Book reviews

Criteria and Indicators for Sustainable Forest Management

R.J. Raison, A.G. Brown and D.W. Flinn (Editors) 2001. IUFRO Research Series 7.
CABI Publishing, Wallingford, Oxon OX10 8DE, UK. A$221.95.

This book is based on the proceedings of a conference, Criteria and Indicators for Sustainable Forest Management, held in Melbourne in August 1998. The conference was hosted by the Centre for Forest Tree Technology of the Victorian Department of Natural Resources and Environment.

The book has 462 pages and 21 chapters with 49 contributors from 15 countries. Inevitably, there is great diversity in the subject matter, and indeed great diversity in the writers' perceptions of 'sustainable forest management' and how this may be monitored and evaluated through 'criteria and indicators'.

Historical perspective of sustainable management

There has been, over many decades, rising global concern about threats to the quantity and quality of forests, including, for example, rapid deforestation in the subtropics, and declining health and vitality of European forests. The concept of 'sustainable development' was adopted as a common political goal at the UNCED Earth Summit, Rio de Janeiro 1992. The concept of sustainable forest management (SFM) further evolved with the formulation of 'criteria and indicators' (C&I) by which countries might support and monitor progress towards better (sustainable) forest management.

A number of sets of criteria and indicators appropriate to different countries and regions have been proposed. These include the Pan-European C&I (Helsinki 1994), those formulated through the Montreal Process of 1995, the Tarapoto C&I (Amazonian countries), and so on. The Montreal Process C&I have underpinned assessment of 'Ecologically Sustainable Forest Management' through the Regional Forest Agreement processes in Australia. The seven Montreal Process criteria relate to (1) biological diversity, (2) the productive capacity of forests, (3) the health and vitality of ecosystems, (4) conservation of soil and water resources, (5) contribution to global carbon cycles, (6) multiple socio-economic benefits, and (7) the legal and institutional framework. The Montreal and other initiatives also provide broad sets of indicators designed to show the status of each of the criteria at a given time, and to monitor changes with time.

C&I can be conceived at a number of scales, and initial effort focused on these at a national or regional scale. To be fully effective, however, the concept must be addressed at the finer (management unit) scale in order to guide and improve forest management practice on the ground, and to help forest managers demonstrate progress against goals and outcomes, and report to both domestic and international stakeholders. This may seem straightforward enough, but herein lies a problem: there seems to be no common appreciation of the meaning of SFM to start with — or even the definition of a forest management unit (Roman-Amat *et al*., Ch. 20), and only limited progress has been made in formulating monitoring and evaluation procedures.

Some concepts of SFM and C&I

There are several 'philosophical' discussions of SFM and C&I concepts. For example, Rametsteiner (Ch. 7) refers to SFM as an 'abstract concept' and sees the need to specify, in concrete terms, what it means. SFM, he suggests, is in a rather early stage of development, characterised by methodological weakness and lack of practical useful data. This is certainly an impression the reader may get in perusing this book.

Again, there is some scepticism about the concept of C&I as a means of monitoring achievement of SFM. One view (cited by Prabhu *et al.* in Ch. 4) sees sustainability indicators as a 'pathological corruption of the reductionist approach to science', that is, 'such approaches cannot deal meaningfully with the complex systems'. However, Prabhu *et al*. believe the use of C&I might improve the efficiency and effectiveness of decision-making if the C&I are 'holistic and pluralistic', 'pragmatic and realistic', and are not the sole grounds on which decisions are made.

Several contributors focus on 'pragmatism', particularly as it relates to wider application of social impact assessment as part of planning for SFM, and people participation in decision-making. Bass (Ch. 3) suggests that in approaching SFM and C&I it is necessary to accommodate the values of the world's one billion poor. He sees recent sets of forestry C&I as 'quick fixes' based on centralised solutions predisposed to top-down control, and suggests greater emphasis on setting and securing goals and services, and facilitating compromise and adaptation in order to fit within local communities. McCool and Stankey (Ch. 6) also believe SFM and C&I should be based on a variety of social, economic and ecological goals — rather than being just scientifically based. To achieve this, institutions must be 'non-compartmentalised and decentralised' with a structure and process that facilitates complex analysis and provides for rapid action at a local level. Similarly, Colfer *et al*. (Ch. 5) suggest indicators should monitor the effectiveness of local management in controlling maintenance of, and access to, forest resources, and ensure all participants have a reasonable share of economic benefits.

Criteria and indicators relating to operational impacts

We can examine here a number of contributions based on the five Montreal Process criteria.

Biodiversity conservation. Several papers recognise that formulation of C&I at the management unit level must be done in the context of wider resource planning. This applies particularly to biodiversity conservation.

Kanowski *et al.* (Ch. 18) argue that nature reserves and wood production forests play a complementary role in biodiversity conservation, and that the success of 'off-reserve' conservation must be judged in terms of their joint contribution. Thus indicators of biodiversity conservation require a clear articulation of conservation objectives, a bioregional basis for conservation planning, assessments at both landscape and stand levels and, from this, agreement on the framework within which indicators are formulated.

Both Finegan *et al.* (Ch. 17) and Loyn and McAlpine (Ch. 19) further develop this premise. Finegan *et al*. believe that C&I for ecosystem-level biodiversity should start with the conservation of forest cover and vegetation patterns formed by forest types in the landscape. It should take account of the proportion of the area of each forest type within the management unit which is modified by management, and how. And Loyn and McAlpine focus on indicators of spatial patterning and forest fragmentation, a major practice impacting on biodiversity. No single spatial patterning can be identified in development of fragmentation indicators. Rather, managers need flexibility to select a mixture of strategies to provide sustainable solutions on a case-by-case basis. Indicators should encourage this flexibility, maintaining biodiversity in the landscape but not necessarily in every stand.

Maintaining the productive capacity of forests. Penny *et al.* (Ch. 10) describe indicators of productive capacity at a regional level, drawing on Victoria's native forests as a case study. Their paper takes a conventional forestry approach, that is, it is largely directed to the inventory of natural forests, the area of forest available for wood production, growing stock levels, the extent to which the harvested area is regenerated, and the level of harvesting compared to the sustainable level.

Indicators for the sustained productive capacity of plantations are examined both in terms of changes in growth between rotations — through the development of growth models — and concerns about the sustained biological capacity of plantation ecosystems under high nutrient removal and fertiliser application systems (Smith *et al*., Ch. 11). In New Zealand, the critical role of harvest residue management is now recognised, with research leading to the development of specific recommendations for harvest residue management based on relationships between soil nutrient availability and tree nutrition and growth. Smith *et al.* refer to the emphasis now placed on utilisation and establishment practices aimed at conserving organic matter and site nutrients, notably on the deep sands in South Australia and Victoria. The extent to which nutrient dynamics can be maintained within the organic matter becomes a robust indicator of productive capacity on these sands.

Monitoring health and vitality. Maintaining the health and vitality of the forest is arguably the most essential requirement of ecologically sustainable management. A difficulty, according to Innes and Karnosky (Ch. 13) is that a 'clear, concise and reproducible definition of forest health has not been developed', and some of the existing indicators of environmental stress are still rather limited and require further development. Innes and Karnosky list and discuss direct or indirect indicators of environmental stresses at the national/regional level, and natural and anthropogenic stresses in forests that could jeopardise their long-term sustainability. However, they recognise there has been little development of indicators for monitoring health and vitality at the management unit level.

This is nowhere more apparent (to this reviewer) than in the eucalypt forests. In this case a much more basic understanding of the forest is needed to start with — including the nature of community patterns, community–environment relationships, the physiological attributes of species affecting their competitive ability, successional processes, the sensitivity of individual species to edaphic factors and changes in those factors, the biological consequences of changing species frequencies within mixtures, stresses associated with large even-aged stockings, and so on. A paper in this journal (Jurskis and Turner) highlights this by addressing a possible cause of the increasing incidence of tree dieback in the east coast forests. Without this sort of understanding it will be impossible to propose indicators for monitoring stand health which will get to the heart of the problem. This reviewer would have welcomed a contribution which addressed C&I for forest health and vitality at this level.

Indicators to interpret change in soil properties and catchment processes. The contributions of both Raison and Rab (Ch. 14) and Roberts (Ch. 15) provide a good technical framework for formulating C&I related to the effects of forest operations on soil properties and catchment processes, respectively. Raison and Rab conclude that while, in theory, indicators can be identified, monitored and evaluated to provide a basis for improved soil management, little progress has been made in this way. The complexity of the soil system and soil processes makes it difficult to identify a small number of generic and relatively simple indicators of change in soil properties. Nevertheless, measures of soil organic matter, soil acidity and base status, and soil density and erodibility are relevant and, on this basis, a set of field measures is proposed for describing soil physical and chemical change, soil pollution and erosion risk. This is illustrated for two native Victorian forests.

Any reader having a particular interest in the effect of forestry operations on water quantity and water quality will find a comprehensive (40 page) review of the topic by Roberts (Ch. 15), together with suggested coarse- and finer-scale sustainability indicators. This reviewer felt that the book would have been enhanced if there had been more contributions along the lines of Raison and Rab, and Roberts, that is, developing a technical framework against which relevant indicators are proposed and discussed.

Forests and the carbon cycle. One of the Montreal criteria requires that forests make a contribution to global carbon cycles. This is

addressed by Kirschbaum (Ch. 16) who provides useful information on carbon stocks in the atmosphere, the world's forests (where two-thirds of carbon is in the soil organic matter), the estimated annual release of carbon by land clearing and wood production, that sequestered by an increase in forest cover, and the increasing global pool of carbon in wood and paper products. While forest pools and cycles constitute significant components of the global carbon cycle, there are no easily measurable direct indicators by which to judge whether specific forests are net sinks or sources of carbon. Given the world's concerns about the greenhouse problem, optimising carbon storage will be an increasingly significant influence on forest management.

Conclusion

It is only a decade since the Rio de Janeiro Declaration established sustainable development as a global objective, and clearly, this is still work in progress. Indeed the Editors of this book conclude (Ch. 21) that practical application of C&I is still very much in its infancy, and realistic expectations must be maintained. In order to ensure continuing progress they suggest that:

(1) The realisation of the several benefits of C&I depends on the effective application of C&I at the forest management unit level, and an associated commitment from forest managers.
(2) While there is general agreement that criteria are sufficiently comprehensive to encapsulate all important forest values, the challenge is to develop useful indicators for those criteria that apply to highly diverse forests and socio-economic contexts.
(3) C&I is only one of several tools that can help support SFM. Others include participatory planning to develop shared goals and agreed actions at the local scale, the establishment of demonstration forests to examine management options, and supporting research and development.
(4) All parties should be encouraged to explore ways of sharing information and forest databases (the main thrust of an FAO contribution — Castaneda, Ch. 9), with stakeholders having access to forest inventory and other data for publicly owned forests.

This reviewer would add to this the great need to develop, in Australia, a vigorous approach to exploring the SFM concept, particularly as it relates to the health and productivity of the native forests. While there are certainly healthy forests of outstanding productivity, there are others beset with problems — including inadequate regrowth (from a variety of causes), weak stand development, dieback, stem borer damage, poor wood quality, and others. There was probably inadequate opportunity (or motivation) during the RFA process to dig deeply into matters concerned with ecologically sustainable forest management. However, if we are to seriously embrace sustainable management of our forests, we now need a nationally coordinated program to better understand the complex biology of our forests and to establish operational limits, for different species and types, which are consistent with sustainable management.

This book makes an important contribution to the continuing development of sustainable forest management. This is important to all foresters, and the book is commended on this basis.

Ross Florence
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Flora of Australia Volume 11A & 11B, Mimosaceae, *Acacia*

CSIRO Publishing 2001 (www.publish.csiro.au, freecall 1800 645 051 (in Australia), email sales@publish.csiro.au, fax +61 (03) 9662 7555). $145 for the two-volume set in paperback or $195 in hardback plus postage.
The WATTLE CD costs $110 plus postage. There is approx. $55 discount if you buy the books and CD together.

What wattle's that?

If you want to identify any Australian acacia, look no further than Volume 11 of the *Flora of Australia*, *Mimosaceae*, *Acacia*.

At last it is available — the means of identifying any one of Australia's 955 species (or nearly 1200 species, sub-species and variants). Until the *Acacia* volumes (11A and 11B) were published in July 2001 there was no single flora that described all Australian acacias. Although there were floras for acacias within each State and a few floras that covered acacias in large regions that cut across State borders, it was frustrating to try to identify a planted acacia when you had no idea from whence it came. Where would you start?

Acacia Volume 11A includes an introduction to the classification of *Acacia*, the fossil record of *Acacia* in Australia and a general description of the utilisation of the genus. There are keys, botanical illustrations and descriptions of the foliage, flowers, pods and seeds; small distribution maps and brief descriptions of the location, habitat, flowering and fruiting for each species. There are some colour photographs but certainly not for each species.

There is also good advice. I laughed when I read in the section 'On the Use of the Keys':

> Successful use of any key requires experience with it and the length of time to gain such experience is directly proportional to the number of taxa included in the key. The following keys

include more than one thousand taxa, as well as informal variants of many of them, so the user should not expect immediate success.

You are warned!

If you are like me, then the only time you use a botanical key successfully is when you already know the name of the species you are trying to identify! (I usually get lost when I have to choose between microscopic flower characters.) But there is hope for us non-botanists if you have a computer. *WATTLE Acacias of Australia* is an interactive key, available on CD ROM, that complements the *Flora of Australia* volumes. It also comes with a very helpful and user-friendly, 46-page *User Guide*.

I couldn't wait to give *WATTLE* a test run, and after loading it onto my computer I leapt into my wattle-filled Canberra garden and picked a small branch from a rare acacia. Armed with a hand lens and ruler, I then sat in front of my computer and put *WATTLE* through its paces. Didn't bother to read the instructions — no time for that!

Well, to cut a short story shorter, I found *WATTLE* an easy program to navigate; I had to answer only nine questions — all about the foliage — before it was down to one species … and *A. dangarensis* was right. OK, maybe that was fluke. Out into the garden again to find something a little different!

With *Acacia covenyi* (an ornamental wattle with very attractive blue-grey foliage), the answers to 12 questions rapidly reduced the choice to four. I needed pod width to clinch the deal but as I didn't have pods I had to go to botanical descriptions and look at the drawings of each species. Here a colour photograph would have been useful because *A. covenyi* has such distinctive foliage.

With three other species, I got one wrong after 15 questions and I couldn't be sure of the two others — I needed to know the geographic origin of one and the pod width for the other to choose between the final possibilities.

I found the key a delight to use — it is quick, and a great way to learn the characters used to identify acacias. You can easily look at drawings of the characters, like phyllode apex pungency or venation or inflorescence arrangement, before making a choice.

Like all tools it is only as good as its user — sometimes I didn't measure the specimen as carefully as I should have — but it is easy to retrace your steps and have another go. And even an electronic key can't make up for the lack of critical information! What was unexpected was the usefulness of pod width to discriminate between species. (Of course you don't always have pods but this is a character I have never used in the field.)

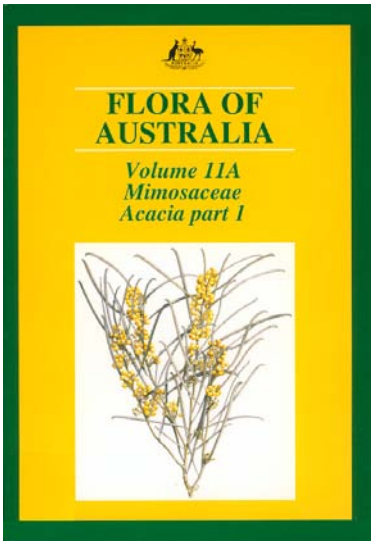
I was disappointed that there weren't colour photographs of each species to help with the identifications and to simply show off the beauty and diversity of Australia's acacias.

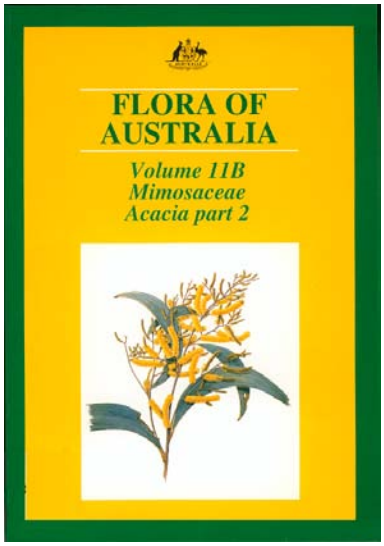
And *WATTLE* could do much to increase the use of Australian acacias in commercial, environmental and amenity plantings if, in any reincarnation, it went beyond identifying acacias to become a one-stop-shop for everything known about this relatively unexplored genus.

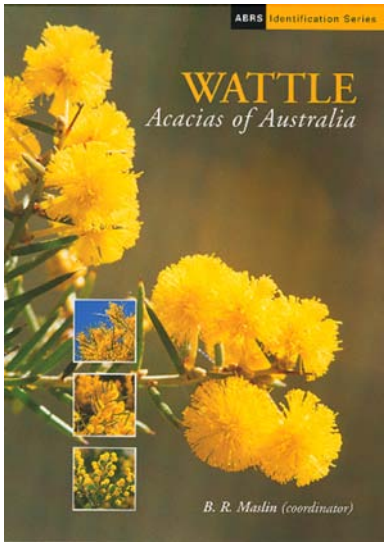
Such information for each acacia species could include past and present utilisation in Australia and overseas; genetic variation and improvement; selection and use of rhizobial strains for nitrogen fixation; vegetative propagation; wood characteristics such as the basic density and heartwood colour; climatic and soil requirements for good growth; silviculture for different purposes; growth rates under cultivation; control of pests and diseases; and growth and management limitations. I understand Bruce Maslin (the principal contributor) from CALM WA has a second expanded version of *WATTLE* planned with colour photographs, but it is difficult to find funding.

Congratulations to Bruce Maslin and the other 39 contributors, illustrators and photographers from across Australia who worked on this project for almost 15 years. It is an impressive and long-awaited achievement — the first comprehensive flora of Australia's acacias.

Suzette Searle
Canberra







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