## BOOK REVIEWS

# Burning Issues – Sustainability and Management of Australia's Southern Forests

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THE day we know how every Australian plant and animal responds to three fire intensities, three fire frequencies, and two fire seasons is the day that fire managers will finally have a decent handle on this most complex of processes. In the meantime though, where the science runs out fire management is directed by best guesses. In Australia, these guesses fall into three paradigms: the ecological paradigm; the indigenous paradigm; and the forestry paradigm. The ecological paradigm is species-centred and based on Ockham's Razor — the assumption that the simplest answer is the most likely. The indigenous paradigm is based on the assumption that aboriginal people were the dominant drivers of fire regimes before Europeans arrived and that the best thing that we can do to manage fire now is to try to emulate what we think they used to do. The forestry paradigm is based on the assumption that traditional timber production practices are the best way to meet fire management aims. In practice, most fire management programs are an amalgam of all three paradigms with priority given to one or another depending on the circumstances and worldview of the practitioners.

The vision presented in this book is of a rural landscape in which forests and woodlands are subject to broad-scale, high-frequency, low-intensity planned burning; as a consequence, unplanned forest fires present minimal threat to human life, property and the environment, and the rural population is sustainably employed in the associated carbon management, water and timber industries. Biodiversity, we are assured, will be maintained or enhanced within this integrated program and Australia will lead the world in best-practice forest land management. In short, this is the vision of the traditional forestry paradigm, intended to influence policy-makers and the public in the ongoing battle between foresters and ecologists for control of the forest resource in southern Australia. In this battle, foresters generally represent the views of rural Australians employed in silvicultural and agricultural industries and provide leadership for the volunteer bushfire services such as Victoria's Country Fire Authority and New South Wales' Rural Fire Service. On the other side, ecologists generally represent urban Australians with an interest in conservation and who form the ranks of the national parks services. In my opinion, the controversy surrounding fire management is one of the few tools that give the traditional forestry lobby leverage in a world where management of most natural ecosystems is controlled by ecologists with the main aim of biodiversity conservation. The take home message of this book is two-pronged: 1) that control of Australia's southern forests should be removed from the heavily urban-influenced national parks services and returned to economically productive use; and 2) fire management in rural landscapes should be vested in local rural communities with the knowledge and experience to effectively manage bushfires.

As a bushfire ecologist, I disagree that the southern forests should be managed according to the traditional forestry paradigm and disagree with the take home message. This is a frustrating book to read because as the argument is assembled I find myself often disagreeing with the premises, disagreeing with the interpretations of key pieces of literature or noting that a key citation is not peer-reviewed. Knowing where the argument is headed, it's the same cross-purposes invective that has perennially occupied media, bushfire conferences and lately the Bushfire CRC (whose brand is on the cover). In my opinion, the advocates of the forestry paradigm of fire management are not seeking a reconciliation of the disparate evidence and points-of-view. Any such reconciliation would mean defeat in their battle to wrest back control of the forest resource from the "greenies".

Having said that, it is important to point out that there is a lot of worthwhile information in the nine chapters of this book. Chapters 1-3 discuss bushfires and bushfire regimes; Chapter 4 discusses fire ecology and plant functional traits; Chapter 5 reviews a topical new area for fire managers — the interactions between bushfires and carbon, water and nutrients; Chapter 6 looks at climate change and its potential impact on fire regimes and Chapters 7-9 conclude by advocating for fuel-reduction burning. Three highlights for me are: 1) the sceptical analysis of what is known about aboriginal fire regimes and their relevance for the present (Box 1.1); 2) a critical analysis of plant functional trait theory and recent evidence (Chapter 3); and 3) the compilation of a fire history timeline for the southern Australian forests (Chapter 2).

So, what in a nutshell, are the flaws with the argument? Why specifically do I disagree with this approach to bushfire management?

The first reason is that fuel reduction burning has limited effectiveness in reducing the intensity and extent of the very hot, fast-moving fires that cause virtually all human fatalities and the vast majority of property damage in Australia. Figures 3.3 and 3.5 illustrate the affect of fuel load on fire behaviour and fire intensity over a range of Forest Fire Danger Indices (FFDIs) as calculated by the MacArthur Forest Fire Danger Meter. The MacArthur Meters were developed by forest science staff of CSIRO and underpin the argument for fuel reduction burning.

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The graphs show that the higher the fuel load, the more dangerous a bushfire can potentially become. The problem with this work, however, is that the experiments from which the relationship was derived involved fires burning at FFDIs of 1-20. The results were then extrapolated to the then theoretical maximum FFDI of 100 and then, following the Ash Wednesday fires in 1983, to an open-ended scale (FFDIs >200 have been recorded). This method would not pass scientific peer-review today. It is clear that intense, fast-moving bushfires do not behave according to the MacArthur Meters. The spread of the 2003 Canberra fires, driven by poorly understood convective atmospheric affects, across dusty drought paddocks where they should never have carried, is just one of the examples that indicates that processes are at work that appear virtually insensitive to fuel load. It is widely accepted, that fuel reduction burning does assist fire suppression at lower FFDIs, but at higher FFDIs, to be affective in protecting life and property, it must be applied immediately adjacent to the asset. It is therefore not a valid reason to apply a regime of broad-scale, low-intensity, high-frequency planned burning to the southern Australian forests.

The second reason is that I am deeply sceptical that the management regime proposed in this book will maintain or enhance biodiversity (Chapter 4). The authors treat the subject of fire ecology in a cursory way. They state that it is "simple logic" that species diversity at the landscape scale is dependent on a diversity of fire ages at the landscape scale. I interpret this to mean that "pyrodiversity begets biodiversity" but this concept is flawed (Parr & Andersen 2006). A landscape with a uniform time-since-fire can still have a complex mosaic of mean fire intervals and minimum fire intervals which are crucial to the distribution of organisms (Bradstock *et al.* 2005). Other factors such as topography and edaphic conditions also vary across the landscape, and in present-day Australia ecosystems such as rainforest and mulga woodland usually contribute more to biodiversity when they are not regularly burnt. This debate will never be settled because the proponents of different points of view will define biodiversity in the way that suits them, however, I would not entrust stewardship of Australian forest and woodland biodiversity to the program advocated in this book.

The third reason is that best practice bushfire management is much more than just burning the bush at regular intervals and in my opinion the authors have failed to recognise the advances in understanding and practice that have occurred across Australia in the past decade. Protection of human life, human property and the environment is most appropriately achieved by an integrated risk management approach consisting of planning regulations for suburbs and buildings, strict fuel and access management at the urban-rural interface, landscape burning in appropriate natural ecosystems at appropriate time-frames and a solid program of bushfire science encompassing suppression technology, human psychology and ecology.

The authors contrast the "best practice" fuel-reduction burning program in Western Australia (the model they advocate for the rest of Australia) with the apparently unsatisfactory "burning over the back fence" systems operating in NSW and ACT. I think therefore that it is illustrative to briefly describe the bushfire management framework in the ACT. Since the destructive bushfires of 2003 the ACT has produced a five-yearly Strategic Bushfire Management Plan (SBMP) and funded a standalone Fire Management Unit within the ACT Parks and Conservation Service. The SBMP sets the technical standards for: 1) bushfire protection at the urban-rural interface including appropriate fuel management zones, building design standards and emergency service access depending on the assessed bushfire threat; 2) fuel management standards in natural ecosystems and agricultural land; 3) appropriate numbers of adequately trained staff; 4) appropriate rural road access and bushfire suppression infrastructure; 5) appropriate conservation guidelines. The Fire Management Unit is tasked with ensuring that the ACT meets the standards and is audited in this work by the Emergency Services Agency (ESA) which reports back to the Government. In the bush capital, the smell of smoke and burning vegetation is not unusual, but much of the work is concentrated at the urban-rural interface which bushfires must cross to kill people in their homes. The grass in the asset protection zones must be mowed, grazed or burnt, the shrubs removed, the trees thinned to reduce the chance of crown fires and the roads made trafficable. Staff must also liaise with anybody doing any work in the protection zones — e.g., planting trees, erecting signs, building new drains — to ensure that it does not compromise bushfire preparations. The 2011–12 Bushfire Operations Plan will see 22 059 ha of the ACT treated to the appropriate standard. That amounts to 9.2% of the area of the ACT and 12.6% of the land managed by the ACT Government. Of the treated area 69% is scheduled to be slashed or grazed, 25% is to be burnt and the remaining 6% is to be pruned by hand or sprayed. Bushfire access works are to be undertaken on 523 km of fire trails (i.e., 12% of the rural road network) and 15 infrastructure projects are to be undertaken such as new fences and water points for grazing, new water sources (tanks, dams and bores) and new helicopter pads. The point is that burning the forest is only one, albeit important, aspect of bushfire management.

This book is disappointing for its one-track analysis and in my opinion it is unlikely to gain much traction amongst bushfire managers in Australia. On the other hand, it raises some important challenges for conservation land managers. 1) A significant proportion of Australians have not "bought in" to the concept of land management for biodiversity conservation. 2) While bushfires continue to kill people in their homes, the tenure of ecologists over natural ecosystems will remain subject to criticism. 3) An important part of the protection of human life and property is the creation of asset protection zones and in some cases these will be incompatible with biodiversity conservation. 4) A flaw with the present management framework for natural ecosystems in Australia is the paucity of funds and innovative solutions are required.

Bradstock, R. A., M. Bedward, A. M. Gill, and J. S. Cohn. 2005. Which mosaic? A landscape approach for evaluating interactions between fire regimes, habitats and animals. Wildlife Research **32**: 409-423.

Parr, C. L., and A. N. Andersen. 2006. Patch mosaic burning for biodiversity conservation: a critique of the pyrodiversity paradigm. Conservation Biology **20**: 1610-1619.

# A Field Guide to Freshwater Fishes, Crayfish and Mussels of South-Western Australia

Morgan, D.L., Beatty, S.J, Klunzinger, M.W., Allen, M.G., and Burnham, Q.F.
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MORGAN *et al*. have filled a significant gap in the library of pictorial guides to the fauna of South-Western Australia with this publication. This pocket-sized edition is a must for anyone who has any interest in the natural history of the South West as well as schools, community groups and anyone who wishes to start investigating the fauna of our rivers. Not only will this guide help anyone with identification, but it will alert them to the very existence of so many native species. Perhaps any small fish will no longer be written off as a "mosquito fish" and elicit a more detailed look. It is quite surprising that there are only 11 native species of fish in the whole south-west province but impressive that 9 are endemic – the highest ratio in any part of Australia. The presence of as many crayfish species (11), many of very limited distribution, is also of note. However, it is quite disturbing that 12 (and likely more) introduced fish species are also listed for identification. A further reflection is that only 1 fish and 3 crayfish in the whole of Australia are on the Critically Endangered list under the Environmental Protection and Biodiversity Conservation Act 1999 – all of these are in the area covered by the guide.

The introduction serves to highlight the worsening plight of aquatic environments in south-western Australia that have significantly degraded since European times. Modern land use, run off, introduced organisms and a whole host of other problems have all taken their toll, particularly the increased salinity of many water courses. Whilst native aquatic species have great cultural significance to the Nyoongar people their "cryptic and seldom seen" presence has meant European culture has little awareness and consequently little value for them. Indeed, this is reflected in the incongruity that the average person will know far more about marine fish, and even fish from overseas, than they do of their own native fish. Were the average person, and even the average science educator, asked to name even one fish from the south-west they are likely to name an introduced variety such as trout or *Gambusia* than they are single native species. This guide will now allow all to readily identify any of the native fishes and crayfish.

Each of the fish and crayfish has its own well laid out plate and description. The terminology is easy to follow and only uses anatomical features when necessary. Maps are clear but an overlay of the river systems would help those wishing to locate the species to a more precise location. The use of photographs is also beneficial as drawings often enhance colours and detail that are not readily observable in the field. The authors, however, do note that the crayfish have many local variations and they are unable to include all varieties. Yet combined with the geographic range identification the guide will be reliable. The text covers all the necessary identification parameters but, perhaps, the size and dimension would be best placed in a separate paragraph or table. It is also hard to perceive that most of the species are less than 100mm in length so a scale on each picture would be an advantage. The inclusion of a dichotomous key for the crayfish would seem to be superfluous as there is no labelled diagram of the parts that need to be identified making this feature impractical for the layperson. However, the illustration and description are so clear that this is not noticed.

For those who wish to find out more information there is an excellent reference section for further reading. The glossary and river map (a surprising 51 river systems in S.W. Australia) also help the richness of the guide. The authors have done a very good job in making this guide simple, clear and easy to use. It should form an essential part of public, school and university libraries. At its modest price private citizens and biologists could also afford it.

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