Preface

Ecology is the study of the interrelationships between organisms and their environment, including the biotic and abiotic components. There are at least six kinds of ecology: ecosystem, physiological, behavioral, population, and community. Specific topics include: Acid Deposition, Acid Rain Revisited, Biodiversity, Biocomplexity, Carbon Sequestration in Soils, Coral Reefs, Ecosystem Services, Environmental Justice, Fire Ecology, Floods, Global Climate Change, Hypoxia, and Invasion. This new book presents new research on ecology from around the world.

Chapter 1 discusses the key role ozone plays in global atmospheric chemistry and is an important greenhouse gas. The surface ozone is a secondary pollutant formed from the precursors NO_x and VOCs during the photochemical reactions. The meteorological situation is very important for the concentration levels. The hot sunny stabile weather is conducive for surface ozone formation. The surface ozone is a pollutant of major concern due to its impacts on receptors at currently occurring ambient levels in many regions of the world. The ambient air pollution, resulting mostly from energy production, belonged to the major environmental problems in former Czechoslovakia between 1960s and 1980s. As a result of profound political and economic changes in Central Europe in 1989, the air pollution (esp. the concentrations of SO_2 and SPM) was significantly reduced. The photochemical smog, the indicator of which is the surface ozone, nevertheless, remains a hot issue.

Chapter 2 is divided into three main sections. The first section is dealing with uncertainties in empirical data, defining and discussing e.g., the highest r^2 of predictive models, the sampling formula and uncertainty in empirical data, empirically based highest r^2, highest reference r^2, CV and sampling period, CV versus mean values, mean versus maximum values and spurious correlations. The second section includes issues concerning model testing, i.e., calibration and validation, sensitivity tests and uncertainty tests using Monte Carlo techniques. The third section introduces some basic ideas concerning dynamic mass-balance models for lakes. Algorithms for water mixing and outflow are given and efficient ways to define deep water, surface water, erosion and accumulation areas are discussed. This section also discusses time and area resolution in dynamic lake models and the most efficient way of utilizing distributed empirical data.

Since the development and popularisation of statistical science during the 1930s, the uptake of statistical hypothesis tests in major science disciplines like psychology, medicine and biology has been rapid. Hypothesis tests did not become common in the ecological literature until the 1960s but, since then, testing zero null hypotheses and using P-values to make dichotomous decisions about rejecting them has become routine. Recent surveys of the ecological literature show that P-values are reported in the vast majority of published research articles. The authors of chapter 3 believe that the focus on tests of zero null hypotheses and the reliance on P-values is inappropriate and argue that ecological data are more relevant to both ecologists and applied users if *a priori* sample size determination procedures are conducted, and effect size estimates and their associated confidence intervals are used to present results. Chapter 3 reports on evidence that effect sizes, associated uncertainty estimates and sample size calculations are missing from a large number of publications in two leading conservation biology journals. An overwhelming majority (92%) of surveyed articles reported P-values, but only 3% of these reported statistical power. Furthermore, many articles were missing at least one estimate of effect size (43%) or measure of variance (67%). Confidence intervals were reported in only 19% of articles and, when reported, were often inadequately interpreted.

According to chapter 4, the correct understanding of ecological and environmental processes is indispensable for the sustainable development of Humankind. For practical purposes, the account of ecosystem complexity is greatly aided by the application of computer aided technologies. This paper presents a methodological approach linking computer modelling of natural processes with geoinformation technology, realised in the PC modelling System "Relief-Processor" (R_P). The paper also delivers a word of warning as regards possible pitfalls with application of certain computer technologies for modelling of ecological processes, giving an example of errors which may occur while using Microsoft Excel for fitting trendline equations.

Taking a glance at chapter 5 one may see that an increase in the consumer's willingness to pay (WTP) for an improvement in the ecological performance of a marketed product should be welfare improving. Furthermore, it should create the appropriate incentives for firms to get involved in such improvements by benefiting "green" producers and harming ecologically indifferent ones. We provide some theoretical arguments against these apparently obvious affirmations, showing that the profitability and welfare effects of WTP increases for green products depend on whether they are targeted towards the least ecologically aware of the consumers. The authors hypothesis concerning these different kinds of changes in ecological consciousness is supported by Spanish survey data on subjective perceptions of the consequences of ecological consciousness-increasing advertisements. The results show that, according to the authors respondents, the socially undesirable type of messages represents a 40% of the total, calling for a more cautious attitude towards qualitative aspects of state advertising aimed at creating a more ecologically aware consumer.

Matrix models, i.e. expressing systems of linear equations in matrices and using matrix algebra, have been successful in describing the demographic dynamics of a population. The same method can be used to study the effect of space on population growth and spatial distribution. Here, a temporally and spatially discrete matrix model is used to ask general and specific question in landscape ecology. One such question is how habitat amount and arrangement affects population distribution and persistence, for example how habitat loss in various habitat arrangements (random, clumped or fragmented landscapes) affects a population. Chapter 6 reviews how matrix models have been used to determine the effect of spatial structure of a population and how this approach have been generalised to a multi-patch system. The authors demonstrate that a matrix model (including population redistribution, survival and growth) can serve as a general framework for spatial redistribution in a landscape. The results are comparable with existing results from studies of critical thresholds. Existing analytical tools are implemented to determine the sensitivity of e.g. population growth and stable population distribution (eigen-value and -vector sensitivity) to changes in transitions between landscape cells. Some examples and illustrations of how sensitivity values can be used in landscape management are provided.

The use of indices has expanded into several natural resource disciplines, including ecological studies, environmental policymaking, and agricultural economics. Nevertheless, despite their increasing use in natural resource disciplines, researchers and public decision makers continue to express concern about validity of these instruments to capture and communicate multidimensional, and sometimes disparate, characteristics of research data and stakeholder interests. The authors purpose in chapter 7 is to demonstrate how useful indices can be for communicating environmental information to decision makers. We discuss how environmental indices have evolved from simple to multicriteria formats, and then propose two advancements, the impact matrix and disparate stakeholder management.

The decisions of many individuals and social groups, taking according to well-defined objectives, are causing serious social and environmental problems, in spite of following the dictates of economic rationality. There are many examples of serious problems for which there are not yet appropriate solutions, such as management of scarce natural resources including aquifer water or the distribution of space among incompatible uses. In order to solve these problems, chapter 8 first characterizes the resources and goods involved from an economic perspective. Then, for each case, the chapter notes that there is a serious divergence between individual and collective interests and, where possible, it designs the procedure for solving the conflict of interests. With this procedure, the real opportunities for the application of economic theory are shown, and especially the theory on collective goods and externalities. The limitations of conventional economic analysis are shown and the opportunity to correct the shortfalls is examined. Many environmental problems, such as climate change, have an impact on different generations that do not participate in present decisions. The chapter shows that for these cases, the solutions suggested by economic theory are not valid. Furthermore, conventional methods of economic valuation (which usually help decision-makers) are unable to account for the existence of different generations and tend to obviate long-term impacts. The chapter analyzes how economic valuation methods could account for the costs and benefits enjoyed by present and future generations. The chapter studies an appropriate consideration of preferences for future consumption and the incorporation of sustainability as a requirement in social decisions, which implies not only more efficiency but also a fairer distribution between generations than the one implied by conventional economic analysis.