

SPECIAL FEATURE

The importance of spatial and temporal perspectives for understanding vegetation pattern and process

Editors:

P.A. Harcombe, M.W. Palmer & L. Mucina

Based on contributions presented at the 38th Symposium of the International Association for Vegetation Science held at Rice University, Houston, TX, USA, 4 - 10 June 1995.

Contents

Harcombe, P.A., Palmer, M.W. & Mucina, L. — The importance of spatial and temporal perspectives for understanding vegetation pattern and process: Introduction	162
Wiegand, T., Dean, W.R.J. & Milton, S.J. — Simulated plant population responses to small-scale disturbances in semi-arid shrublands	163
Jeltsch, F., Milton, S.J., Dean, W.R.J. & van Rooyen, N. — Simulated pattern formation around artificial waterholes in the semi-arid Kalahari	177
Winkler, E. & Klotz, S. — Long-term control of species abundances in a dry grassland: a spatially explicit model	189
van der Maarel, E. & Sykes, M.T. — Rates of small-scale species mobility in alvar limestone grassland	199
Geißelbrecht-Taferner, L., Geißelbrecht, J. & Mucina, L. — Fine-scale spatial population patterns and mobility of winter-annual herbs in a dry grassland	209
Herben, T., Krahulec, F., Hadincová, V., Pecháčková, S. & Kovářová, M. — Fine-scale spatio-temporal patterns in a mountain grassland: do species replace each other in a regular fashion?	217
Eek, L. & Zobel, K. — Effects of additional illumination and fertilization on seasonal changes in fine-scale grassland community structure	225
Palmer, M.W. & Maurer, T.A. — Does diversity beget diversity? A case study of crops and weeds	235
Kenkel, N.C., Hendrie, M.L. & Bella, I.E. — A long-term study of <i>Pinus banksiana</i> population dynamics	241
Oksanen, J. — Plant neighbour diversity	255
Podani, J. & Czárán, T. — Individual-centered analysis of mapped point patterns representing multi-species assemblages	259

The importance of spatial and temporal perspectives for understanding vegetation pattern and process: Introduction

Harcombe, P.A.^{1*}, Palmer, M.² & Mucina, L.³

¹Department of Ecology and Evolutionary Biology, Rice University, MS 170, 6100 Main Street, Houston, TX 77005, USA; *Corresponding author; Fax +1 713 285 5232; E-mail harcomb@rice.edu;

²Department of Botany, Oklahoma State University, Stillwater, OK 74078, USA; Fax +1 405 744 7074;

³Department of Botany, University of Pretoria, 0002 Pretoria, Republic of South Africa; Fax +27 12 43-2184;

This special feature is a product of the 38th Symposium of IAVS held at Rice University, 4-10 June 1995. The program for the Symposium was organized by P.A. Harcombe, E.O. Box, R.K. Peet and C. D. Canham. In keeping the breadth of the theme, a wide variety of topics was addressed, and many interesting papers presented there are appearing in *JVS* and elsewhere. One selection of the papers, which represented a particularly coherent and timely topic, was collected for publication as a special feature in this issue of *JVS* by L. Mucina, with editorial assistance of P. Harcombe and M. Palmer, as well as many able reviewers.

The papers all deal with spatial patterns within plant communities; most incorporate a temporal dimension, as well, and most deal with grasslands or relatively poor habitats. They represent three basic approaches: simulation modeling (Wiegand *et al.*, Jeltsch *et al.*, Winkler & Klotz), field investigations of mechanisms governing pattern and/or community structure (van der Maarel & Sykes, Geißelbrecht-Taferner *et al.*, Herben *et al.*, Eek & Zobel, Palmer & Maurer, Kenkel), and methods of spatial analysis (Podani & Czárán). Cutting across these approaches are several recurring findings:

Dispersal, mobility and life-history attributes can explain much of the spatio-temporal pattern in these communities (Wiegand *et al.*, van der Maarel & Sykes, Geißelbrecht-Taferner *et al.*).

Particular disturbance characteristics will also be important in some systems (Wiegand *et al.*, Jeltsch *et al.*, Winkler & Klotz). In other systems, climatic controls may be important (Jeltsch *et al.*).

Nevertheless, competition and species interactions are prevalent and important in structuring spatio-temporal dynamics for at least some species in nearly all communities (Wiegand *et al.*, Winkler *et al.*, Geißelbrecht-Taferner *et al.*, Herben *et al.*, Eek & Zobel, Kenkel, Oksanen).

This series of papers nicely illustrates the point that the relative importance of two basic processes in com-

munity organization (lottery competition vs resource competition) depends on the scaling of recovery rate against disturbance. Sites that are richer and/or less frequently disturbed will show stronger effects of interspecific interactions and resource competition; sites that are poorer or more frequently disturbed will show stronger effects of disturbance, dispersal/mobility, and life-history attributes of community members – we are grateful to our colleague Mark Fulton for discussions from which this point emerged – though both processes will inevitably be important for at least some species across the scales.

The papers show a high level of sophistication with respect to appropriate null models against which to test some of the subtler elements of community theory (e.g. van der Maarel & Sykes, Herben *et al.*, Oksanen). It also seems appropriate to highlight the high level of creativity and rigor reached by experimental approaches, as illustrated by the light augmentation experiment of Eek & Zobel which tests the hypothesis that the declines in species richness in fertilized grassland plots are a consequence of increased competition for light.

This meeting, attended by over 150 plant ecologists from around the world, was the first IAVS Annual Symposium held in the United States. It was also the first time the Vegetation Section of the Ecological Society of America participated in meetings away from the parent society, and it was the occasion of the first meeting of the Panel on a National Classification System for the United States. As a result, the meetings provided an uncommon opportunity for North American vegetation ecologists to interact with colleagues from around the world, and they provided a uniquely valuable opportunity for discussion and dialog. Thanks to generous support by the US National Science Foundation, by IAVS, and by Rice University, funds were available to enable some of the most creative scientists from around the world to attend the meetings.