

the **BIOREGIONS** of New South Wales

A PRACTICAL GUIDE TO THE
ASSESSMENT OF THEIR BIODIVERSITY





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***The Bioregions of New South Wales
a practical guide to the assessment of their biodiversity***

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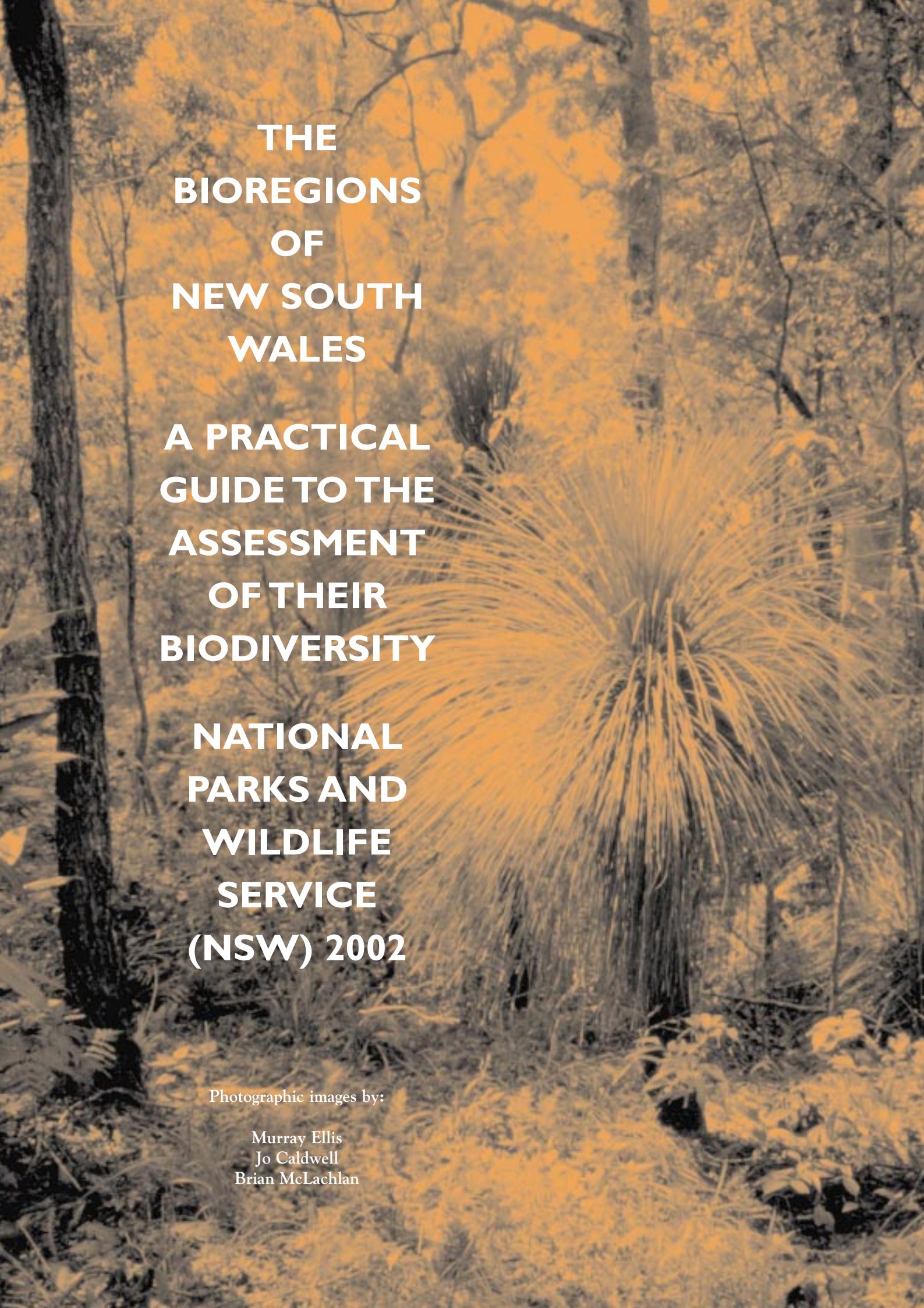
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**NATIONAL
PARKS AND
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(NSW) 2002**

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Jo Caldwell
Brian McLachlan



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This document draws heavily, though not solely, on work undertaken by the US Nature Conservancy. Its work in the area of ecoregional planning, as evidenced in publications such as Groves *et al.* 2000, *Designing a Geography of Hope – A Practitioner’s Handbook to Ecoregional Conservation Planning Volumes I and II* and Anderson *et al.* 1999, *Guidelines for Representing Ecological Communities in Ecoregional Conservation Plans*, provided a checklist and, in some cases, the structure and content for sections of this document. The work of these researchers enabled the completion of this Guide within the time and resources allocated.

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INTRODUCTION



This Guide was prepared as part of a suite of projects funded under the NSW State Biodiversity Strategy which were designed to fill gaps in information and to provide tools for State and bioregional conservation assessment. It was prepared particularly for those personnel working on bioregional or regional conservation assessment in State government – that is, the group of people grappling with what, where and how much to conserve as part of their responsibility for bioregional conservation assessments or contributing to Regional Vegetation Management Plans, Catchment Blueprints, Regional Environmental Plans and Western Regional Assessments. The targeting of this audience is expressed through the language used and an assumed level of familiarity with the elements of biodiversity conservation. Having said this, we hope that the Guide will also serve the interests of the wider community of people making decisions about biodiversity conservation at the regional scale.

Bioregional conservation assessments are an assessment of the biodiversity of a bioregion. More than a map and a document, they also include a set of information guidelines and suggested processes for analysis. A bioregional conservation assessment is not static, and every opportunity should be taken to update the information, particularly following major changes in biodiversity conservation such as land use or allowable land use within the bioregion. An assessment is usually able to identify ideal management strategies for the protection of bioregional biodiversity but does not extend to the complex phase of implementing those strategies, that generally being the responsibility of several government departments and local environmental bodies.

Bioregional conservation assessments are not the same as other plans that could be collectively termed as environmental plans in NSW. A bioregional conservation assessment is larger in geographic scale than a Regional Vegetation Management Plan (RVMP), Catchment Blueprint or Western Regional Assessment (WRA), for example. A bioregional conservation assessment can address cultural heritage values but does not include the social or economic aspects raised in RVMPs or WRA. Although the boundaries of a RVMP, Catchment Blueprint or WRA may not fall entirely within one bioregion, they can and should integrate the findings of completed bioregional conservation assessments within their plan to facilitate understanding of the implications of land-management decisions. The process of integration is, however, generally beyond the scope of this Guide.

This Guide is divided into ten Sections. Most Sections contain ‘boxed’ portions of text which provide examples, case studies or more detailed information than the general text. Large sections are followed by ‘Key guidelines, principles and standards’. These provide a snapshot of the most critical elements of these Sections.

The first Section of the Guide introduces the bioregions, the basis for the bioregions and processes for updating bioregional boundaries.

The experiences of bioregional or regional assessments undertaken in NSW and elsewhere are covered in Section 2, which highlights those elements of project planning that can lead to success or cause an assessment to falter. Establishing meaningful conservation targets with the available information is the essence of the third section. Summarised here in a step-by-step process is the complex of ecological principles and practice that form the basis of conservation target establishment. Case studies profile the experience of other assessments to demonstrate practical applications in different situations.

The establishment of conservation targets is only one area of critical decisions to be made in work of this kind. The other is the identification of areas which best address conservation targets and can include decisions on how to choose the best configuration of areas. Knowing the location of sites that meet conservation targets and then making decisions to recommend their conservation management is complicated by the often large area of a bioregion and hence the large range of possibilities. Section 4 outlines some of the tools available within NSW to assist practitioners undertaking this activity.

Sections 5 and 6 identify the more general data collection and management needs of a bioregional conservation assessment accompanied by Appendices listing major website sources of information and established standards for biodiversity survey.

Most people wish to see places of importance to them conserved, and often these are places of social or cultural importance. The idea that cultural heritage conservation priorities should be identified as part of the traditionally nature conservation oriented bioregional conservation assessment has been well articulated. However to carry out this task is a complex process and it may be some time before enough background information has been gathered to ensure that bioregional conservation assessments can reasonably integrate these priorities at a sufficient scale and depth to appear more than tokenistic. Initially we considered that it would be entirely outside the scope of this document. However, in Section 7 we have been able to introduce some of the processes for collection of information on Aboriginal cultural heritage which may act as an important mechanism for incorporating the concerns and values of Aboriginal people into regional planning.

Section 8 of this Guide outlines the expectations for documentation of bioregional conservation assessments undertaken in NSW.

The development of conservation targets is not an end in itself; the most challenging task for our society is to implement them and halt the decline in biodiversity and ecological processes. The most important element of Section 9 is the accompanying Appendices which provide a table of key land management tools available in NSW. The main body of the Section outlines how management tools and strategies should be practically matched to areas and landscapes identified for conservation management.

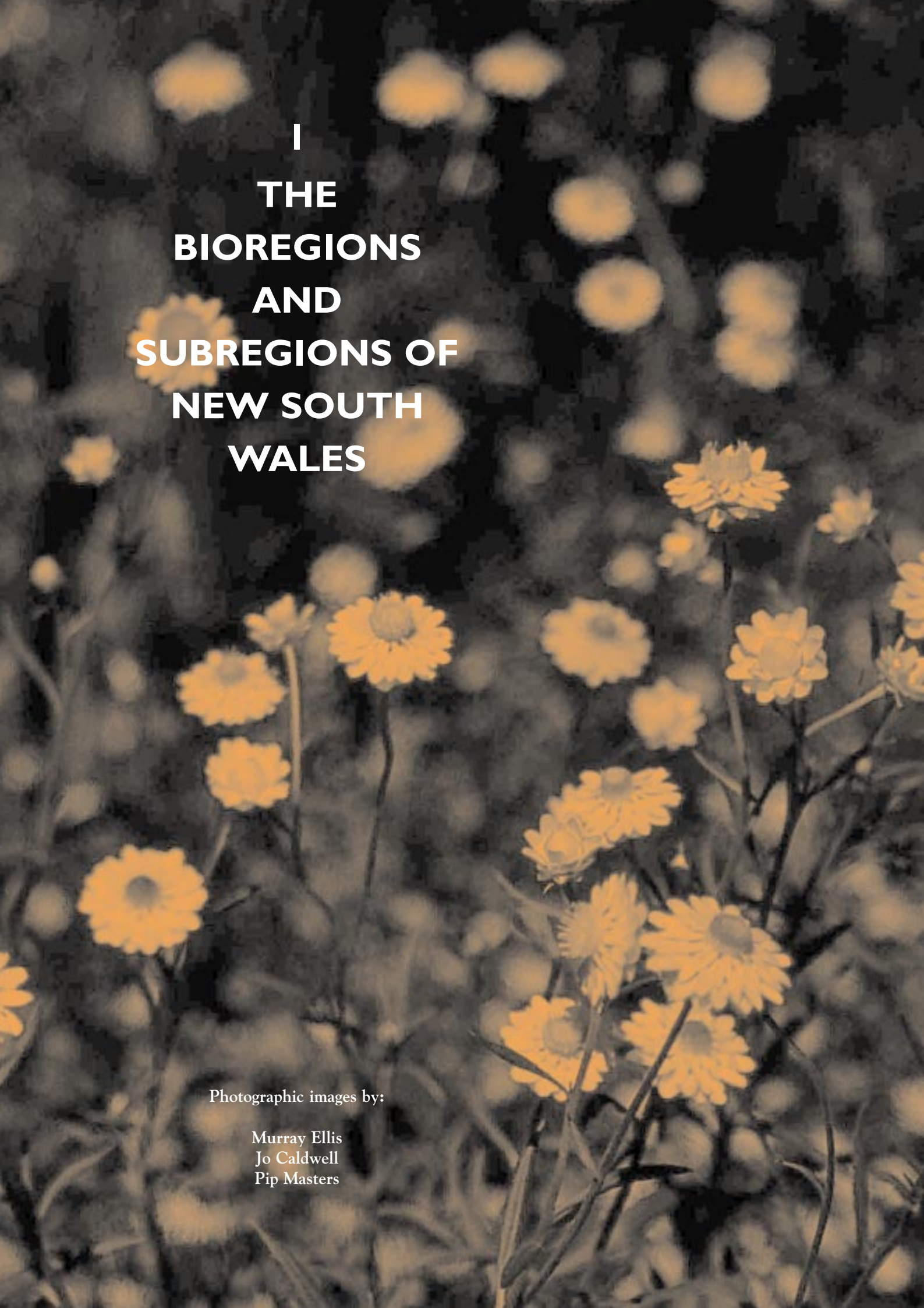




Finally we address monitoring. Too often we measure only the most easily calculable components of our work or we measure performance only within a narrow framework. Stated simply, if we do not monitor biodiversity conservation efforts well, we will not understand how far we have progressed towards maintaining the remaining biodiversity of our State or how rapidly we are causing its decline and extinction. No one in the field of biodiversity conservation pretends that this is an easy task when so much remains to be discovered but we do know enough to understand many of the consequences of our actions and hence to make monitoring important. The Guide outlines factors that should be considered when establishing indicators for bioregional conservation assessments.

Looking ahead

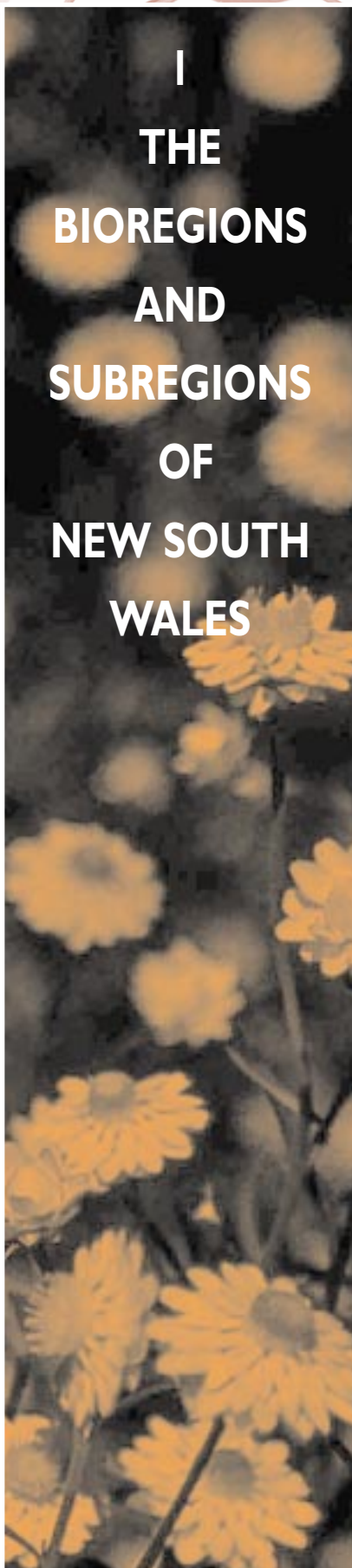
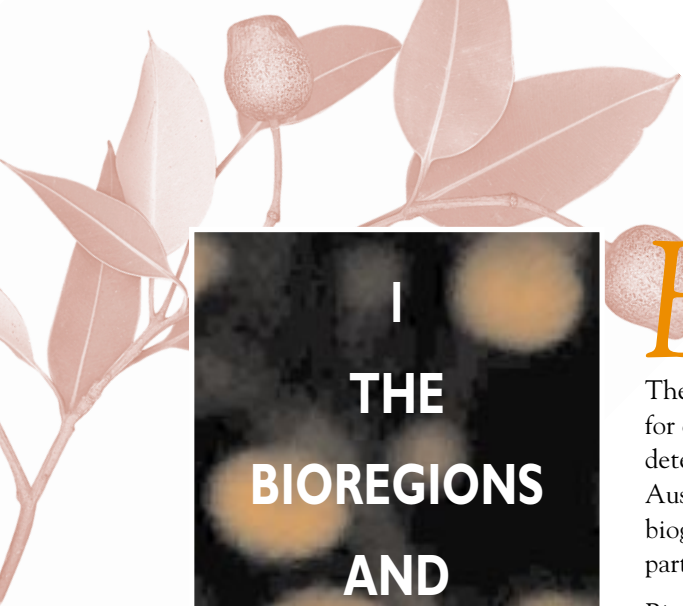
This Guide is a start and we recommend its revision every few years as the program of bioregional conservation assessment in NSW evolves. That being said, there are some areas that will remain a challenge well into the foreseeable future. It is questionable whether we will ever really have enough information or know how much we must conserve to retain every community and species. We hope, however, that by producing bioregional conservation assessments of a consistent quality we can gather the arguments to lay the basis for action when we do have the information.

A field of yellow daisies with a dark, moody background. The flowers are in various stages of bloom, some in sharp focus and others blurred. The overall tone is dark and atmospheric.

I
THE
BIOREGIONS
AND
SUBREGIONS OF
NEW SOUTH
WALES

Photographic images by:

Murray Ellis
Jo Caldwell
Pip Masters



THE BIOREGIONS AND SUBREGIONS OF NEW SOUTH WALES

Bioregions provide a broad view of the organisation of landscapes and biota at a continental level.

The ecological divisions recommended for use as a large-scale unit for conservation assessment within New South Wales (NSW) were determined under the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway and Cresswell 1995). Seventeen biogeographic regions (referred to as bioregions) occur wholly or partially within NSW (Figure 1).

Bioregions provide a broad view of the organisation of landscapes and biota at a continental level and usually represent major structural geologies or climatic differences (Morgan 2001). The nominal resolution of information used to derive IBRA was 1:500,000. Where finer scale data was used it was aggregated to achieve boundaries at this scale (Thackway and Cresswell 1995). This scale was based on the need to provide:

- A uniformly sized grouping of landscapes within which the variability of landscape and biota was as homogeneous as possible; and
- A scale at which the ecosystems within the bioregions would have stronger internal linkages than the linkages between bioregions.

Subregions or provinces (Morgan and Terrey 1992, Morgan 2001) usually delineate significant geomorphic patterns within a bioregion, particularly where geomorphology is the major driver of soil and vegetation. In higher rainfall areas, such as eastern New South Wales, rainfall may over-ride geomorphology to some extent, and subregions in these areas will reflect the climatic interpretation provided by the native vegetation. They are usually used at a scale of 1:500,000 to 1:1,000,000 (Morgan 2001).

As such the boundaries of both bioregions and subregions:

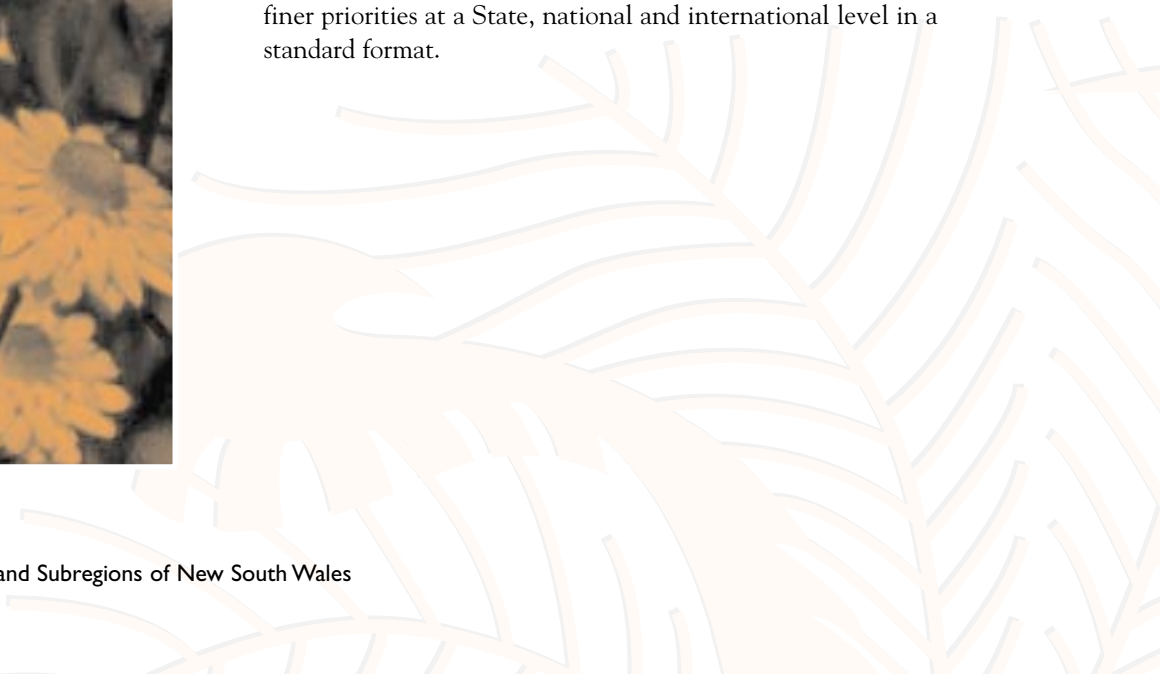
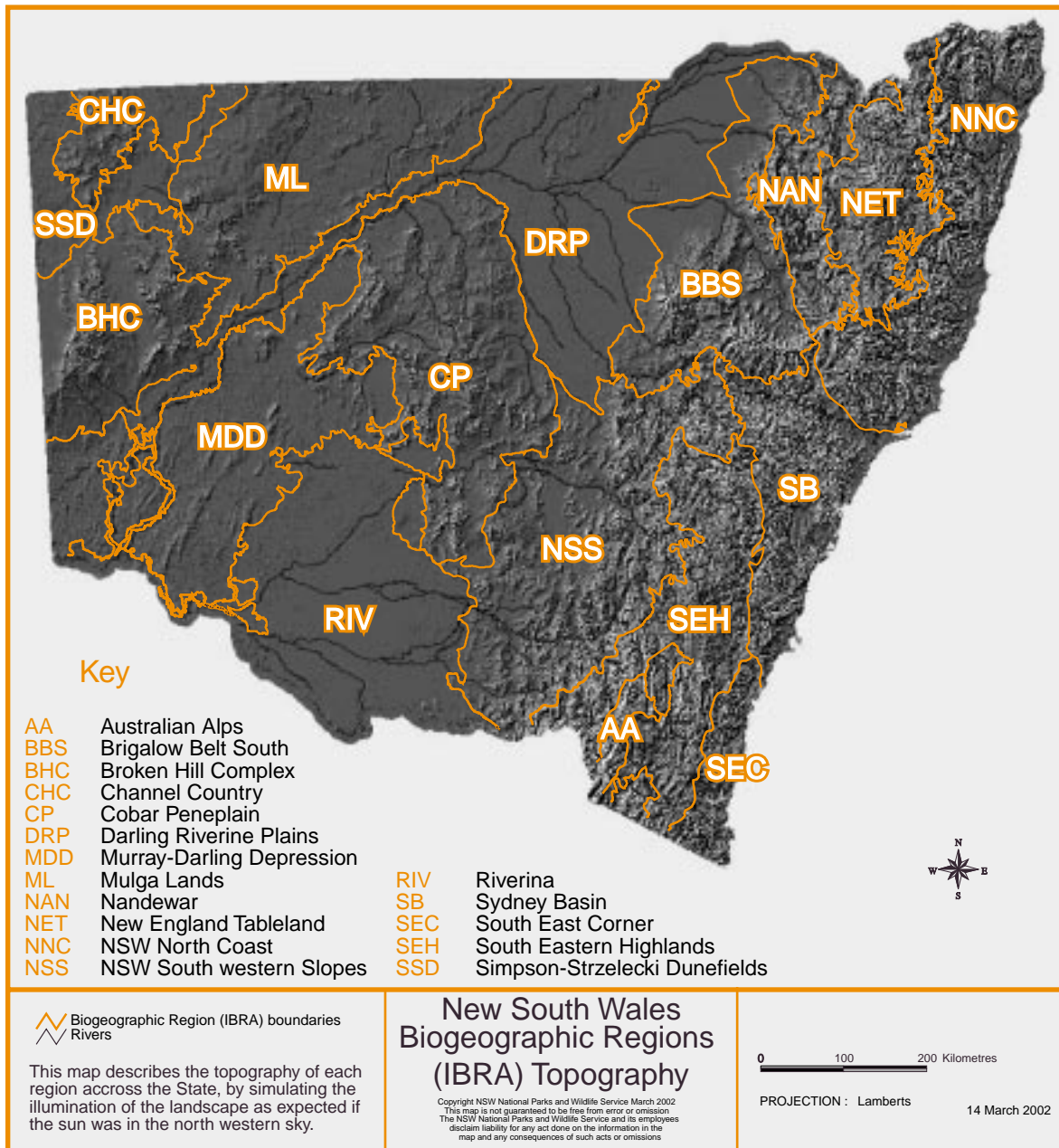
- Provide a fundamental framework within which finer scale assessments of biodiversity distribution, condition, priorities and monitoring should take place; and
 - Provide a basis for communicating this information and these finer priorities at a State, national and international level in a standard format.
- 

Figure 1 - NSW Bioregions (IBRA Version 4.0)





Bioregional and subregional boundaries:

- Do not necessarily correspond with distribution of species or communities. As with all classifications they are a 'best fit' for their intended purpose based on the available information;
- Do not provide a reliable basis for absolute comparisons of environmental or ecosystem type between bioregions. This is because the information used to derive bioregional boundaries is not the same for each bioregion; and
- Do not usually reflect culturally imposed boundaries.

As regional surveys are undertaken new data and information can and should be incorporated into the IBRA and its conservation planning attributes. A system of version numbers has been adopted to track these changes. The custodianship and hence the responsibility for coordinating refinements of the IBRA boundaries is currently vested jointly with the State or Territory nature conservation agencies and the Commonwealth. A similar arrangement will be in operation for subregional boundaries.

KEY GUIDELINES, PRINCIPLES AND STANDARDS

Bioregional and subregional boundaries will provide a fundamental (but not the only) ecological framework within which assessment of the distribution, condition and conservation status of the biodiversity of NSW will occur.

At this time, bioregional and subregional boundaries are interim boundaries. While they should be used to guide finer scale assessment, caution should be used when making critical or contentious planning decisions at or close to the bioregional boundary. This is likely to remain the case until State-wide or national environmental data sets are more consistently mapped or until the States, Territories and Commonwealth accept that further modification is unnecessary following a bioregional conservation assessment of each bioregion.

Bioregional and subregional boundaries may be periodically updated but because there are consequences from this (for example, planning and other processes based on bioregional boundaries may also require updating), updates will be infrequent.

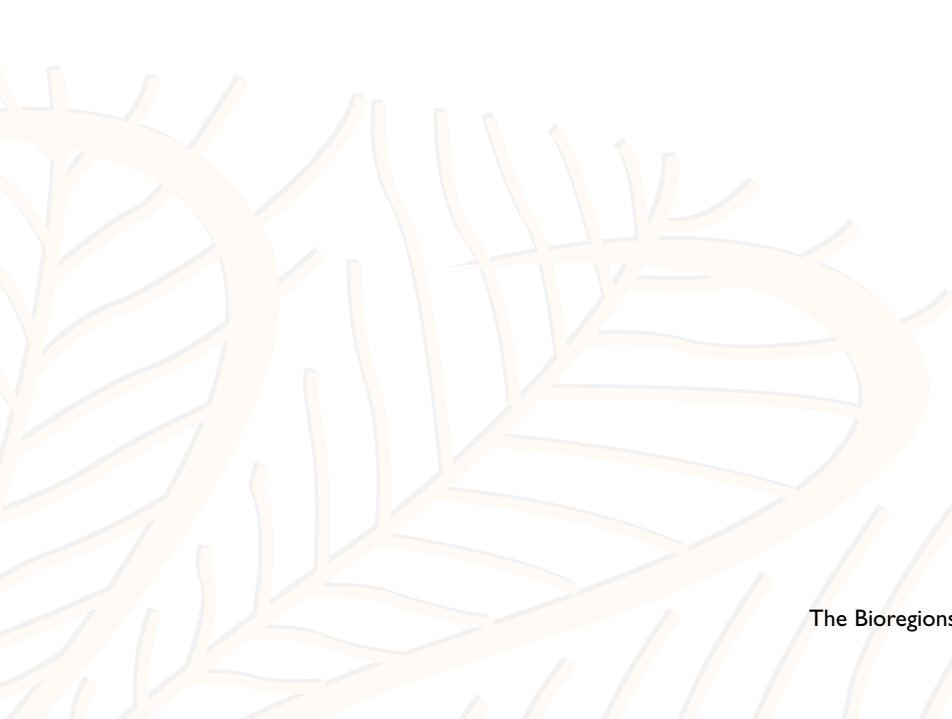
Within NSW the responsibility for coordinating refinements of the bioregional and subregional boundaries rests with the conservation assessment section of the Head Office of the National Parks and Wildlife Service (NSW). This section will periodically collate and review documentation recommending the review of bioregional boundaries and provide this to Environment Australia (the Commonwealth nature conservation agency) for incorporation, if appropriate, into a revised IBRA framework.

Refinements of bioregional and subregional boundaries should:

- Be based on data which is at the finest level, consistently mapped and derived from vegetation community, ecosystem or ecological units based on assemblage models having a bioregion-wide or close to bioregion-wide coverage;
- Ensure that bioregional boundaries continue to be geographically continuous, that is, adjacent and without gaps;
- Continue to be meaningful at the nominal 1:500,000 scale. They should seek to operate at the scale of heterogeneity of other bioregions and not be confused with finer scale groupings (or finer levels of classification);
- Continue to be defined, where possible, by major ecological discontinuities and, where this is not the case, should have another ecological basis (Peters and Thackway 1998);
- Involve consultation and agreement with counterparts in Victorian, South Australian or Queensland nature conservation agencies where bioregional boundaries cross borders; and
- Justify the proposed changes in a written document accompanied by a digital and paper map.

Justification of any proposed changes to a bioregional boundary should:

- Define the data sets used including survey, mapping scale and source data; and
- Describe any rules used for aggregating or splitting units.





FURTHER READING AND REFERENCES

Morgan, G and Terrey, J. (1992) *Nature Conservation in Western New South Wales*. National Parks Association (NSW), Sydney.

Morgan, G (2001) *Delineation and description of the Eastern Environmental subregions (provinces) in New South Wales Study*. Final report to the Conservation Assessment and Priorities Unit, National Parks and Wildlife Service, Hurstville.

Peters, D. and Thackway, R. (1998) *A New Biogeographic Regionalisation for Tasmania*. A report prepared for the National Reserve System Program Component of the Natural Heritage Trust by the Tasmanian Parks and Wildlife Service, Hobart.

National Reserve System program home page for the most current listing of IBRA boundaries at:
www.environment.gov.au/bg/nrs/ibraimcr/ibra_95/index2.htm.

Thackway, R. and Cresswell, I.D. (1995) *An Interim Biogeographic Regionalisation for Australia: a Framework for Establishing the National System of Reserves, Version 4.0*. Australian Nature Conservation Agency, Canberra.

