time the notion of ‘landscape’ itself remains elusive. The need for indicators to evaluate and monitor the effects of landscape policies and plans is urgent. What is more, landscape is one of the components considered in environmental reporting, but unlike air, soil, or water, it is difficult to measure using quantitative methods. With studies on landscape indicators being as rare as they are, this volume is an attempt to fill the gap, dealing as it does with the definition and use of specific indicators for landscape assessment and monitoring. To tackle the diverse dimensions of the landscape (whose complexity is well known), the subject is approached by a multidisciplinary team of experts in landscape ecology, landscape history, landscape perception, regional planning, strategic environmental assessment and environmental impact assessment procedures, and multi-criteria assessment methods. Individual chapters include comparative assessments of studies conducted thus far in the EU, as well as detailed analyses of ecological, historical, perceptive, land-use, and economic ways of looking at landscape. As well as providing a rich source of references for researchers studying the landscape from a variety of perspectives, the book will be required reading for European officials involved at any level in planning or assessing the landscape or environment.

This work provides in-depth analysis of the origins of landscape ecology and its close alignment with the understanding of scale, the causes of landscape pattern, and the interactions of spatial pattern with a variety of ecological processes. The text covers the quantitative approaches that are applied widely in landscape studies, with emphasis on their appropriate use and interpretation. The field of landscape ecology has grown rapidly during this period, its concepts and methods have matured, and the published literature has increased exponentially. Landscape research has enhanced understanding of the causes and consequences of spatial heterogeneity and how these vary with scale, and they have influenced the management of natural and human-dominated landscapes. Landscape ecology is now considered mainstream, and the approaches are widely used in many branches of ecology and are applied not only in terrestrial settings but also in aquatic and marine systems. In response to these rapid developments, an updated edition of Landscape Ecology in Theory and Practice provides a synthetic overview of landscape ecology, including its development, the methods and techniques that are employed, the major questions addressed, and the insights that have been gained.”

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Landscape Ecological Applications in Man-Influenced Areas not only expands the concept of landscape ecology, but also applies its principles to man-influenced ecosystems. New dimensions of landscape ecological research in a global change such as urbanization, biodiversity, and land transformation are explored in this book. The book also includes case studies concerning landscape analysis and evaluation using spatial analysis and landscape modelling for establishing sustainable management

strategy in urban and agricultural landscapes.

Growth in the field of landscape ecology has included the development of methods and results that can be applied to an impressive range of environmental issues. This book addresses a broad spectrum of political, theoretical and applied aspects that often arise in the design and execution of landscape studies. The concepts of geographical scale and hierarchy arising within the confines of landscape ecology are examined, and a series of techniques are presented to address problems in spatial and temporal analysis. This book will provide the reader with a current perspective on this rapidly evolving science.

This series is dedicated to serving the growing community of scholars and practitioners concemed with the principles and applications of environ mental management. Each volume is a thorough treatment of a specific topic of importance for proper management practices. A fundamental objective of these books is to help the reader discem and implement man's stewardship of our environment and the world's renewable re sources. For we must strive to understand the relationship between man and nature, act to bring harmony to it, and nurture an environment that is both stable and productive. These objectives have often eluded us because the pursuit of other individual and societal goals has diverted us from a course of living in balance with the environment. At times, therefore, the environmental manager may have to exert restrictive control, which is usually best applied to man, not nature. Attempts to alter or hamess nature have often failed or backfired, as exemplified by the results of imprudent use of herbicides, fertilizers, water, and other agents. Each book in this series will shed light on the fundamental and applied aspects of environmental management. It is hoped that each will help solve a practical and serious environmental problem.

Experts from different disciplines discuss the nature, origin and possible solutions to the problem of landscape degradation and diminishing global biodiversity.

While the research and management of wildlife has traditionally emphasised studies at smaller scales, it is now acknowledged that larger, landscape-level patterns strongly influence demographic processes in wild animal species. This book is the first to provide the conceptual basis for learning how larger scale patterns and processes can influence the biology and management of wildlife species. It is divided into three sections: Underlying Concepts, Landscape Metrics and Applications and Large Scale Management.

Publisher Description

This book provides guidelines for those pursuing landscape projects based on integrative concepts – interdisciplinarity and transdisciplinarity – whether they are members of an integrative research team or individuals working on a problem that demands integration. They must define terminology, choose appropriate methodologies, overcome epistemological barriers and cope with the high expectations of some stakeholders while encouraging others to participate at all.

Development and status of landscape ecology - subject of this book During the last decades, landscape ecology has developed tremendously. It concerns both the theoretical basis and practical application. The roots of landscape ecology are geography and biology. The term "landscape ecology" was first coined by the German scientist Carl Troll in 1939. ünce, the devel opment center of landscape ecology was in Central Europe. Recently, also other parts of the world became powernd centers of landscape ecology, es pecially Northern America. American approaches partly differ essentially from the European, because they are focused esp. on biogeography and population dynamics. In Europe, however, the geographical roots of land scape ecology playamajor role. Landscape is defined as a complex of abiotic, biotic and human components. Mainly due to linguistic barriers, the international discussion does not take notice of approaches and experiences from non-anglophone countries in a sufficient manner. Therefore this book considers more the German and European views on landscape ecology than the books which were published before. It tries to bridge the gaps between theory and practice of landscape ecology, as well between the Ger manlEuropean and American approach es. The book gives a fundamental representation of landscape ecology, which proves to be a young, but an interesting and very important transdisci plinary science for the solution of environmental problems. Both the theo retical basis and practical application of landscape ecology are considered.

An ideal text for students taking a course in landscape ecology. The book has been written by very well-known practitioners and pioneers in the new field of ecological analysis. Landscape ecology has emerged during the past two decades as a new and exciting level of ecological study. Environmental problems such as global climate change, land use change, habitat fragmentation and loss of biodiversity have required ecologists to expand their traditional spatial and temporal scales and the widespread availability of remote imagery, geographic information systems, and desk top computing has permitted the development of spatially explicit analyses. In this new text book this new field of landscape ecology is given the first fully integrated treatment suitable for the student. Throughout, the theoretical developments, modeling approaches and results, and empirical data are merged together, so as not to introduce barriers to the synthesis of the various approaches that constitute an effective ecological synthesis. The book also emphasizes selected topic areas in which landscape ecology has made the most contributions to our understanding of ecological processes, as well as identifying areas where its contributions have been limited. Each chapter features questions for discussion as well as recommended reading.

Based on both research and practical experience,Ecological Landscape Design and Planning offers a holistic methodological approach to landscape design and planning. It focuses on the scarcity of natural resources in the Mediterranean and the need to aim for long-term ecological stability and environmental sustainability. The principles of this approach, therefore, can be used as a theoretical foundation for holistic landscape research, creative ecological design and better sustainable practice development.

Landscape ecology as a modern interdisciplinary science is making use increasingly of quantitative research techniques adopted from other fields. So far, no synthetic reference has been available to those wishing to acquaint themselves with new approaches to quantitative analysis of spatial heterogeneity at the landcape level. This book seeks to meet this need by providing a conceptual framework and illustrating potential applications for methods such as pattern analysis, spatial statistics, fractals, spatial modeling, broad-scale studies, and extrapolation across scales. Each technique is discussed in sufficient detail to be adaptable to a variety of research problems. Quantitative Methods in Landscape Ecology is an important resource for researchers and students of landscape and ecosystem ecology in understanding and analyzing the dynamics of complex spatial systems.

This volume offers selected contributions to the 8th International Congress of Ecology to illuminate large-scale ecological

problems and discuss how these can be managed through a variety of planning processes. From mathematical approaches to improve understanding of complex ecosystems, to monitoring activity and human impact, this book covers a truly global range of issues. The book concludes with a summary of the Congress, and a discussion of possible future directions.