BOOK REVIEWS

New Models for Ecosystem Dynamics and Restoration

Richard J. Hobbs and Katharine N. Suding (eds), 2008. Island Press, Washington, DC 2009, USA. 345 pp.
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IN order to better understand links between ecological theory and its practice in restoration setting, Hobbs and Suding in this book present models of transition dynamics and feedbacks. It consists of three parts.

The first part provides innovative ways to assess ecosystem dynamics, highlights the importance of three conceptual models in restoration framework, looks into (i) regime shifts, (ii) how succession goes into transition, and (iii) inference methods, such as observational, manipulative (i.e., experiments involving long-term, short-term and perturbation). In addition, it explains when to use mathematical modeling as a simulation tool, identifies drivers and responses in threshold dynamics and shows how to link concepts regarding ecosystem dynamics to science, management, and restoration activities in rangelands.

The second part presents site-specific "tests" and considers applications, such as arid lands, grassland, woodland, savanna, forests and wetlands. It also includes intensively managed areas as case studies in "production" landscapes. It describes creation of non-forest communities through transitions across two regime shifts and states assembly of exotic and native species. It also emphasizes the importance of understanding climatic and socioecological systems of arid land. Chapter 9 develops data-driven state transition model (STM) of Californian grassland and applies it to examples which resulted in better predictions, refining hypothesis about system response to restoration and management. In Chapter 10, the researchers provide a general conceptual model of savanna representing drivers, including climate, fire, herbivory, and dynamic responses of vegetation properties, such as biomass of woody compared to herbaceous plant species, including interaction and feedbacks. In chapter 11, qualitative models of degraded grassy woodlands are presented and applied to interactive processes of system components of native vegetation, exotic annuals and resource levels. Chapter 12 reviews alternative vegetation states, thresholds, and modifies the model accordingly, which becomes a useful guide for land managers and funding organization. Chapter 13 looks into state and transition approach for the recovery of abandoned farmlands, builds a conceptual model, then critically evaluates the approach and its potential, describes alternative vegetation states and thresholds and illustrates the implications of the model for restoration of the old fields. Chapter 14 presents not only successional models, but also alternate models of forest dynamics to inform long-term management of restored sites applicable to forest lands within Australian tropical and subtropical rainforest landscapes.

In chapters 15 and 16, the researchers apply STM to lesser Snow Geese and Artic vegetation and consider its aid in conservation and restoration initiatives. Additionally, they look at feedback mechanisms (which at times sustain natural and invaded sites) and emphasize that they are important for conservationists and restorationists. Chapter 17 distinguishes between alternative states of conceptual models and ecological regimes in temporary Australian wetlands and points out that the main value of the conceptual model is to provide a conceptual framework explaining how wetland ecosystems function in relation to a number of controlling variables. Chapter 18 applies STM to mining restoration projects in Australia and gives a Tool Kit for developing the model. Additionally, stated strengths and limitations of STM in mining restoration are discussed. In chapter 19, the researchers use an Alternative Stable State (AST) model for landscape –Scale restoration in an area of South Australian Murray-Darling Basin. They propose three landscape thresholds in the model; (i) fragmentation resulting in altered fire regimes, (ii) alteration to the disposition of landscape elements, and, (iii) patch thresholds. In Chapter 20, STM for forest restoration in the highlands of Western Mexico is developed and a strong threshold behaviour of biomass accumulation during the establishment phase of plant development was found using piece-wise linear approaches. Furthermore, they looked at the importance of applying STM and the problems faced when applying STM, such as defining relevant time frame and cause and effect relations between controlling and response variables.

The third part answers the question whether the new models for ecosystem dynamics are scientifically robust and helpful in guiding restoration projects by considering various approaches, issues raised and practicalities.

Overall, I found the book to be well written and clear, including of all basic theory and practice of restoration ecology. The book is suited to undergraduate students and possibly to beginning post-graduates who are aiming to develop models in a restoration setting. The theory and modelling approaches are given in great detail, which makes it particularly easy to follow the presentations. The book can, therefore, be recommended to everybody interested in a detailed, easily understandable and comprehensive overview of the links between ecological restoration theory and its application.

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