CHAPTER 1

LANDSCAPE ECOLOGICAL APPLICATIONS IN MAN-INFLUENCED AREAS - LINKING MAN AND NATURE SYSTEMS

Editorial introduction

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1. INTRODUCTION

The characteristics of the structure and function of landscapes and their ecological dynamics are integrated with natural and social factors (Naveh and Lieberman, 1994; Forman, 1995; Zonneveld, 1995). In view of the large-scale perspectives of ecosystem patterns and ecological processes (Turner et al., 2001), special attention should be paid to research on interdisciplinary solutions to the examination of patterns and processes of ecosystems (esp. degraded ecosystems and reserved areas; Liu and Taylor, 2002; Wiens and Moss, 2005). Landscape ecology is therefore a strong emerging concept and implements for those solutions. Landscape ecology does not only support new ecological principles, but also suggests models and designs that facilitate ecosystem creation (Zonneveld and Forman, 1990; Wu and Hobbs, 2002; Jongman and Pungetti, 2004; Pedroli and Pinto-Correia, 2006). A look at the history of landscape ecology reveals that two of its principles are strongly rooted in the academia of the EU and North America (large-scale ecosystem

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evaluation and land use planning). However, these two principles and cultural background should be integrated so as to facilitate the linking of various wildlife and systems. The current socio-economic principles are significantly different from those which were in place when the original framework of landscape ecology was formulated in the West. However, these principles have now become a major axis with which to understand landscape ecology and its applications in Eastern countries (Nakagoshi, 1995; Numata, 1996; Takeuchi et al., 2003). Moreover, human activity has now become the main focus of global change ecology, with special attention being paid to developments in these countries' man-dominated areas (Hong et al., 2004).

2. OBJECTIVE

This book focuses on the integration of landscape ecological principles and their application to landscape issues which might emerge in man-influenced areas. Landscape ecology has not only been focused on the conducting of research on spatial heterogeneity and its effect on unit ecosystems, but also on the introduction of strong implements which can be employed for habitat evaluation and the assessment of land use and restoration practices (Turner and Gardner, 1991; Farina, 2000; Gutzwiller, 2002; Wu and Hobbs, 2002; Bissonette and Storch, 2003).

The objective of this book is to utilize the many intellectual roots of landscape ecology to integrate the principles of ecology-management-planning (Figure 1).

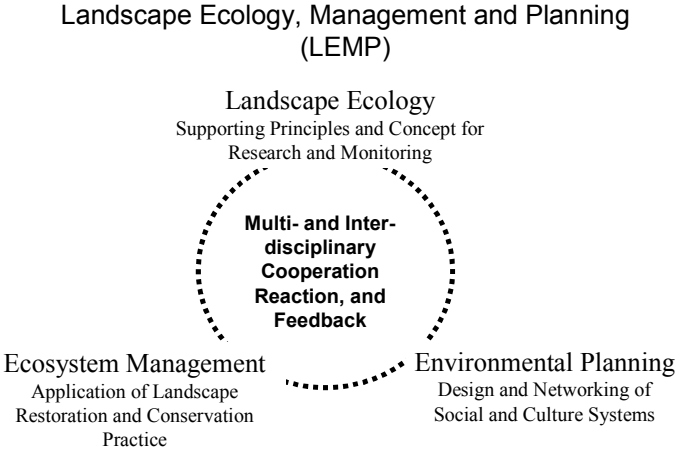

Figure 1. Multi-disciplinary objective of landscape ecological application.

Current eco-environmental issues such as resource management, habitat conservation, ecological restoration, ecological planning, EIA and the 'urban-rural gradient' issue are being resolved through the application of landscape ecology principles (Gutzwiller, 2002; Liu and Taylor, 2002; Bissonette and Storch, 2003). In this regards, the assurance of sustainable harmony between 'development and conservation' in man and nature systems should be regarded as an important focal point of any effort to resolve man-related issues. In this book, we attempt to resolve this 'debate' by integrating the principles of landscape ecology with practical issues such as management and planning. To achieve such an end, we invited experts in landscape research on such topics such as (1) multifunctional landscape, (2) ecosystem restoration, (3) landscape management, and (4) bio-eco-human networks, from the world over to take part in the compilation of this book.

3. CONTENTS OF THE BOOK

Landscape Analysis and Evaluation Method

Section I is divided into two parts, namely general *issues* and *analysis*. Part 1 represents an introduction of the major fields of landscape ecology in man-influenced areas; meanwhile, Part 2 deals with the current state of the development of the techniques and methodologies used for the spatial analysis and evaluation of landscapes.

Part 1. Baseline concept

Part 1 is a basic introduction to the main contents of the book. It involves a delicate debate of the difference between '*principles'* and' *practice'* from the standpoint of landscape ecology. While there are many landscape research-related issues in man-influenced areas, we have chosen to focus on three specific ones in this book. In this part, the main principles and concepts associated with landscape analysis and ecological monitoring efforts are discussed at length. The authors also describe the standard landscape methods used to survey landscape patterns and ecological processes. Major keywords such as spatial analysis, long-term ecological database, and its networking in man-influenced areas are also discussed.

Part 2. Applications in evaluation

As part of the study of landscape evaluation, Part 2 explores instances of the quantification of landscape patterns and ecological processes. "*Landscape evaluation*" represents the first step towards implementing conservation, planning and restoration practices. Landscape mosaics are strongly influenced by human activities such as agriculture, forestry, and land use (Bunce et al., 1993). Moreover, biological habitats are usually adjacent to fragile landscapes such as urban-to rural areas. Therefore, serious problems occur in very sensitive areas which lie between

natural and densely populated areas (McDonell and Pickett, 1993). Ecosystem modelling, impact assessment, and wildlife habitat models are also addressed in this section. Here, the evaluation of landscape pattern changes can be regarded as one of the main ecological indicators which should be used for sustainable landscape planning.

Landscape Management

Many biological disciplines can be linked to landscape ecology from both a theoretical and methodological standpoint (Szaro and Johnston, 1996; Schwartz, 1997). Although the theories associated with restoration, conservation, and wildlife ecology have different historical backgrounds, the need to cooperate in order to ensure the sustainable management of resources, and to develop a shared goal of natural conservation have become increasingly important for landscape researchers. In this part, we discuss the development of new concept which can be used to manifest spatial patterns and ecological processes in multi-scales. Moreover, this section also introduces the important landscape ecological application practices being utilized in various countries.

Part 3. Applications in managing diversity

Global perspectives on conservation ecology as well as biodiversity issues are discussed in this portion of the book. The dispersal and distribution of biological components are heavily dependent on the landscape configuration and the quality of the landscape matrix. This section includes a discussion of a wide range of biodiversity issues spanning from the species to ecosystem levels. Moreover, the authors discuss the ecological integrity of landscape patterns as viewed through the lens of various cultures.

Part 4. Applications in landscape health

To date, restoration ecology has been focused on local areas, and more particularly small-scale ecosystems. Restoration ecology, as such, has been applied to those areas that have clear boundaries, such as roads, wetlands, watershed, and forest ecosystems. However, those involved in these restoration efforts, due to their tendency to implement comprehensive plans to change the landscape structure, and their mismanagement of the restoration process, have more often than not wound up weakening the ecological function of other surrounding ecosystems, and in further degrading the ecosystem which they were trying to restore (Barrow, 1991).

To resolve these problems and restore a comparatively large-scale region, methods to assess the impact of such restoration efforts on surrounding ecosystems must be developed. These include expanding the scale of these restoration efforts; in other words, moving from the local to the landscape scale. As a conclusion, the practice of ecological restoration is increasingly moving towards the landscape scale in order to deal with these problems.

Designing for Landscape Creation

Part 5. Applications in land planning and strategy

In Part 5, landscape planning and environmental strategies will be discussed. Biotope creation and nature conservation strategies in man-influenced or man-dominated landscapes represent the major issues discussed in this section. In particular, flexible cooperation between governments, citizens, and researchers represents an essential element of any well-laid land development plans. The environmental movement and civic groups are actively pursuing the maintenance of a balance between development and the conservation of nature. Education and the dissemination of information pertaining to ecology, most specifically as it relates to landscape ecology (Farina and Hong, 2004), represent another element in the quest for a sustainable society. Landscape ecology is not an omnipotent principle which can be applied to all ecological fields, but rather an element of the inter-disciplinary cooperation that will be needed to resolve the problems associated with linking man with natural systems.

RESUME

At the multi-scale level, environmental problems have already moved beyond the social capacity. While the resolution of these problems is a complex one, the development of a spatial understanding land patterns and natural processes had been partly resolved this plethora of emerging problems. Networking and connectivity between man and natural systems as well as the ecological role of landscape bridges such as urban-rural gradients and green-water gradients (such as *Feng-shui*, wind-water theory) are some of the major perspectives which are discussed in this book. Finally, prominent issue discussed herein is that of the search for landscape integrity in man-dominated areas (Chapter 30).

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