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978-0-521-54231-9 - Ecology of Woodlands and Forests: Description, Dynamics and Diversity

Peter A. Thomas and John R. Packham

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## ECOLOGY OF WOODLANDS AND FORESTS

### Description, Dynamics and Diversity

Taking a functional rather than an ecosystem or a utilitarian approach, Thomas and Packham provide a concise account of the structure of woodlands and forests. Using examples from around the world – from polar treelines to savannas to tropical rain forests – the authors explain the structure of the soil and the hidden world of the roots; how the main groups of organisms that live within them interact both positively and negatively. There is particular emphasis on woodland and forest processes, especially those involving the flow and cycling of nutrients, as well as the dynamics of wooded areas, considering how and why they have changed through geological time and continue to do so. This clear, non-technical text will be of interest to undergraduates, foresters, ecologists and land managers.

PETER A. THOMAS is senior lecturer in environmental science at Keele University, UK, where his teaching encompasses a wide range of tree and woodland related topics including tree design and biomechanics, tree and woodland ecology and woodland management. His research interests focus on tree ecology, dendrochronology and forest fires. He is the author of *Trees: Their Natural History* published by Cambridge University Press.

JOHN R. PACKHAM is Emeritus Professor of Ecology at the University of Wolverhampton, where he headed the Woodland Research Group for many years. He has special interests in forestry, was a founder member of the Continuous Cover Forestry Group (CCFG) and has worked extensively in English and Scandinavian forests. His research is particularly concerned with virgin forests, the ecology of the woodland field layer, and the establishment of attractive and diverse communities in new woodlands. Executive editor of *The Ecological Flora of the Shropshire Region* (1985), he was the first author of two major books on woodland and forest ecology and one on coastal ecology, and an organizing editor of *Ecology and Geomorphology of Coastal Shingle* (2001).

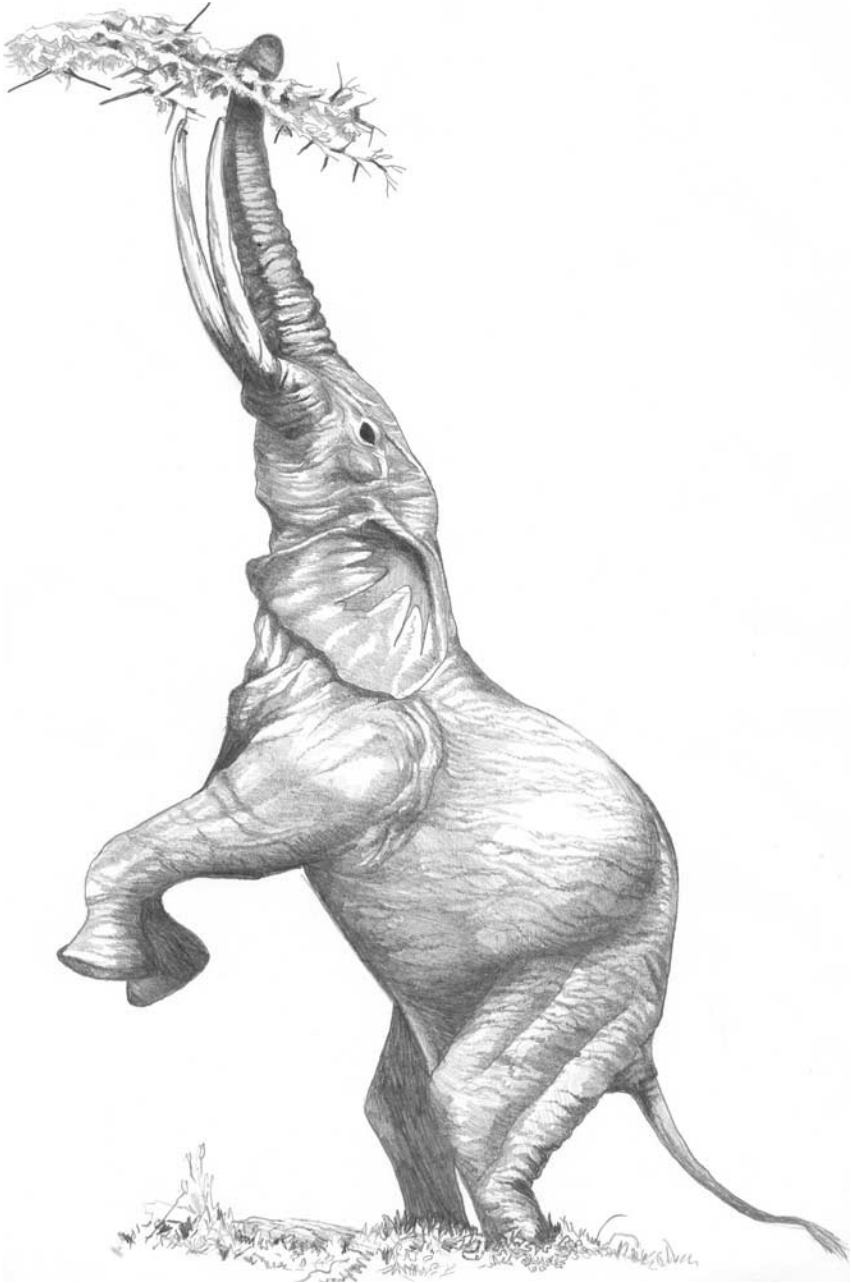
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Forest type African elephant *Loxodonta cyclotis* feeding on acacia canopy. (Formerly regarded as a subspecies of the African elephant *Loxodonta africana*, the forest elephant is now considered a separate species.)

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To our wives, Jody and Mary, who have supported our work so thoroughly. Also to those planting the forests of the future and conserving those of the present.

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## Epigraph

For ye shall go out with joy, and be led forth with peace: the mountains and the hills shall break forth before you into singing, and all the trees of the field shall clap their hands.

*(Isaiah 55, v.12)*

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## Preface

As its subtitle implies, the aim of this book is to provide within a relatively small compass an account of the structure of the woodlands and forests of the world, the relationships between the main groupings of organisms which live within them, and a discussion of the significance of plant and animal diversity at both the community and regional level. There is particular emphasis on woodland processes, especially those involving the flow of energy and cycling of nutrients. An attempt has also been made to show how communities dominated by trees, together with their constituent animals and plants, have gradually evolved during geological time.

Foresters and conservationists have of necessity to be far-sighted, and are usually both cheerful and philosophical. While Isaiah 55, v.12 presents a somewhat unusual view of tree behaviour, it does convey a very positive approach, one well suited to the major forest tasks which have to be dealt with in this new century. One function of this book is to provide a background against which foresters, ecologists, land managers and others can view the past and plan for the future. This book, while drawing on previous work, is wherever possible based upon the most recent research, in the hope that those familiar with our other books will find something more of value here. It uses the ecosystem approach and endeavours to show how various organisms, often diverse in space and time, have employed basically similar strategies, sometimes resulting in the repeated evolution of special features that enable them to exploit particular environmental niches. It is intended to provide undergraduates, teachers, and all those interested in vegetation dominated by trees, with a concise account of woodlands and how they operate. The more society at large gets to know about these systems, which never cease to fascinate the authors, the greater is the chance that rare species and habitats – and in particular old woodlands – will be effectively protected.

A great deal of interest attaches itself to the study of particular ecosystems. Amongst the ultimate aims of a plant ecologist, however, must be the ability to

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predict the ways in which vegetation will change, and the achievement of an understanding of the general rules which govern plant and vegetation behaviour. Many eminent scientists have devoted much of their research to studies along these lines, notably Grime whose *Plant Strategies, Vegetation Processes, and Ecosystem Properties* (2001) is a seminal reference. In his preface, Grime quotes MacArthur (1972) 'To do science is to search for repeated patterns not accumulate facts'. We hope that the examples described in this book are illustrative of the general patterns that are the basis of woodland and forest ecology.

**Bold type** is used to emphasize key ideas and concept words when first explained, while entries involving definitions are printed in bold in the index. Much of the book is written directly from our own experience. Where the work of others is quoted, the names of the authors are given together with dates of publication, so that the article can be looked up in the references at the end of the book.

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## Metric equivalents

Metre = 39.37 inches = 3.28 feet

Kilometre = 0.6214 statute mile

Hectare = 2.4711 acres

Kilogram = 2.2046 lb

Tonne = 0.985 ton

1 mile = 1.6093 km