SERVICES—A BARRIER TO ACHIEVING LAND CONSERVATION OBJECTIVES?

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ABSTRACT

Effective communication of information between land managers and advisory services is crucial to achieving land conservation objectives—but is it happening?

In Western Australia, advisory services are considered an important means of providing land managers with the knowledge they require to successfully undertake land conservation work.

While advisory services have made a valuable contribution, in some respects they are also a barrier to achieving land conservation objectives. This issue is discussed in the context of revegetation to combat land degradation in south-western Australia.

INTRODUCTION

Land managers in Western Australia face a range of land conservation issues. In agricultural regions, there is significant land degradation including salination, waterlogging, soil erosion and soil acidification (Nulsen 1991). These result largely from widespread replacement of perennial, native vegetation with annual, commercial crops and pastures. At the same time, large-scale clearing of natural vegetation and its consequent fragmentation have also caused a range of nature conservation problems for managers of natural lands (Main 1987, Saunders and Hobbs 1989).

While major land conservation issues—soil, water, and nature conservation—are generally treated as separate disciplines handled by different organisations, it is increasingly apparent that none of these conservation problems can be solved in isolation. Solutions for any single conservation issue at the landform level require an integrated, multi-disciplinary approach.

It is also clear that, in agricultural areas, the broad goals of land conservation are maintenance of biodiversity and achieving sustainable agriculture. Increasingly, these goals are recognised as interdependent. Main (1981) has emphasised the importance of alternative, biotic pathways to maintain nutrient cycles and thus the need to retain biotic diversity. Such principles are applicable to both agricultural and natural ecosystems. In fact, Squires (1991) has suggested mimicking natural ecosystems to design stable agricultural systems, and Lefroy *et al.* (in press) have additionally argued that maintenance of biodiversity is an inevitable characteristic of achieving sustainable agriculture.

Those advising land managers must also consider socio-cultural factors. In his discussion of land use conflicts, Havel (1986) documents the importance of political, cultural and technological changes in determining land use and concludes that natural and cultural issues cannot be separated when resolving land use matters.

Thus, successful advisory officers working in land conservation integrate a variety of information from a range of sources, and provide advice appropriate to the current and potential cultural contexts.

Given that advisory services are perceived in Western Australia as important in achieving land conservation objectives (Parliament of Western Australia 1991), it is appropriate to ask whether they are an effective resource for land managers. That is, are they effective, or are they a barrier to achieving land conservation objectives?

This question is addressed here with respect to revegetation advice to farmers in south-western Australia. Revegetation is an important tool for combating a range of land conservation problems and is a comparatively new method in which knowledge and ideas are constantly changing, and therefore advisory services can be expected to play an important role.

ADVISORY SERVICES INVOLVED IN REVEGETATION

The major advisory services participating in revegetation are

- Department of Agriculture of Western Australia (DAWA)—with substantial numbers of officers based in rural areas this agency has the greatest government contact with farmers. Advice is generally via advisory officers and land conservation technical officers. Apart from responsibilities with regard to agricultural practice, DAWA is accountable for implementing the Soil and Land Conservation Act, and the importance of revegetation has been recognised by the establishment of a specialist section.
- Department of Conservation and Land Management (CALM)—CALM's involvement in revegetation arises because of its responsibilities for forestry and nature conservation. Historically CALM was also the first organisation, private or government, to establish nurseries with the primary purpose of supplying trees and shrubs to farmers. Thus CALM's interests in rural revegetation centre around use of woody plants for production and nature conservation. To achieve these ends CALM has a commercial revegetation advisory service for farmers in higher rainfall areas, and three advisory officers working in drier agricultural areas. Other rural-based officers also provide some advice on revegetation.
- Greening Australia (WA)—funded largely by government, its mission is to increase the tree and shrub cover of the State. It is an important source of funds for farmers involved in revegetation. At the same time, the organisation has a number of part-time field officers and also provides advice from its Head Office in Perth.

Together these three organisations provide most of the formal sources of revegetation advice. However, private advisers, Men of the Trees, nurserymen and numerous others provide advice on revegetation, and together form a significant service. Furthermore, many farmers use other farmers as their major source of advice.

SUCCESS OF THE ADVISORY SERVICES

There is no doubt that over the past decade advisory services have made an important contribution to achieving land conservation objectives through revegetation. Together, they have provided a source of encouragement, particularly to individual farmers, and have helped to disseminate information concerning new methods. They have also initiated and assisted with some research, and have provided a small amount of direct assistance.

The success of advisory services can be gauged in part by the fact that demand for advisory assistance in the case of CALM officers greatly exceeds the resource available.

Thus over the past decade advisory services for revegetation have succeeded to the extent that they have

- provided a source of information
- stimulated and assisted research, such as that on mechanisms for direct seeding
- established plant nurseries to supply revegetation together with advice on planting techniques
- represented a source of one-to-one contact for not only advice, but also encouragement
- assisted farmers to access increasing government funds for revegetation and protection of remnant vegetation
- contributed to the establishment of a new industry based on commercial plantations on private property in the wetter south-west.

However, the advisory services have also been a barrier to the successful achievement of land conservation objectives in three, broad ways.

Firstly, the historical and cultural contexts of the advisory services have provided intrinsic barriers. For example, a European view of land conservation has had detrimental consequences.

Secondly, agencies have not developed a common vision for land conservation and have therefore failed to integrate land conservation objectives. This is exemplified by the narrow focus of school educational programs developed by DAWA and CALM. These programs concentrate on issues of immediate, organisational concerns, rather than the teaching of an integrated understanding of land management issues and their solution.

Finally, lack of accessible knowledge and a failure to synthesise and use available information have resulted in barriers to achieving land conservation objectives. This includes the failure to fully capitalise on the knowledge of experienced and innovative land managers.

Therefore, despite the positive contribution of advisory services, they have also been a barrier to successful achievement of land conservation objectives. Reasons for this are examined in more detail together with suggestions as to how the current situation may be improved.

BARRIERS TO EFFECTIVE LAND CONSERVATION

Historical and Cultural Contexts of Advisory Services

Western Australia's agricultural areas were cleared and settled by Europeans within the last 160 years, and half of the land has been cleared of natural vegetation since 1945 (Burvill 1979). Over the same period, the knowledge and tradition of Aboriginal people concerning the land and its management has almost entirely been lost.

Therefore the use of the land and its revegetation has been dominated by concepts and techniques brought from other countries, generally those of Europe. The result of this European based view of land management has been revegetation solutions imposed on, rather than developed with, the landscape.

An example of this is that, when revegetation was first perceived as desirable for amenity and land conservation, south-western plants were overlooked. Pepper trees (*Schinus molle)* were commonly used as shade trees in the wheatbelt, and tamarisk *(Tamarix aphylla)* were favoured to combat land degradation in salt affected areas. This is despite the fact that the shrubland flora alone of south-western Australia is one of the richest found in Mediterranean climates, and is probably the richest sclerophyllous vegetation in southern Australia (Lamont *et al* 1984).

Effects of this approach include continued revegetation with weedy species, some of which present problems for agricultural production as well as nature conservation, and a failure to take advantage of the economic potential of our indigenous species. Spierre (1992) lists eight cases where commercial use of Australian species has been overshadowed by their prior, or better, development overseas.

While the importance of working within the biological and cultural contexts of local agroforestry systems, rather than importing systems and species from elsewhere, is now well recognised in areas such as Latin America and Africa (Altieri 1991, Danida 1988, von Maydell 1987), the acceptance of similar ideas in Australia is taking much longer. This is no doubt due in part to the almost total loss of the indigenous culture. A major challenge facing all involved in rural land management is that the achievement of sustainable agriculture may well depend on a marked, cultural change in agriculture rather than merely adapting our current approach.

A positive step in Australia is the debate concerning the comparative merits of using local or exotic plants in revegetation (Youl 1991). This is highlighting some of the cultural issues listed above, however, the debate must be expanded to ensure that it generates meaningful solutions to land conservation issues, and promotes integration of conservation and production objectives. Inevitably, the debate must address to what extent achievement of sustainability and biodiversity goals requires a major cultural shift.

A cultural factor which also influences the service provided by advisory groups is that collectively they represent a very diverse array of organisations with a commensurate diversity of backgrounds, experience and objectives. Apart from the three major groups, others involved in giving revegetation advice include private consultants, Men of the Trees, staff from plant nurseries, conservation groups, and local farmers. There are few factors which unite these disparate groups, thus their advice reflects their divergent knowledge and past experience. At its worst, quite contradictory advice is given by different advisers, and Goss (1990 unpublished) has argued that "a major constraint on revegetation of rural lands is the limited access to valid and reliable advice".

There are four trends which should improve this situation. Firstly, training courses are becoming better integrated across disciplines and have a stronger ecological base which should better serve the requirements of land conservation. However, the cautionary comments by Magill (1991) concerning barriers within natural resource personnel to effective public interaction should also be considered. These barriers include the tendency of resource professionals to think that they 'know best' about resource management.

Secondly, information resources will become more comprehensive, better organised, and more accessible. This will provide advisers with an improved information resource and thus at least decrease the opportunity for contradictory advice. However, Goss's (1990 unpublished) proposal that regional revegetation advisers be established to link information and research with advisers and land managers is unlikely to be funded in the short term.

Thirdly, increasing innovation and experimentation by land managers and agencies will lead to the development of new methods which will provide valuable ideas and models for further development.

Finally, growing recognition of the need to develop a sustainable agriculture and maintain biodiversity provides a unifying theme for land conservation on agricultural lands.

Other cultural issues, such as ideology and organisational constraints, are important in this respect, and are considered in detail in the next section.

Ideological and Organisational Constraints

The actions of specific agencies and individual officers are strongly influenced by their ideologies, organisational constraints and statutory responsibilities. As a consequence, there are conflicts between and within agencies, and widely differing advice and emphases at the field level. While friction between different ideologies may generate valuable ideas, it may also provide a barrier to effective integration and achievement of land conservation objectives.

While a number of constraints, such as the statutory requirements of organisations, are not easily changed, advisers should have an understanding across disciplines which enables them to integrate land conservation objectives and work towards the joint goals of sustainable agriculture and maintenance of biodiversity. That this is not currently so is apparent from the use of the linear model shown in Figure 1.

Figure 1 A linear model of revegetation opportunities

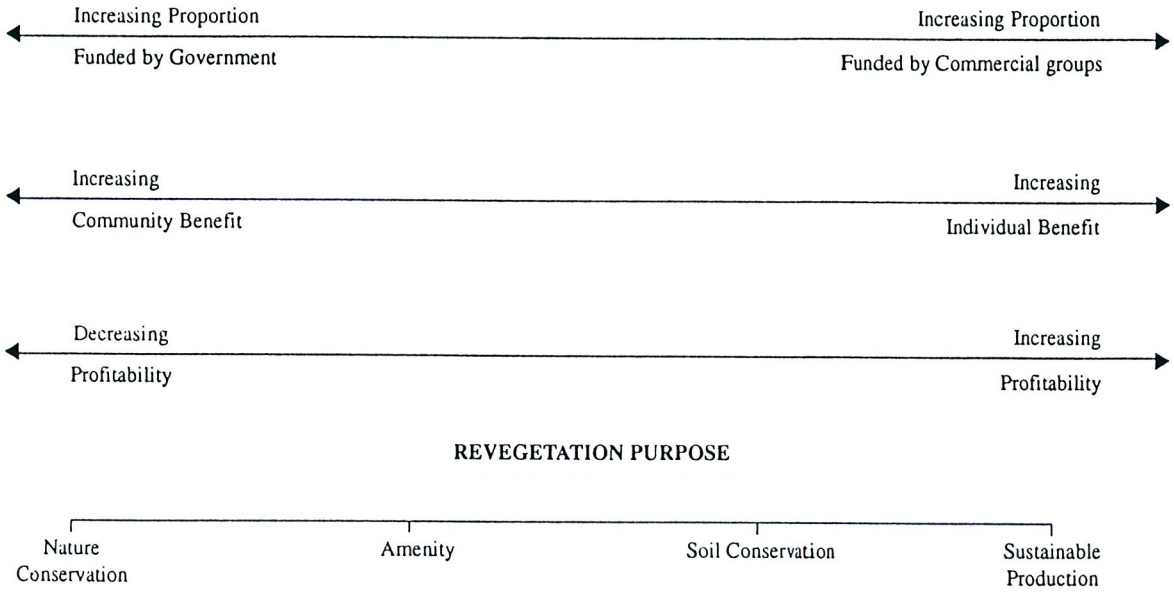

Figure 1 is a synthesis of models often used in Australia to examine revegetation issues.

To represent revegetation objectives as lying along a linear continuum with nature conservation at one pole, and sustainable production at the other clearly demonstrates the difficulty agencies and individuals have integrating objectives. An implication from Fig. 1 is that only one land conservation objective can be met by a single revegetation project, and that, for example, there is no overlap between nature conservation and production (profitability). That this is not so is evident from the potential to design revegetation projects which meet a range of land conservation objectives and enhance farm profitability.

For example, a woodlot of native vegetation which is selectively cut for firewood or posts will maintain some value for nature conservation in comparison with cleared farmland, particularly if it is sited in a way which provides a corridor for wildlife. Similarly, if revegetation with local plants is undertaken for cut flower production, local nature conservation values will also be enhanced. An even wider range of objectives are met where such revegetation is also located, for example on highly erodible soils, to meet soil conservation or water conservation objectives.

Thus, objectives for timber production, soil conservation, nature conservation, water conservation and agricultural production may all be met by a single, judicious revegetation project. This integration of objectives is better explained by a matrix diagram (Table 1), although even this model is limited given that it does not emphasise how three or more factors can be combined.

Table 1 Matrix of revegetation opportunities

NOTE: The numbers represent the possible contribution of the horizontal characteristic to the vertical characteristic, 0 = no compatibility, 10 = total compatibility. Scores are given as a range. For example, the contribution of soil conservation (shaded) to nature conservation (un-shaded) will range from 0 to 10 depending on methods used and the characteristics of the revegetation site.

REVEGETATION OBJECTIVE	NATURE CONSERVATION	SOIL CONSERVATION	WATER CONSERVATION	AMENITY	AGROFORESTRY	TIMBER PRODUCTION
Nature Conservation	10 - 10	0 - 10	0 - 10	0 - 10	0 - 5	0 - 5
Soil Conservation	5 - 10	10 - 10	5 - 10	5 - 10	5 - 10	5 - 10
Water Conservation	5 - 10	5 - 10	10 - 10	5 - 10	5 - 10	5 - 10
Amenity	5 - 10	5 - 10	5 - 10	10 - 10	0 - 10	0 - 10
Agroforestry	0 - 5	0 - 10	0 - 10	0 - 10	10 - 10	5 - 10
Timber Production	0 - 5	0 - 10	0 - 10	0 - 10	5 - 10	10 - 10

The use of linear models such as that in Fig. 1 is a reminder that most people have a specific interest or focus, and find it difficult to integrate this with other objectives. The inclination to equate conservation with lack of profitability, despite the contrary evidence, is also disturbing. As a consequence, advice to land managers tends to be poorly integrated. While this tendency is understandable, it is a significant barrier to maximising the value of revegetation for land conservation. The frequent perception of actions for community benefit as a government responsibility, and frequent misunderstanding of the relationship between individual and community benefit, are also of concern.

Narrow views of land conservation are also encouraged by the mission statements of government agencies, which necessarily reflect a restricted view of land management in line with statutory responsibilities, a view which is then repeated within the various advisory groups. Even worse, in current recessionary times the tendency is to narrow, rather than broaden, the focus of interests.

This situation is further exacerbated by the lack of discussion concerning a philosophy of land management. If those involved in land conservation held a broadly agreed philosophy of land management, then information and ideas would at least be directed at a common vision, and consequently advice would be complementary if not entirely consistent.

Solutions to incompatible ideologies and goals will depend on three elements.

Firstly, it is essential that improved cooperation between organisations achieves a more coherent vision of land conservation. To achieve this requires organisations to have clearer goals and to develop joint goals with other groups. Currently the DAWA is working through an interdisciplinary, program-based approach to develop more coherent goals and vision at a departmental level (personal communication Mr K. Goss), and this process may provide a model for inter-agency agreements to be developed. Certainly the agencies themselves have recognised the need to better integrate activities, and the current interest in maintaining biodiversity and achieving sustainable agriculture should provide the necessary basis to develop a common vision.

Failure of agencies to develop satisfactory, cooperative arrangements also encourages the growth of specialist committees and authorities purely as a forum for liaison. Thus, prevention of unnecessary bureaucracies is a further incentive to direct cooperation between agencies.

Secondly, the development of a robust philosophical debate concerning land conservation, land ethics, biodiversity and sustainable agriculture is important. While a number of activities, such as work by Select Committees on Land Conservation (Parliament of Western Australia 1991) and biodiversity investigations (in process) have stimulated discussion, the debate must involve advisers and land managers in a way which is meaningful to them and captures their interest and contribution. To achieve this remains an important challenge to government agencies and land managers, and will require astute leadership which is able to transcend immediate demands and constraints.

While this paper focuses on advisory services, the need to better develop concepts and goals in an interactive process with land managers is apparent. Successful implementation of land conservation objectives depends on land managers, and they should be encouraged to examine their values and constraints along with agencies. Unfortunately, little research has been conducted on the values of land managers, and that which has, for example by Kerridge (1978), further underlines the importance of understanding cultural factors.

Finally, advisers must evaluate their work, not only to achieve the important objectives listed by Gorddard (1992), but also to provide a means of asking "Why am I doing this?", and thus an opportunity to examine ideological aspects of programs.

Although the importance of evaluating advisory services is recognised (Parliament of Western Australia 1991), it is not a strong component of program management. While no attempt has been made to assess why this should be so, observation suggests that major reasons are

- it is difficult to measure social change (Mr B. Gorddard personal communication)
- the sense of accomplishment and immediate gratification from monitoring and evaluation do not equal that from implementing specific, 'on the ground' actions
- effective monitoring and evaluation often involve a sizeable commitment of resources. While the potential returns are high, they may be difficult to justify given the alternative of using the resources in 'doing'
- the personal assessment component of evaluation can be threatening.

Experience suggests that it is often difficult to persuade staff of the value of effective evaluation. Currently lacking are concrete examples at the adviser level of the value of properly implemented, but simple, evaluation programs. This remains a challenge for middle management and advisers.

ACCESSIBILITY, INTEGRATED, AND USE OF KNOWLEDGE

Use of Knowledge

Effective land conservation in agricultural areas depends on an understanding of the environment and its ecological processes. While there are many examples which emphasise the need for advisers to use available knowledge concerning ecosystem structure and function, the impact of episodic, physical events provides important insights.

Main (1987) shows that while the wheatbelt of Western Australia is accepted as a region with a dry Mediterranean climate and a comparatively reliable rainfall for wheat-growing, there are a number of physical factors which cause dramatic deviations from its normal character. These include drought, unusually heavy winter rainfall events, tornados, summer rainfall from tropical cyclones which have moved unusually far south, thunderstorms and fire. The periodicity of these events ranges from about ten a year in the case of thunderstorms, to less frequently than once in 100 years for fires in eastern woodlands.

While infrequent, these events may have an enormous impact on land conservation. Fire and drought provide two dramatic examples of episodic events which affect all aspects of land conservation.

In the case of revegetation, the amount and distribution of rainfall determines the success or failure of cost-effective establishment techniques, such as direct seeding, and some natural regeneration cycles probably depend on various combinations of fire and above average summer rainfall followed by good winter rains. Therefore, revegetation advisers must understand the effects of episodic events, even those they have not experienced.

The effect of combining two episodic events is shown by the almost complete eradication of sheoak (*Allocasuarina huegeliana)* seedlings by a locust plague from an area of recently burnt bushland (Dr G. R. Friend personal communication). As this plant species is an obligate seeder and fire sensitive, the combined effect of two episodic events has, in this case, been dramatic at a local scale.

Given that the life cycles of humans and financial systems are short compared with many environmental cycles, it is not surprising that there are few people, advisers or otherwise, capable of giving advice that reflects ecosystem complexity. The present situation must improve if we are to adequately advise and plan for land conservation.

To achieve this will require not only an appropriate education, but a recognition that learning for life is an important part of being a professional (Thomas 1986). Binkley (1991) has postulated that less than half of United States foresters may be educated in the basic concepts of biodiversity and its role in ecosystem theory. Therefore, unless they have engaged in ongoing education they will not adequately cope with current concepts. This proposition applies equally to all land management professionals.

Finally, a core of experienced senior officers is required in rural areas to provide an informed, longer term view of local issues and the environment. Unfortunately, Australians are an urban people, and most cities are coastal in Western Australia. Consequently, it is very difficult to attract people into rural areas and to retain a core of experienced, senior, rural-based officers who have a holistic understanding of ecosystem and cultural processes. At the same time, an equivalent core of experience and understanding is necessary among land managers.

Knowledge—Access and Integration

The recognition that revegetation is an important component of land conservation has preceded the ecological and technical knowledge to implement it effectively. This situation has been exacerbated by the understandable emphasis of government support on immediate on-ground action, rather than to fund relevant research and development. However, for effective use of resources there must be a commensurate development of revegetation research and technology.

Available knowledge is scattered across a wide range of sources including both written and anecdotal. Thus, not only are there gaps in current research and technological information, information that exists is difficult to access. The valuable anecdotal information of experienced and innovative land managers has, in particular, been poorly collated and used.

Consequently, it is not surprising that there have been mistakes, and that revegetation could have been more effective. For example, those revegetating drier agricultural areas have rarely considered those plants most likely to produce a commercial return. Thus, an opportunity to establish a commercial resource with the first wave of tree planting has been lost. At the same time, some land managers have attempted to plant commercial species within inappropriate climatic zones.

Over the past two years agencies have begun to redress the most pressing issues. For example CALM, CSIRO, Greening Australia (WA), and DAWA have all collaborated to improve available information for management of remnant native vegetation, direct seeding, and species selection. Furthermore, there is currently a joint agency proposal to develop a vegetation information system which integrates data on plant growth, distribution, and values. If implemented, this project will greatly improve species selection for revegetation.

Improved information systems will help land managers achieve their goals. However, it is essential that these systems are developed in a way that is friendly to the land manager and constructed to meet their objectives and accommodate anecdotal data. If this is achieved, then collaborative partnerships between land managers, advisers and researchers will be encouraged and driven by the needs of managers, rather than the intellectual interests of researchers.

Finally, it is important that land managers are able to focus their information collection and use on a specific, immediate problem of concern to them. Currently, catchment planning provides an organising goal, however, this should eventually develop into a focus on sustainability and biodiversity.

In summary, the upsurge in collaborative projects and the push to establish important information systems augur well. However, it is important that these service the needs of the land manager and the goals of sustainability and biodiversity, rather than the immediate concerns of researchers, agencies or advisers.

CONCLUSIONS

To achieve land conservation objectives in south-western Australia requires an effective advisory service to ensure that relevant knowledge and concepts are available to land managers.

While current advisory services have succeeded to some extent in delivering information to major target groups, they will also be a barrier to the achievement of land conservation objectives unless they

- overcome historical and cultural barriers, and develop and provide advice which is most relevant to the local biological and cultural environment
- utilise the goals of sustainable agriculture and maintenance of biodiversity to promote and assist the development of a coherent vision for land conservation. This vision must include a philosophy of land management and integration of land conservation objectives
- better evaluate advisory programs using methods which allow ideological aspects to be examined
- adequately use existing knowledge concerning ecosystem structure and function
- ensure that information concerning revegetation is improved, better collated and far more accessible to land managers and advisers. It is also important that this information is generated in collaboration with land managers and in response to their needs.

ACKNOWLEDGMENTS

Comments by Messrs J. Bartle, J. Blyth, K. Goss, E. Lefroy, D. Mitchell, A. Sutton and R. Underwood on an early draft of the text were very helpful and are gratefully acknowledged. The work of Mrs B. Kennington and Ms K. Merrit in preparing Table 1 and Fig. 1 respectively is appreciated.

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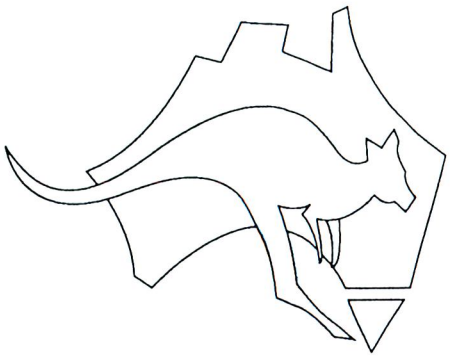

Sydney, Australia 27–30 Sept. 1992

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Published by the International Soil Conservation Organisation under the auspices of the Department of Conservation and Land Management, 23–33 Bridge Street, Sydney, NSW 2000 AUSTRALIA.

Produced in Australia for the Publisher
Typeset in Australia by Wordshop
North Sydney, New South Wales
Printed by Rainbow Printing Pty Ltd
Rydalmere, New South Wales

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Volumes 1 and 2 Set ISBN 0 7305 9977 9
Volume 1 only ISBN 0 7305 9978 7
Volume 2 only ISBN 0 7305 9979 5

Editors P.G. Haskins and B.M. Murphy
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Graphic Design G. Biagioni