

## Book Review

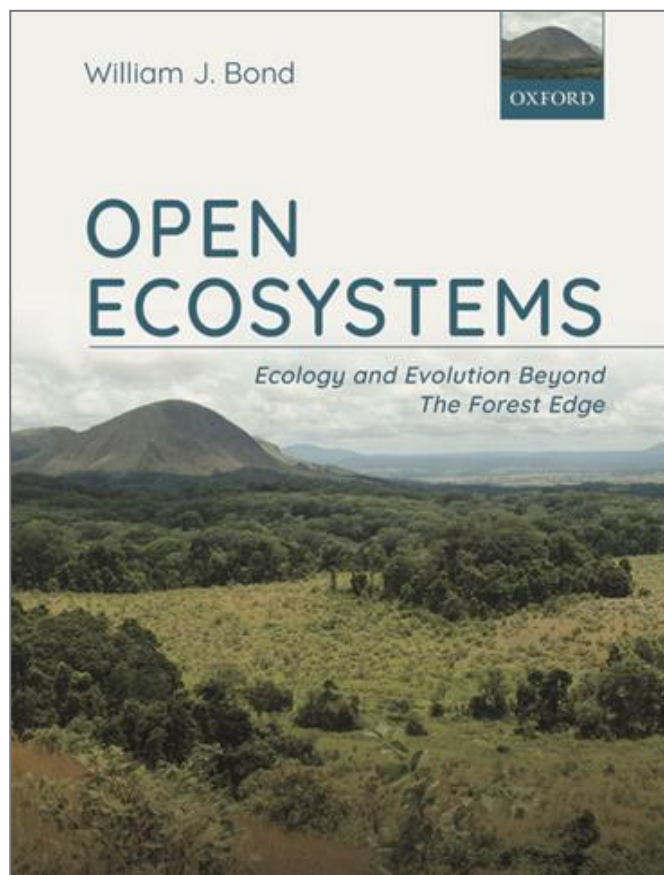
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**Bond, W.J. 2019. Open Ecosystems: ecology and evolution beyond the forest edge.** – Oxford University Press, Oxford, 192 pp., ISBN (hardback): 9780198812456 – £58.00, ISBN (paperback): 9780198869306 – £34.99.

It is estimated that almost 60% of the Earth's land surface is covered by non-forested, open ecosystems (Dinerstein et al. 2017), yet grasslands and shrublands have been much less studied by scientists and much less appreciated by the general public than forests (Bond & Parr 2010). It has been a long-held belief that in landscapes where the climate and the soil can support forest growth, open vegetation is secondary, degraded and that it is of anthropogenic origin. This prejudice against non-forest ecosystems is based on the 'one climate = one vegetation' assumption, in other words that climate is the single most important factor that determines the distribution of vegetation formations (e.g., Holdridge 1947). However, it is now known that a large share of the Earth's surface is in climate zones where ecosystems are uncertain (Whittaker 1975; Bond 2005), meaning that they can harbour strikingly different vegetation formations from open grasslands and shrublands to closed forests. Open ecosystems that occur in landscapes where the climate can also support forests are the main subject of this book.

This book is not an exhaustive review of the existing literature on open ecosystems. Rather, it sets up an argument and advances a point of view that these ecosystems, instead of being merely successional to climax forests, exist as Alternative Stable States (ASSs) alongside closed forests (Hirota et al. 2011; Staver et al. 2011). Thus, they are ancient systems with unique biota and ecological processes that deserve to be conserved in their own right. The book develops this crucial argument in nine chapters, each starting with a subsection introducing the reader to the topic of the chapter, and most ending with a summary.

Chapter 1 is an introduction to open ecosystems and explains how the occurrence of open vegetation in landscapes that also harbour forests are a global anomaly. This is demonstrated using the example of fynbos shrublands, and briefly summarises the history of research on open ecosystems. Chapter 2 explores the extent to which actual and potential vegetation differs on a global scale and describes the climates under which these mismatches mostly occur, i.e., climate zones where ecosystems are uncertain. The conceptual framework of uncertain ecosystems is introduced in Chapter 3. It explores the concepts that have emerged to explain the existence of uncertain ecosystems, most notably the Alternative Stable States (ASS) theory and its implications. Chapter 4 discusses the surprisingly understudied nature of open ecosystems, including their diversity,



endemism and antiquity, plus the functional traits of plant and animal species of different types of open ecosystems. Chapter 5 focuses on the origins of open and closed ecosystems and their biota based on fossil and phylogenetic evidence. It sheds light on the antiquity of these ecosystems which is crucial for recognizing their value despite the obvious but unjustified preference for forests by public policy and practice. The influence of soils on forest distribution is discussed in Chapter 6. This chapter also explores how soils can affect tree growth through their physical and chemical properties and also draws the attention to plant–soil feedbacks which have been largely under-appreciated in the past. Chapter 7 explores the extent to which fire, a generalist consumer, accounts for the existence and distribution of open ecosystems, shedding light on the fact that fire has helped to maintain open vegetation for millions of years. Chapter 8 focuses on vertebrate herbivory and its effects on ecosystems, demonstrating that fire and large herbivores can be competing consumers that drive ecosystems towards divergent functional compositions. Chapter 9 looks into the future and discusses how atmospheric changes, including increasing CO<sub>2</sub> concentrations, might change the fundamental characteristics of open ecosystems and thereby threaten their existence.

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The text is accompanied by numerous informative tables, graphs, maps, and photos, some of which are also presented on separate colour plates. A minor point of criticism is that some of the maps are presented both in black and white and on colour plates, but they are undiscernible without colours, so presenting them in black and white in the text seems to be redundant and useless. The author is from Cape Town, which is presumably why the book is mostly focussed on (sub)tropical ecosystems, especially those in Africa. This could be seen as a shortcoming by readers from the Palaeoarctic. However, I found it refreshing and eye-opening to learn of certain issues and phenomena that otherwise are not well-known by those of us unfamiliar with tropical ecosystems.

Bond's major motivation for writing this book was his concern over international plans to afforest large areas of open ecosystems to tackle increasing atmospheric CO<sub>2</sub> concentrations and climate change. As open ecosystems are largely perceived as inferior to forests, legislation and international policies often run contrary to their maintenance, including legislation for fire suppression to protect forests and funding for eliminating open ecosystems by 'reforesting' them. This complete disregard of the accumulating scientific evidence of the antiquity and intrinsic value of open ecosystems is likely to cause severe damage to the diversity of life on Earth. Readers of *Palaeoarctic Grasslands* are probably already interested in and fascinated by open ecosystems.

However, I am sure that reading this book will convince many to become more interested in their ecology and more committed to the conservation of these remarkable ecosystems.

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Loess grassland with *Filipendula vulgaris* and *Trifolium alpestre*, Hungary. Photo: J. Sonkoly.