Ecological Networks and Greenways
Concept, Design, Implementation

The establishment of ecological networks in Europe and greenways in America has required some of the most advanced applications of the principles of landscape ecology to land use planning. This book provides a thorough overview of the recent developments in this emerging field, combining the theoretical concepts of landscape ecology with the actual practice of landscape planning and management. In addition to biological and physical considerations important to biodiversity protection and restoration, equal weight is given to cultural and aesthetic issues to illustrate how sympathetic, sustainable land use policies can be implemented. Species models and landscape models provide the link between theory and practice, with emphasis on the choice of appropriate parameters and design for the adequate translation and implementation of the models to real life situations. Examples are given for large-scale areas (Estonia and Florida) as well as regional areas such as Milan, Chicago and the Argentinian Yungas. This invaluable book will provide a wealth of information for anyone concerned with biodiversity conservation through networks and greenways and their relevance to the planning process, whether researcher, land manager or policy maker.

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Foreword

There is an increasing trend towards urbanisation all over the world. In developed countries, around 80% of the human population now lives in cities or towns. Similarly, in developing countries, there is increasing movement to cities and towns with associated development pressures and ecological impacts in urban areas. In addition, while many rural areas are depopulating, changing land uses are placing major ecological pressures on these landscapes. These changes have had major impacts on biodiversity with detrimental changes to ecosystem processes and functions, habitat loss and fragmentation, and widespread loss of species.

Humans are a dominant species; landscape planning and management are necessary to minimise their impacts. In the past, we have relied on dedicated conservation areas and national parks to conserve the biota. We now know that these areas are usually left over after the more productive soils and landscapes have been developed for human enterprises. As a result, these areas are inadequate for the conservation purposes for which they were dedicated. The land outside these areas is also critically important for the conservation of biodiversity, and a layer of management that addresses this function now needs to be added to the more traditional management of much of the world.

Landscape connectivity is one major landscape attribute essential for the conservation of biodiversity. If we are to retain all biotic elements in landscapes and preserve ecological functions, we need to preserve the ecological connectivity of those landscapes. This involved recognising the ecological connectivity of urban and rural landscapes and planning to retain such connectivity or enhance it where appropriate. This is a major challenge for landscape ecology, that of providing practical applications to address the conservation of biodiversity across a wide range of scales from continents and regions to local districts. However, these applications must be underpinned by theoretical

understanding of the functioning of ecosystems and populations and the impacts that changing land uses will have on these.

Greenways, ecological networks, landscape linkages, and corridors represent an important and critical step in the application of landscape ecology to landscape planning for conservation of biodiversity. Such ecological linkages provide advantages in terms of movement of species and nutrients, in addition to ameliorating wind and water fluxes across landscapes. They also provide a focus to galvanise social and political support to integrate human communities into landscape planning and management.

There is considerable uncertainty inherent in landscape planning and management; however, the application of ecological linkages offers manifold opportunities to develop partnerships between individuals and organisations to manage landscapes for a range of objectives, including nature conservation. We know that planning and management are experiments to which we do not know all the long-term solutions. However, the application of ecological networks and greenways offers us an adaptive management approach to our planning and actions. This approach will result not only in the development of ecological networks, but also social and political networks that will assist in the connections of people with nature conservation.

This book on theoretical and practical aspects of the design and implementation of ecological networks and greenways is an important addition to the information needed for managing natural resources and minimising our ecological footprint.

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Preface

> MacArthur and Wilson's theory was and to a large extent remains a radical departure from mainstream thinking in contemporary community ecology. In its fundamental assumption it is a neutral theory that asserts that island communities are dispersal assembled and not niche assembled.

This statement was made in 2001 by Stephen Hubbell in his 'unified neutral theory of biodiversity and biogeography' (Hubbell 2002). He continues on metapopulation perspectives, asserting that this theory is very well applicable in cases of habitat fragmentation. Despite some critical discussion in scientific journals, the theory found application in planning and did change attitudes to nature conservation. The wider countryside has slowly been included in nature conservation, as also has landscape planning and land use planning.

In 1987 the President's Commission on Americans Outdoors in the United States of America recommended the '*greenways*' as new tools 'to provide people with access to open spaces close to where they live, and to link together the rural and urban spaces in the American landscape' (President's Commission 1987).

At the international conference 'Conserving Europe's Natural Heritage: Towards a European Ecological Network' held in Maastricht in 1993, Graham Bennett envisaged the need for an operational framework for guiding the implementation of strategies on European nature conservation, indicating the concept of '*ecological network*' as a tool for this (Bennett, 1994a). Engendered by the need to conserve and enhance the functioning of the ecological infrastructure of a region, the concept quickly moved on to conserving biological and landscape diversity, and to assisting other policy sectors with responsibility for sustainability and the conservation of natural ecosystems and biodiversity.

The development of ecological network and greenway concepts has been fast and they are widely used in scientific and planning literature. This book addresses both concepts and their development in two continents: Europe (EU and eastern Europe) and the Americas (North and South).

The idea for the book was generated at the world congress of the International Association for Landscape Ecology (IALE) in 1999 in Colorado where most of the authors were meeting for a symposium on ecological networks

and greenways organised by the editors. In planning *Ecological Networks and Greenways* we wanted to tackle questions of concepts, design and implementation, specifically on how *econets* (ecological networks) and *greenways* can be developed on the ground after the theoretical basis has been established.

In bringing together the contributions into this book, we focused on different groups of users and we faced two main aspects of developing econets and greenways. The first aspect is the recognition that understanding the common theoretical basis of econets and greenways provides scientific knowledge that can be conveyed not only to other scientists, but also to the practitioners and politicians responsible for future implementation. In fact furthering the discourse on concepts, philosophy, methodology and history clarifies the theory and facilitates converting knowledge into practical application.

The second aspect is the requirement that we should, by illustrating the process of constructing econets and greenways, demonstrate the means of their development in the field. Thus examples of design, planning and implementation of the two subjects in different continents are essential for the necessary flow of information on more practical solutions.

The two parts of the book follow these two directions, with specification and examples in each chapter. References have been amalgamated at the end of the book, to avoid repetition and guide the reader with a single comprehensive list.

Rob Jongman and Gloria Pungetti have co-operated on the subject of ecological networks in Europe since 1996, while working together at the ECNC (European Centre for Nature Conservation) in the Netherlands. Gloria's research on ecological networks started that year after a request from ANPA (National Agency for the Protection of the Environment), Rome, to initiate the ANPA Ecological Network Action Plan with a European overview on ecological corridors, and at the same time to promote the dialogue on ecological networks in Italy. Gloria Pungetti, European Co-ordinator of the Life ECOnet Project, is a scholar of holistic landscape research and ecological landscape planning in Europe, Italy and the Mediterranean, with a focus on the relationship between nature and culture. Her professional experience at Cambridge and Reading Universities as environmental researcher and consultant for governmental organisations and local authorities is based on uniting academic theory with technical, political and social practice. Rob Jongman is a landscape ecologist trained as a vegetation scientist and working at Wageningen University and Research Centre. He specialised first in ecological monitoring and data analysis. In 1989 he started on the development of the concept and implementation of ecological networks at the European level as well as at the national and regional level. In the period 1994–97 he was based at ECNC and co-ordinated European activities on ecological networks in the framework of

the Pan-European Biological and Landscape Diversity Strategy as a European approach to biological diversity.

This book contains contributions from Europe and America. We do not pretend to have included all new scientific and planning approaches. We were not able to invite all pioneers, such as the Czech and Slovak researchers and planners, nor the first planners of greenways in the USA, Canada and Australia. However, the discussion presented here and the examples of planning and implementing ecological networks show the potentials of econet and greenway development, present a broad overview and offer a challenge for authorities to renew their policy for biodiversity conservation and rural planning.

We live in an informatics world where everything changes rapidly. When the econet debate started in Italy in 1996, for example, we encountered much scepticism, but at the conference organised in 2001 for the Life ECOnet Project we found great support and recognition. Ecological networks in Europe and greenways in America are today among the most advanced applications of landscape ecological principles in land use planning. These concepts are accepted in biological and landscape conservation, not only by scientists but also by planners and political thinkers.

Furthermore the concept requires new avenues to explore; hence we are proposing in this book an approach based on both ecological and cultural linkages. We also think that in the planning of ecological networks, integration of social and ecological aspects is necessary. Nature conservation and land use planning are social actions. We show this in concrete examples from two continents and several countries: the USA, Argentina, Spain, Italy, the Netherlands and Estonia.

This book was assembled to introduce a better comprehension of econets and greenways to both scientific and planning audiences. Starting from scholars and academics, we want to exchange our experiences also with practitioners, technicians, public officers, decision makers and, last but not least, local populations. Our aim is to improve understanding, stimulate debate and encourage sustainable policies and mutual co-operation. To this purpose we found it essential to bring together theory, design, planning and practice. Although we believe in the importance of words, we also firmly believe that without sound implementation words alone will have no effect. We therefore hand over the concepts of ecological networks and greenways to all those willing to implement them. Or, as Bellamy (1994) stated at the EECONET conference in Maastricht in 1993:

> Ladies and gentlemen, time is running out for much of the biological diversity of Europe. The biological diversity of Europe is in your hands! Action must be taken now.

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