Journal of Vegetation Science 18: 1-2, 2007

Experiments and field observations: Two predominant aspects of a multi-faceted vegetation science

Chiarucci, Alessandro[1*]; Collins, Beverly[2]; Díaz, Sandra[3] & White, Peter S.[4]

[1]*Department of Environmental Science 'G. Sarfatti', University of Siena, Via P.A. Mattioli 4, 53100 Siena, Italy;*
[2]*Department of Biology, Western Carolina University, Cullowhee, NC 28723, USA;*
[3]*Instituto Multidisciplinario de Biología Vegetal, Universidad Nacional de Córdoba, Casilla de Correo, RA-5000 Córdoba, Argentina;* [4]*Department of Biology, University of North Carolina, Chapel Hill, NC 27599-3280, USA;*
**Corresponding author; E-mail chiarucci@unisi.it*

Editors' Award 2006

Each year, the Chief Editors of the *Journal of Vegetation Science* choose one of the papers nominated by Coordinating Editors and Referees, for the Editors' Award for their quality, novelty or clarity in approaching a topic in vegetation science. There is no financial or other reward, just glory for the authors! For this year, there were eight papers nominated.The paper selected for the Editors' Award was that by Carlyle & Fraser (2006). This paper reports an experiment, performed under controlled greenhouse conditions, to test the Competitive Response (CR) strategy model in 19 species typical of wet meadows in Northeast Ohio, USA. Each species was placed into one of three strategies based on variation in the CR strategy of juvenile plants growing under a canopy: (1) *persist*; (2) *escape*; (3) *forage*. The three possible strategies were tested with well-planned experiments and then checked for correlations with classic plant traits such as seed size or plant biomass.

Carlyle & Fraser (2006) found significant differences among species in their response to the different manipulation applied for testing each strategy. Traits correlated with the *escape* strategy were seed weight, plant height and plant biomass, the trait correlated with the *persist* strategy was time to reach maximum height and no trait correlated with the *forage* strategy. A clear trade-off off between *escape* and *persist* strategies emerged, with *escape* strategists allocating most of their resources for immediate growth, and *persist* strategists using the majority of their resources for maintenance until sufficient resources for growth were available. The trade-off between these two strategies and the *forage* strategy was less obvious; this is not surprising as this is thought to be an opportunistic strategy.

This study was based on a true experimental approach, under well-controlled conditions, but it also has important implications for restoration, conservation, and invasion ecology. In fact, by using a truly reductionist approach Carlyle & Fraser (2006) identified a trait, response to shading, which could allow an ecosystem manager to be more selective as to which species are allowed to establish within an ecosystem.

Other nominated papers

We would like to mention the other papers that were nominated by the Chief Editors as they represent different facets of present-day vegetation science.

The runner-up for the prize was a paper by Sherriff & Veblen (2006). These authors investigated the relative importance of low- and high-severity fires in shaping forest structure over the range of *Pinus ponderosa* in northern Colorado. Their approach was quite different from the experimental one of Carlyle & Fraser (2006): they conducted a well-planned observational study to investigate how long-term and large-scale processes affect present-day vegetation. It is not possible to make a truly experimental approach to such processes, given the limitation of our life span and research opportunities, but well-planned observational studies can provide valuable information.

A third outstanding paper was that by Maestre et al. (2006). One classic topic of vegetation science is the influence of soil conditions on plant communities. This certainly is a basic issue for almost all ecosystems and vegetation types, except maybe floating vegetation. Maestre et al. (2006) tested the hypotheses that soil nutrient heterogeneity will interact with plant species composition to determine the performance of individual plants and act with both species composition and richness to determine the productivity and biomass allocation patterns of communities. This study also was a well-designed experiment, performed under the well-controlled environment of the Duke University Phytotron. In this experiment, seven levels of species composition (all possible combinations of *Lolium perenne*, *Poa pratensis* and *Plantago lanceolata*) were crossed with three levels of distribution of soil nutrient patches. This study confirmed that nutrient heterogeneity may interact with plant species composition to determine community biomass, and that small-scale differences in the location of nutrients affect individual and community responses.

The fourth paper was that by Leyer (2006). She investigated changes in dispersal patterns of floodplain pioneer vegetation along a gradient of declining river-floodplain connectivity. This too was a manipulative study; it in-

cluded a field experiment with five treatments along the Middle Elbe river, Germany. This research showed that water dispersal and the soil diaspore bank were major dispersal strategies shaping floodplain pioneer vegetation, and underlined the importance of river/floodplain ecotones as sink habitats for water-dispersed seeds. It is suggested that as a consequence of reduced river-floodplain interactions, due to dykes and other engineering structures, management strategies are necessary to improve connectivity and the renewal of fluvial land forms.

Other nominated papers included an investigation of the relationship between plant richness and soil nutrient availability in a tropical semi-arid environment (Perroni-Ventura et al. 2006). The authors observed the relationships between soil fertility and plant species richness in 'fertile islands' occurring beneath two legume species (*Cercidium praecox* and *Prosopis laevigata*) in the Tehuacán-Cuicatlán region, central Mexico. This was an observational study performed using a stratified randomisation selection of three different micro-habitats.

In contrast, Bradford & Lauenroth (2006) used a modelling approach to predict abundance and distribution of the invasive plant *Bromus tectorum* in arid and semi-arid ecosystems where water is a limiting resource. A soil water model was used to simulate seasonal soil water dynamics and a gap dynamics model was used to simulate the impact of disturbance regime and seed availability on competition between *B. tectorum* and native species. The results suggested that climate is the main driving factor, while soil properties do not significantly increase the probability of suitable conditions for *B. tectorum* establishment.

Another nominated paper, by Traba et al. (2006), investigated changes in the seed density and species richness of Mediterranean soil banks during summer and the relationships between these variations and seed traits, also taking into account phylogenetic effects. In this study, performed in Central Spain, Canonical Correspondence Analysis and ANOVAs were applied, demonstrating a substantial loss of seeds in the uppermost soil layer during the summer dry period between the point of peak production and the autumn germination peak.

The final nominated paper, by Graves et al. (2006), presents and tests a general structural carbon-nutrient balance hypothesis, which suggests that herbs should be at a competitive advantage where the leaf area of plants in the ground layer is limited by light (or fixed carbon, C) rather than soil resources (R) such as nutrients or water. This hypothesis was tested using data from field plots, distributed along an 800 km band in northern America, for which soil and vegetation data were available. The results confirmed the stated hypothesis and demonstrate how field data-sets can be utilised for proper hypothetic-deductive testing in vegetation science.

Vegetation Science: a highly diverse community served by the Journal of Vegetation Science!

These eight nominated papers illustrate the range of approaches that the Journal covers: observation, experiment, modelling and theory. The community of vegetation scientists, our community, is becoming increasingly richer in methods, approaches and opinions on the patterns and processes of vegetation and plant communities. Spatial and temporal patterns, species interactions, mechanisms of competition, resource partitioning, and many other issues are investigated by modern vegetation science and almost all of them are covered by the papers published in 2006 by the *Journal of Vegetation Science*.

For the third consecutive year, the ISI impact factor of the *Journal of Vegetation Science* increased. The factor for 2005 (the value published in 2006) was for the first time higher than 2 (2.112). The rank of the *Journal of Vegetation Science* was maintained within the top 40 positions (38 of 112) in the subject of Ecology, it was 29 of 144 in the subject category of Plant Biology and 2 of 36 in the subject category of Forestry. Thus, the *Journal of Vegetation Science* maintains its high reputation in the field of Ecology and Plant Biology but it is also strengthens its position as one of the leading journals in forestry!

References

Bradford, J.B. & Lauenroth, W.K. 2006. Changes in spatial pattern of trees and snags during structural development in *Picea mariana* boreal forests. *J. Veg. Sci.* 17: 693-704.

Carlyle, C.N. & Fraser, L.H. 2006. A test of three juvenile plant competitive response strategies. *J. Veg. Sci.* 17: 11-18.

Graves, J.H., Peet, R.K. & White, P.S. 2006. The influence of carbon - nutrient balance on herb and woody plant abundance in temperate forest understories. *J. Veg. Sci.* 17: 217-226.

Leyer, I. 2006. Dispersal, diversity and distribution patterns in pioneer vegetation: The role of river-floodplain connectivity. *J. Veg. Sci.* 17: 407-416.

Maestre, F.T., Bradford, M.A. & Reynolds, J.F. 2006. Soil heterogeneity and community composition jointly influence grassland biomass. *J. Veg. Sci.* 17: 261-270.

Perroni-Ventura, Y., Montaña, C. & Garcia-Oliva, F. 2006. Relationship between plant richness and soil nutrient availability in a tropical semi-arid environment. *J. Veg. Sci.* 17: 719-728.

Sherriff, R.L. & Veblen, T.T. 2006. Ecological effects of changes in fire regimes in *Pinus ponderosa* ecosystems in the Colorado Front Range. *J. Veg. Sci.* 17: 705-718.

Traba, J., Azcárate, F.M. & Peco, B. 2006. The fate of seeds in Mediterranean soil seed banks in relation to their traits. *J. Veg. Sci.* 17: 5-10.