

The processing of insects into granular, paste or other forms is presently possible, as is the extraction of proteins, fats, chitin, minerals and vitamins, but they are presently too costly and need further development.

Your reviewer has seen *Edible insects* positively mentioned in a number of publications from around the world, and I am indebted to the Italian magazine *Panorama* of 4<sup>th</sup> September 2013 which not only reviewed the FAO/Wagenin-gen publication but also drew my attention to a new “pop-up” restaurant devoted to serving dishes based on insects in south London. *Eat Ento* is working towards *getting people to eat insects one delicious bite at a time* as their website [www.eat-ento.co.uk](http://www.eat-ento.co.uk) proclaims. They are also working on creating awareness of the many benefits of edible insects and their passion is infectious, as a recent article in the *Times* of London has explained with a reporter sampling, albeit slightly reluctantly, several of their dishes, and deciding that she would return – probably. The *Panorama* article also drew my attention to the *Eat-a-bug Cookbook* by David George Gordon, which was published in the USA last July and includes recipes to transform worms, scorpions, ants and many other insects into delicious dishes.

The authors conclude with a chapter on *The Way Forward*, the “roadmap” drawn up by the participants in the meeting on the potential of insects a food and feed of January 2012 which summarizes the main tasks that lie ahead:

- Further document the nutritional values of insects, in order to promote them as a healthy food source;
- Investigate the sustainability and quantify the environmental impacts of harvesting and farming insects, compared with traditional farming and livestock-raising practices;
- Clarify and augment the socio-economic benefits of insect farming and gathering, focusing on improving the food security of society’s poorest; and
- Develop a clear and comprehensive legal framework at national and international levels, leading to investment and the development, from household to industrial scales, of production and trade in insect products for human food and animal feed

The case must be made to consumers that eating insects is not only good for one’s health but also benefits the planet and insect-rearing, which requires minimal technical knowledge or capital, is a socially-inclusive activity. But the sustainable harvesting of edible insects from the wild will require nature conservation strategies as well as some habitat manipulation to increase abundance and accessibility. Simple rearing procedures for insect-raising need to be developed. In the Western world consumer acceptability will be determined to a great extent by pricing, perceived environmental benefits and the development of tasty protein snacks derived from insects. Preservation and storage will need to be improved and automated mass-rearing systems and procedures to

extract proteins for the food and feed industry will have to be developed.

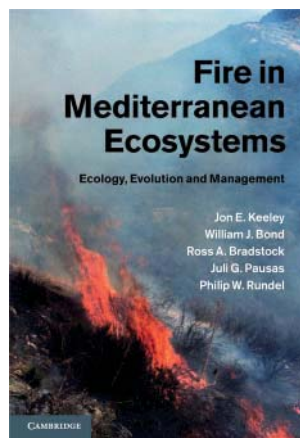
There are many case studies in boxes and examples are quoted throughout the text; the centerfold has a number of attractive photos, but the colourful front cover of *Edible insects* summarises the book’s contents well: it shows photos of African women selling caterpillars in a market; gold-plated crickets on top of luxury Belgian chocolates; black soldier fly in a mass-rearing unit; insects as appetizers; species of Coleoptera used a food colourant; and palm weevil larvae, a staple food.

**Jim Ball**  
President CFA

## Fire in Mediterranean Ecosystems: Ecology, Evolution and Management

Jon E. Keeley, William J. Bond, Ross A. Bradstock, Juli G. Pausas and Philip W. Rundel

Cambridge University Press. 2012. ISBN 978052182490, £74.00/US\$127.00



Here is a valuable overview of knowledge about fire in the ecosystems of the five mediterranean-type climate (MTC) regions of the world, and a timely contribution to an emerging discipline—*pyrogeography*. Its topic is fire in local ecological interactions as well as global earth systems processes (and I use *pyrogeography* here to encompass the scope of this book). I agree with the underlying theme that

*pyrogeography*, and the development of the discipline, is tightly bound to human notions of nature, which in turn are the products not just of science but also our lived experience of nature. These notions are historical, and are prone to irrational myth. A book of the scope and ambition of this one needs to attend explicitly to these historic influences, and I return to this in my concluding here.

This is not a field with a long history; Margaret Levyns, who experimented in the Cape renosterbos and published in 1929, seems to have been the pioneer. The extensive San Dimas experiment, near Los Angeles, was set up in the early 1930’s (though not noticed in this book). But, as Juli Pausas and Jon Keeley reported recently, it is only from around 1980 that the science has flourished<sup>1</sup>. By this standard, the authors

<sup>1</sup> Juli G. Pausas And Jon E. Keeley, ‘A burning story: the role of fire in the history of life’, *BioScience* 59 (2009), 593–601.

of this book are veterans: William Bond (South Africa), Ross Bradstock (Australia), Jon Keeley and Phil Rundel (California) have been publishing on this topic since around 1980, and Juli Pausas (Spain) since about 1990.

Fire (wildfire, bushfire, veldfire) has played its part in the evolution of the earth's biota for at least 65 m years, perhaps 400 m years<sup>2</sup>. Much of the Earth's land surface is exposed to fire today, from tropical savannas to the boreal forests: half has 'fire-prone' ecosystems. Much of the vegetation of the world is not at its climate potential: for example, in large parts there is grassland where the climate would predictably allow forest: the area of forest would be twice what it is if fire had been prevented.<sup>3</sup>

Scientists predict that the proportion of land that is prone to fire would increase under plausible climate-change scenarios, while the fire regimes to which we are accustomed in the places where we live may shift. Overall, fire is a complex issue, and we are not helpless victims—in today's environment, human activity (past forest management, carelessness, arson, building in the bush, etc.) is the main determinant of fire incidence and effects, a factor that obscures the effects of climate and climate change—as in the case of the recent, two-month 100,000-ha Rim Fire near Yosemite<sup>4</sup>. And wildfire is not just a phenomenon subordinate to climate and human actors, but also an agent in climate change.

People, often wealthy and careless absentees, have and are extending their habitations further and further into fire-prone ecosystems and the costs of emergency management, recovery, and insurance soar. And probably the most important shift in human populations has been our urbanisation, and our accompanying alienation from and 'Disneyfication' of nature (a process well treated in this volume in the chapter on the Mediterranean). How do we get to grips with all this?

In most parts of the world, then, sustainable forest, or ecosystem management must incorporate ecologically sound fire management, and for this reason, a book of the scope of *Fire in Mediterranean Ecosystems* is relevant, not only to ecologists, or to scientists, but to a wide readership, and should be written with this in mind.

From this perspective, the book is an important one, and for several reasons. First, the fact that MTC regions are small and quite isolated in five different regions in the globe, gives a nice definite set that can give us a handle on the bigger questions of fire, and on whether and how we can draw globally relevant lessons from particular contexts. Second, they are (mostly) highly prone to fire. Third, their ecology is intensely interesting, and biodiversity protection, urgent. And finally, people prefer to live there and in exercising their preference, choose in large measure to occupy places vulnerable to fire, with lessons to us on fire management.

The authors dispute the 'hegemonic' idea that climate and soils are 'sufficient to explain the origin and distribution of plant species'—rather, we can explain these distributions in fire-prone regions only if we understand fire too. MTC ecosystems (winter rainfall and summer drought, distinct and separate biomes, natural experiments in convergent evolution) provide 'a focal point for discussion of the integral role that fire plays'. They set out to show, by a critical review of a huge literature (their bibliography runs to 100 pages, the truth of this proposition, in opposition to the 'climate-only' hypothesis. Their first conclusion is that 'fire is a critical factor that interacts with climate and geology to affect plant traits, community assembly, and ecosystem functioning.'

The book has three parts: an Introduction, a second section, 'Regional Patterns', and a third 'Comparative Ecology, Evolution, and Management'.

The Introduction presents the central argument about the role of fire in evolution, revisits the concepts of evolutionary and ecological convergence (and their limits) as the framework for the analysis that follows, and consolidates a lexicon of central terms (perhaps a little too colloquially American for this reviewer), all important steps toward a recognisable discipline. It expands the Fire Regime Framework, the conceptual nexus between fire and ecology seminally developed by Malcolm Gill in 1975, and has a nice section on the typology of winds in MTCs as determinants of extreme fire weather. The section concludes with a summation of the array of heritable traits expressed in plants for survival in the fire regimes of MTCs. This section is a good compendium of the concepts and terms that scientist, policy makers and citizens need to engage with their fire-determined environments.

The five chapters on Regional Patterns (i.e. for Mediterranean Europe, California, central Chile, south-western South Africa and southern Australia) provide the necessary framework for the overall analysis of pyrogeography that follows. The frameworks are analyses of the vegetation and physiographic patterns in each region, and how human action and fire ecology vary across these patterns. Each chapter is an excellent contemporary review of knowledge, well stocked with illustrative cases: the phylogenetics of serotiny in Mediterranean pines, fire-dependent cues for seed dispersal, fire-generated cues for seed germination and flowering, smoke as a stimulant of regeneration, human history and the historical ecology of fire, to cite some examples. The chapters provide tight accounts of the development of fire management systems in each region.

The third section, 'Comparative Ecology, Evolution, and Management', puts the authors' central ideas to the test. It synthesises the pyrogeography of MTC regions in six parts, the evolution of fire-adapted traits, fire and the origin of MTC ecosystems, plant diversity and fire, alien species and fire, fire

<sup>2</sup> Bond, W. J., Scott, A. C., 'Fire and the Spread of Flowering Plants in the Cretaceous', *New Phytologist* 188 (2010), 1137–1150. (Pausas and Keeley some of the same fire regimes evident today were present in early land plant communities at 395m yr)

<sup>3</sup> Bond, W. J., 'Large parts of the world are brown or black: A different view on the 'Green World' hypothesis', *Journal of Vegetation Science* 16: 261–266, 2005.

<sup>4</sup> Andrew C. Revkin, 'The Yosemite Inferno in the Context of Forest Policy, Ecology and Climate Change', *New York Times* August 29 2013.

management, and an analysis of the joint climatic, fire, and geological determinants of convergence in MTC ecosystems. Their concluding passages highlight and explain the character and identity of convergences and divergences in the fire ecology of MTC regions.

This book extends beyond many recent books: Bond and Van Wilgen on *Fire and Plants*, Sugihara et al, *Fire in California's Ecosystems*, Cary et al. *Australia Burning: Fire Ecology, Policy and Management Issues*, and others. It is an important step in the forming of the discipline of pyrogeography, because it gives us an authoritative, critical review of the body of knowledge emerging from intensive inquiry in the MTC biomes, but a set from which arguably we have learn most about wildfire. It builds on a continuity of Mediterranean ecology that begins with Andreas Schimper's 1908 *Pflanzen-Geografie* and proceeds through the vital programme on convergence in MTCs of the 1970s and 1980s. So it is a book that should be in the libraries of any advanced research, education and policy body concerned with MTC regions, or fire.

But the book needed greater strength in certain respects. First, it has certain blind spots, largely overlooking the history of science and policy (work by Simon Pooley, Brett Bennett, and Brian van Wilgen—the latter on the evolution of fire and invasive alien plant management practices in fynbos, and why the omission of Bendix's work?<sup>5</sup> Second, progress in the sustainable management of ecosystems and in reforming and building effective institutions requires engagement of a diverse range of publics—scientists, emergency managers, urban planners, citizen groups—who can share common concepts and semantics and a sufficient grasp of pyrogeography. For this, we need a more coherent account of pyrogeography than we find here, which will allow us to map out and consistently interpret pattern and process in the social-ecological system that houses the fire problem. This means clarity of concept, consistency in semantics, and a cogent analytical framework—do the terms 'fire prone' and 'fire dependent' relate only to South African ecosystems, or are they generally valid? We need a better account of the evolutionary history of present biotas and how change will likely effect a re-sorting of the species that distinguish present ecosystems, rather than the discursive and often inconclusive accounts in this book. But most urgent, we need a far stronger analysis of the question of fire management, which takes full account of the institutional history—here, the book is especially weak, descending quickly into the technicalities of prescription burning, fuelbreaks, and climate change, with little attention to prior questions. What causes the unhealthy interaction between humans and fire at the 'wildland-urban interface'? Does it have to do with the 'cultural framing' of 'environment', our contempt of the past and our romanticising of 'wilderness', as mentioned briefly in this book, part perhaps of our increasing alienation from nature? Do the interests

vested in capital-intensive and militarily exciting fire-response capacity wag the dog? Or does it have to do with the 'cultural cognition' of risk, as now being explored by Dan Kahan at Yale and others? Can we create or recreate the local traditions—in Burke's "little platoons"—needed to overcome our short memory spans—taking account of Tom Griffiths' words 'the most haunting aspect of this tragedy [the Black Saturday disaster in Victoria] is its familiarity'—its happened before, and likely again<sup>6</sup>. Or is the whole process driven by real-estate marketeers, promoting the gentrification of the countryside, ecological slumlords? What has been learnt from the Royal Commissions and other enquiries following events like the Black Saturday fires in Australia (entirely overlooked in this book), and what more can we learn from such history? Has the drive toward a consistent and comprehensive approach to (environmental) fire risk assessment and management yielded improvements? What of the historic ebb and flow of policy and practice, such as around prescribed burning? What is coming from new legislation and policy instruments, such as the Veld and Forest Fire Act and its Fire Protection Associations in South Africa? Perhaps we need a different mix of disciplines to write the next book.

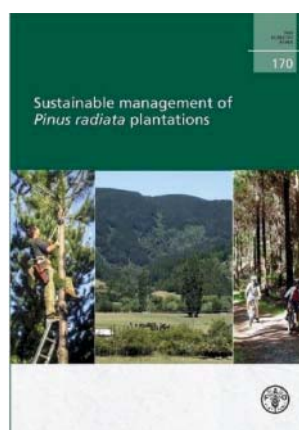
**Fred Kruger**

Honorary Research Associate, University of Cape Town,  
South Africa

## Sustainable Management of *Pinus radiata* plantations

Dr DJ Mead

FAO Forestry paper No. 170. 2013. FAO, Rome. Free download at <http://www.fao.org/docrep/018/i3274e/i3274e00.htm>



It is entirely fitting that probably the world's most extensively planted exotic softwood should be the topic of a comprehensive record of its use in plantation forestry, and equally fitting that the record be written by New Zealander Dr Don Mead, who for more than 50 years has been involved in some of the key research and teaching about this species.

Radiata pine is an extremely valuable plantation species in countries as widely separated as Spain, Chile, New Zealand, Australia and South

<sup>5</sup> Jacob Bendix, 'Pre-European Fire in Californian Chaparral', in: Vale T. R. (ed) *Fire, Native Peoples, and the Natural Landscape*, Island Press (2002), 315 p., pp. 269–294.

<sup>6</sup> Griffiths, T., "'An unnatural disaster'? Remembering and forgetting bushfire', *History Australia* 6 (2009), 35.1–35.7.