Book Review

M.R.T. Dale (1999)
Spatial Pattern Analysis in Plant Ecology.
Cambridge Studies in Ecology.
Pp. ix + 326. Cambridge University Press, Cambridge.
£45.00 (hardback). ISBN 0 521 45227 9.

In the rapidly evolving field of spatial pattern analysis, this is the first book especially written for plant ecologists. It is a reflection of the increasing interest in the role of spatial pattern in ecosystem functioning and the need for a more general application of methods of spatial analysis. As mentioned in the Preface, this book tries to explain the concepts and methods of spatial pattern analysis. In order to make the existing literature accessible to plant ecologists, the author has chosen a textbook approach, taking the reader through all the steps from the sampling methods to spatial analysis.

In the first chapter the reader is introduced to the concepts of spatial pattern. The overview is useful, but focuses mainly on scale as the dominant aspect of spatial pattern, overlooking aspects such as patch shape and size. This mirrors the traditional divide in the use of spatial statistics in different scientific disciplines. The origin of spatial statistics lies with geostatistics, a field traditionally concerned with the interpolation of spatial point patterns. Plant ecologists have concentrated on scale as the main spatial driver of vegetation dynamics, whilst landscape ecologists have developed methods which focus on individual patches to study the interaction between animals and landscape pattern. The different statistical methods have been designed within the context of each specific discipline, thus suggesting that their use is limited to that discipline. But if one considers an arbitrary spatial pattern of any grid, the results of any statistical method are independent of grid resolution and ecological meaning of the cell value. The difference lies only in the interpretation of the results within the ecological context of the pattern under study. Throughout the book the author correctly expresses the spatial scale in units of grid length, thus confirming the irrelevance of grid resolution. A more generalised development of spatial statistics would certainly benefit their application in the study of ecosystem functioning. This is confirmed by the author, but unfortunately this book contributes little to the convergence of the different schools of thought. A recent critical review of landscape metrics (Frohn 1997) is therefore an essential addition for anyone interested in the wider implications of pattern in ecosystem functioning.

The second chapter covers the sampling methods used to investigate spatial pattern. A key warning in the book is that hypothesis and methods of analysis should be decided upon before sampling begins. Not mentioned in the book is that the scale apparent to the observer is not necessarily the scale relevant to the observed process.

The core of the book covers various spatial pattern analysis methods, hierarchically organised according to the number of dimensions and species considered: for one dimension, one species, two species, and multiple species; two dimensions; and finally point patterns and environmental gradients. This divide causes some overlap in the text, but this avoids extensive flipping of pages. The different methods are well explained and supported by field data examples and numerous illustrations. The advantages and disadvantages of the methods are described. Although the text is self-explanatory, a solid knowledge of statistics is assumed. Formulas are an integral part of the text, not in patronising boxes. A general attitude is that no one method will give the absolute answer, but that a combination of methods will lead to the best understanding and quantification of spatial pattern.

The book finishes with a view of the future development of spatial pattern analysis. It seems a little premature for the author to discuss spatial pattern in three dimensions when we can barely grasp the complexity of multiple scale interactions between pattern and process in two dimensions, and the role of these interactions in ecosystem functioning.

The book is well published in a pleasant typeset with many clear and relevant illustrations. The author has kept the book compact by referring to many original sources within and outside plant ecology. The bibliography is extensive. The book comes with a good index and a useful glossary of abbreviations. In the dynamic world of spatial statistics, this book is very useful for those concerned with vegetation pattern or anyone interested in the spatial interactions between ecological processes and vegetation pattern. However as it represents an incomplete view of spatial pattern, this book should not be the only reference to methods of spatial pattern analysis.

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Reference

Frohn, R.C. (1997) *Remote sensing for landscape ecology: New metric indicators for monitoring, modelling, and assessment of ecosystems*. CRC Press, Boca Raton.