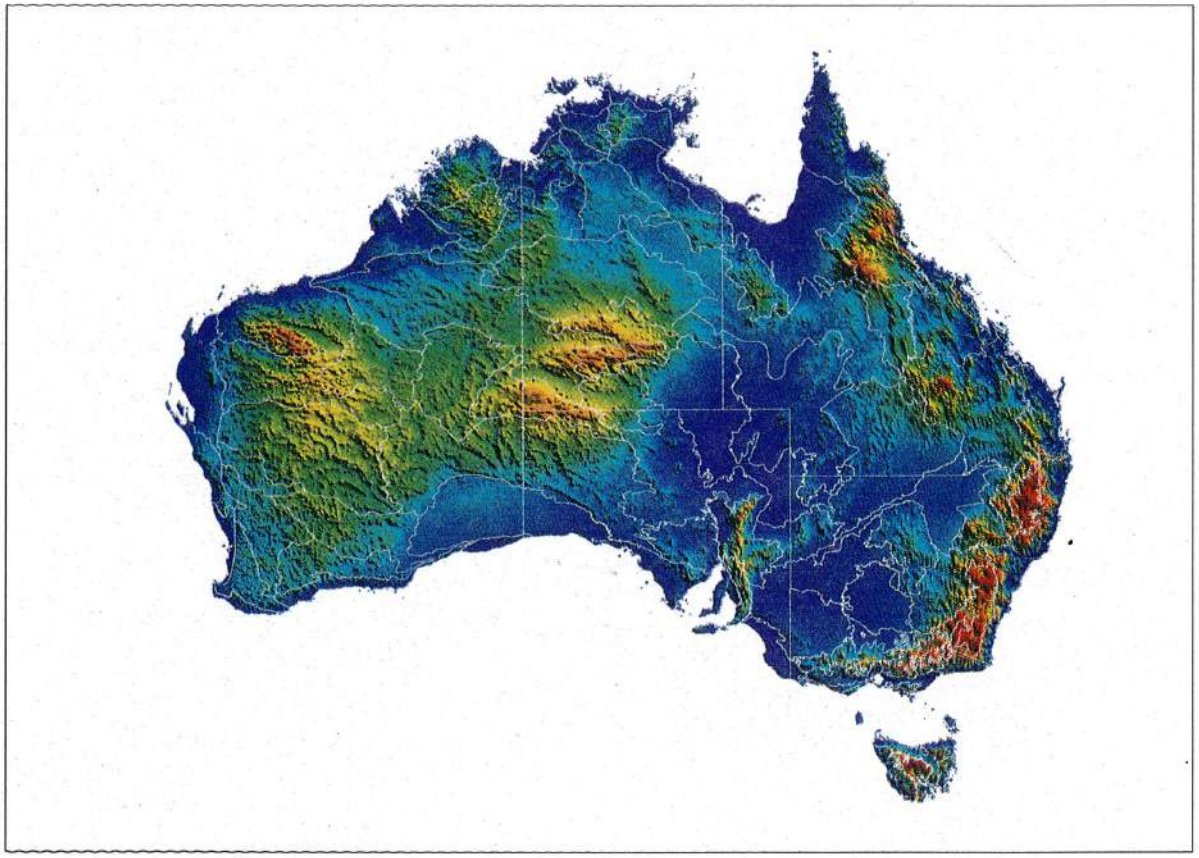
AN INTERIM BIOGEOGRAPHIC REGIONALISATION FOR AUSTRALIA:

A FRAMEWORK FOR SETTING PRIORITIES IN THE NATIONAL RESERVES SYSTEM COOPERATIVE PROGRAM



Edited by: R Thackway and I D Cresswell, Reserve Systems Unit, Australian Nature Conservation Agency, Canberra.

31 March 1995

Version 4.0

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The front cover shows the Interim Biogeographic Regionalisation of Australia draped over a hillshaded digital elevation model of Australia and coloured from blue (low) to red (high) - compiled by Margaret Kitchin (ERIN).

Preface

The Prime Minister's December 1992 Statement on the Environment confirmed the Commonwealth Governments commitment to the development, in cooperation with the States and Territories, of a national comprehensive system of parks and reserves. Through this initiative the National Reserves System Cooperative Program (NRSCP) was established and is administered by the Australian Nature Conservation Agency (ANCA).

The aim of the NRSCP is for all major ecosystems to be surveyed to facilitate progress toward comprehensive, adequate and representative system of reserves be established progressively by the year 2000.

The NRSCP objectives are:

1. to develop and refine methodologies for identification of protected areas, including the development and implementation of a bio-regional approach, through continuing and expanding existing Commonwealth/State programs;
2. to provide incentives for State and Territory cooperation in progressively developing a comprehensive system of protected areas, to be completed no later than the year 2000; and
3. to develop and apply, in association with the States and Territories, nationally consistent management principles for protected areas in accordance with internationally accepted classifications and standards.

The previous Commonwealth Minister for Environment, the Hon. Ros Kelly, presented a paper (prepared in conjunction with officials from Victoria and Queensland) to the Australian and New Zealand Environment and Conservation Council (ANZECC) meeting in October 1993, as the basis for a national approach to establishment of the national reserves system (NRS). Although it did not endorse the paper, ANZECC agreed to further discussions between the Australian Nature Conservation Agency (ANCA) and the State and Territory nature conservation agencies regarding technical issues surrounding the development of the NRS.

In December 1993 several of the agencies suggested that ANCA coordinate the development of a report based on the specialist input of the State and Territory nature conservation agencies with the aim of identifying the deficiencies in the system of protected areas. Recognition of the need to develop an agreed biogeographic regionalisation resulted from those discussions. A series of technical meetings and workshops between the Commonwealth and State and Territory nature conservation agencies followed.

This report has accordingly been developed through the cooperative efforts of representatives from the Commonwealth and State and Territory nature conservation agencies. A draft technical report was prepared from material presented at a meeting held in Adelaide between 7 - 11 February 1994. The draft report was circulated among the Commonwealth, State and Territory nature conservation agencies for comment. In April 1994 ANZECC considered the draft technical report on the development of the interim biogeographic regionalisation for Australia (IBRA). ANZECC welcomed the cooperative development of IBRA and endorsed continued discussions to refine and further develop the technical aspects of IBRA.

A second technical meeting was held in Alice Springs between 25 - 28 July 1994. All participants agreed that the report be widely circulated for comment and be used primarily for the purpose for which it was developed.

It is intended that this report provide a broad framework for identifying deficiencies in the existing system of protected areas, and for setting priorities for action in establishing the national reserves system in Australia.

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Acknowledgements

The developers of the Interim Biogeographic Regionalisation of Australia wish to thank the following agencies and individuals.

First Technical Meeting: Adelaide 7-11 February 1994

The South Australian Department of Environment and Natural Resources provided the venue and office facilities. We wish to thank Dr Peter Copley, South Australian Department of Environment and Natural Resources (SADENR), who chaired the meeting. We also wish to thank the following individuals for their efforts - Ms Suzanne Chrzaszcz (Australian Nature Conservation Agency (ANCA)) and Mark Wilson (SADENR) for organising the meeting; Tricia Kaye (Environmental Resources Information Network, (ERIN)) and Kym Nicolson (SA Department of Housing and Urban Development) for their help in making available computer resources at the meeting; and David Crossley (ERIN) for his tireless effort in bringing together the required continental and State and Territory data sets in a uniform digital format for the meeting.

Second Technical Meeting: Alice Springs 25-28 July 1994

The Conservation Commission of the Northern Territory (CCNT) provided the venue and office facilities. We wish to thank Dr Mike Fleming (CCNT) who chaired the meeting. We also wish to thank the following individuals for their efforts - Mr Damian McRae (ANCA) and Ms Lyn Day (CCNT) for organising the meeting; Andrew Scarman (ERIN) and Grant Allen (CCNT) for their help in making available computer resources at the meeting; and David Crossley (ERIN) for bringing together the required continental and State and Territory data sets. Special thanks go to Dr Peter Latz who led a half day field trip to view first hand the IBRA regions in the vicinity of Alice Springs. Dr Latz and Dr Fleming provided an excellent commentary on the field trip on the issues of conservation assessment and management in arid ecosystems.

Editorial comments on the draft were provided by Doug Brown, Peter Coyne, Gwen Shaughnessy and Steven Szabo (Australian Nature Conservation Agency). The assistance of Leonie Kestel with word processing is gratefully acknowledged.

Definitions

Comprehensiveness
The degree to which the national reserve system encompasses the full range of biological/biophysical diversity and other values as identified by an agreed nationally recognised system of scientific classifications.

Adequacy
The capability of the national reserve system to maintain biological diversity and ecological patterns and processes and other values, given temporal and spatial perturbations, both natural and human-influenced.

Representativeness
The extent to which the areas selected for inclusion in the national reserve system sample known biological/biophysical diversity and other values.

Protected area
Defined according to the IUCN CNPPA definition of protected areas viz:
An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.

Biogeographic region
A complex land area composed of a cluster of interacting ecosystems that are repeated in similar form throughout. Region descriptions seek to describe the dominant landscape scale attributes of climate, lithology, geology, landforms and vegetation. Biogeographic regions vary in size with larger regions found where areas have more subdued terrain and arid and semi-arid climates.

Ecosystem
All of the organisms in a given area in interaction with their non-living environment.

Reservation status
A measure of the percentage of land area within a biogeographic region which is dedicated as protected area.

Bias
A measure of how well the reserve network samples known environmental variation in the same proportion as it occurs within a biogeographic region. Bias in the comprehensiveness of protected areas was defined as the extent to which the existing system of protected areas fails to include examples of the most extensive ecosystems (or land systems); those that characterise entire sub-regions.

Context
Context describes the degree of alteration to the biodiversity at a landscape scale that has occurred due to European land management influences. This is described in terms of the current land use, grouped into three classes.

National reserves system
The national reserve system encompasses the existing reserve systems which are managed and / or administered by the Commonwealth, State or Territory nature conservation agencies. One of the primary goals of the national reserve system is the conservation of biodiversity. Conservation may be achieved at a regional scale through a range of management measures including protected areas as well as off-reserve conservation approaches.

Conservation management measures
Conservation management measures are techniques for achieving conservation of biodiversity. Within any biogeographic region these measures may include land acquisition, binding legal agreements, planning instruments, and non-binding conservation activities.

Summary

The National Reserves System (NRS) encompasses the existing protected areas which are managed and / or administered by the State, mainland Territory or Commonwealth nature conservation agencies. One of the primary goals of the NRS is the conservation of biodiversity. Conservation may be achieved at a regional scale through a range of management measures ranging from strict protected areas to off-reserve alternate conservation management measures.

In order to provide a framework for establishing priorities for delivering the National Reserves System Cooperative Program (NRSCP) it was necessary to have general agreement on the broadest level break-up of the Australian environment into biogeographic regions. A consensus on biogeographic regions across jurisdictions provides a fundamental starting point for building a cooperative approach to the identification and management of a truly national reserves system. Agreement on the broad biogeographic regions of Australia also provides a basis for establishing common criteria for identifying deficiencies in the existing protected areas system.

The October 1993 meeting of Australian and New Zealand Environment and Conservation Council (ANZECC) agreed to discussions between Australian Nature Conservation Agency (ANCA) and the State and Territory nature conservation agencies regarding technical issues surrounding the development of the NRS. Recognition of the need to develop an agreed biogeographic regionalisation was an outcome of those discussions. As a result, it was decided to hold technical meetings between the Commonwealth and State and Territory nature conservation agencies. The format of the meetings comprised workshop and syndicate sessions.

This is a report of two technical meetings held in Adelaide on 7 - 11 February 1994 and in Alice Springs on 25 - 28 July 1994 to develop an Interim Biogeographic Regionalisation of Australia (IBRA) for use in planning the NRS. Each State and mainland Territory nature conservation agency has participated in the development of the IBRA.

Description of the IBRA

Prior to the development of the IBRA the total number of existing biogeographic regions defined by nature conservation agencies across their respective jurisdictions was 130. Two methods were used to rationalise these existing regions and to derive the IBRA regions, region names and region descriptions:

1. map unit boundaries and descriptions were interpreted / integrated and transferred onto paper maps or drafting film, and then these boundaries were digitised; and
2. where finer scale GIS data were available, that is, map unit boundaries and descriptions, regions and their descriptions were interpreted and aggregated.

Using the procedures outlined in the report 80 IBRA regions across Australia were derived by compiling the best available data and information about each State and Territory including specialist field knowledge, published resource and environmental reports, and biogeographic regionalisations for each State and Territory, as well as continental data sets.

Names and descriptions for the IBRA utilised existing common names and referenced published source documents. Where no descriptions were available specialist field knowledge was used to generate appropriate names and descriptions. Where region names were restricted to a particular State or Territory, eg Midlands (Vic), these names were revised to provide a more meaningful name in the IBRA context eg Victorian Midlands.

The IBRA represents a 'milestone' product, meaningful to both field based ecologists and land managers. It is acknowledged that validation of the regions is required and subsequent revisions will be necessary.

A range of issues are discussed regarding the use and misuse of the IBRA given its assumptions and limitations.

IBRAs Conservation Planning Attributes

In order to provide a systematic framework for identifying the deficiencies in the existing system of protected areas, as well as establishing priorities for filling these gaps, four conservation planning attributes have been developed based on the IBRA.

Reservation status and the *bias in the degree of comprehensiveness.* Estimates of the natural environments represented within protected areas were calculated for each IBRA region respectively.

Estimates of the *constraints and limitations to planning the national reserve system.* That is, the degree of alteration to the biodiversity at a landscape scale which has occurred due to European land management influences were assessed. This attribute was derived for each biogeographic region to provide a knowledge base for ranking NRSCP funding proposals according to the degree of risk or threat to the conservation of biodiversity.

Alternative conservation management measures. That is, those measures other than strict protected areas for conserving biodiversity across the range of land tenures within a biogeographic region, were also identified. These measures may include land acquisition, binding legal agreements, planning instruments, and non-binding conservation activities. This information will provide a knowledge base for ranking NRSCP funding proposals, and make a valuable contribution to ongoing discussions about the 'real' level of funding necessary to address the deficiencies in the NRS in the medium and long terms.

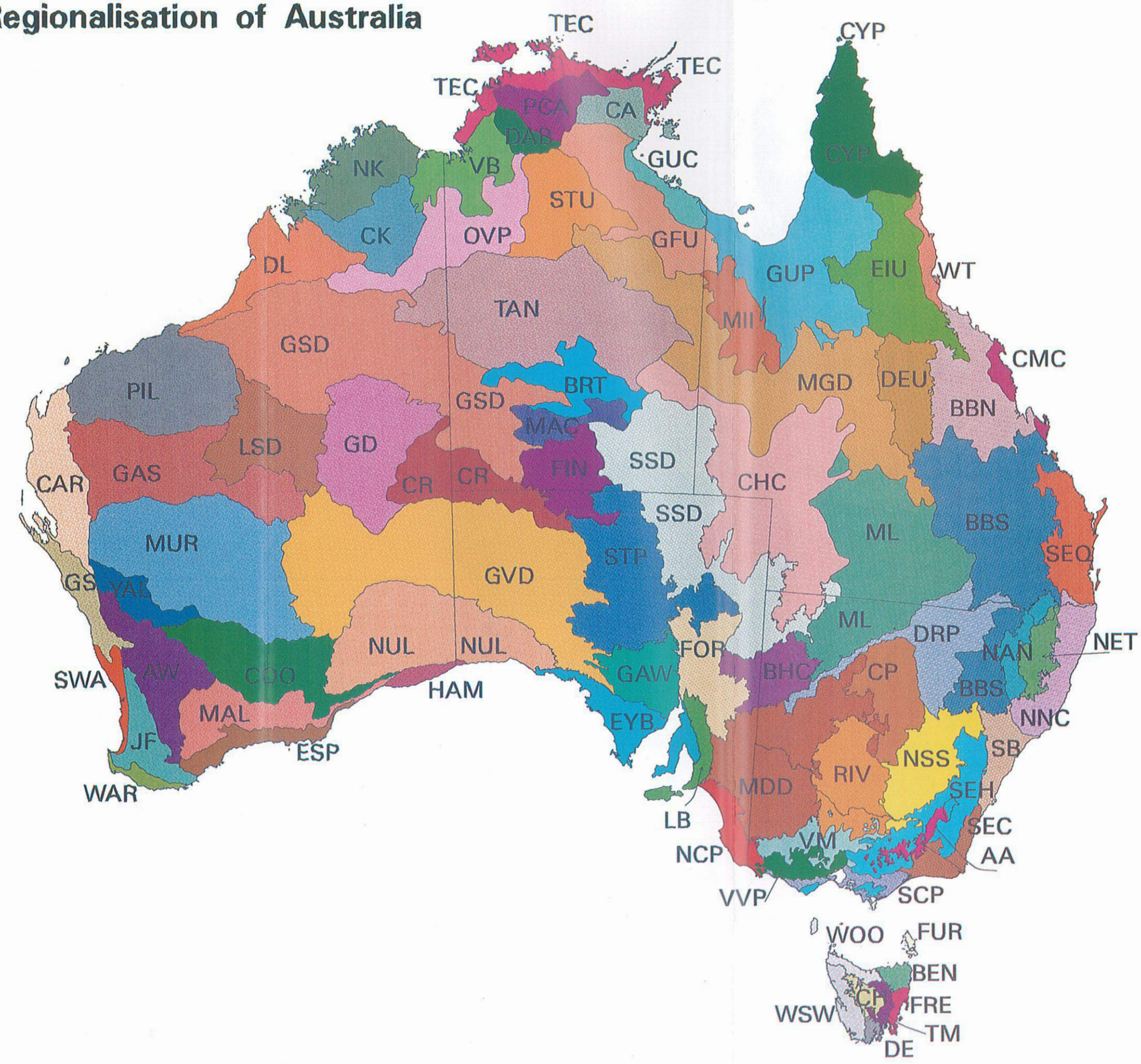
Applications of the IBRA for reserve design and selection
The developers of the IBRA acknowledge that to work at the regional scale it will be necessary to collect and analyse data at a finer scale within each IBRA region. For example, such an hierarchical approach is being implemented jointly between the Commonwealth, State and Territory forest management agencies under the auspices of the National Forest Policy Statement (NFPS). The IBRA in this application provides the hierarchical ecological framework to assess and develop a comprehensive, adequate and representative system of forest reserves to conserve old growth forests, wilderness areas and biodiversity values.

An Interim Biogeographic Regionalisation of Australia

SCALE: 1:15,000,000

Produced by the Australian Nature Conservation Agency (1995)
Map version - 27 March 1995

Projection: Albers Equal Area
Standard Parallels: 18 and 36 deg. south
Central Meridian: 132 deg. east
Australian Spheroid



BACKGROUND:
This map has been developed through cooperative efforts of the Australian and State and Territory nature conservation agencies. The map provides a broad framework for developing the National Reserves System for Australia.

NB: Please consult the report "Thackway, R. and I.D. Cresswell (Eds) (1995). An Interim Biogeographic Regionalisation of Australia, Australian Nature Conservation Agency, Canberra." For information on assumptions, limitations and caveats regarding use of this map.

SOURCES:
ANCA (1995). 'IBRA digital data set'.
AUSLIG (1993). 'Coastline digital data set'.

CAVEATS:
Some of the Biogeographic regions are at the scale of sub-regions or environmental provinces but are recognised and illustrated as part of the planning framework of State/Territory jurisdictions.
Further analysis is required to ensure a uniform level of heterogeneity is established between regions within all States and Territories.

1. INTRODUCTION

1.1 Background

Regionalisations provide a useful framework for focussing attention, summarising patterns, aggregating information, and allocating resources and priorities in nature conservation. During the 1970s and 1980s there were a number of attempts at the Federal level to develop national ecologically meaningful regionalisations. However, gaining State and Territory government acceptance of these efforts for the delivery of Commonwealth, State and Territory nature conservation programs, have generally not succeeded.

In the mid-1980s the Australian Nature Conservation Agency (then ANPWS) initiated the National Index of Ecosystems (NIE) as a cooperative project between Commonwealth, State and Territory nature conservation agencies to establish methodologies for classifying environments or ecosystems as a basis for developing a national system of protected areas for Australia (ANPWS 1988). Some progress was made toward developing methodologies and providing national overviews on the conservation of selected ecosystems. Two reviews of the NIE showed that nature conservation agencies agreed that a national classification of ecosystems was required as a framework to develop a truly national system of protected areas which represented the diversity of major ecosystems in Australia (Thackway 1989; Kestel Research 1991). The establishment of the NIE and its contribution to developing a national system of reserves (NRS) were, however, hampered by a lack of adequate resources.

In 1989 the NIE was incorporated into the Environmental Resources Information Network (ERIN), where work commenced on implementing the NIE as a modelling application on a GIS platform. The methodology implemented by ERIN for developing environmental regionalisations was based on the numerical classification of physical environmental attributes. A national workshop on environmental regionalisations was held in 1992 in an attempt to develop a national framework for developing regionalisations for use in national and regional conservation assessment and planning, including planning a national system of protected areas (Thackway 1992a). That workshop showed that there was reasonable agreement between the State and Territory biogeographic or 'natural' regionalisations in terms of scale, attributes, and the methodologies used to derive these regionalisations (Thackway 1992b). The workshop did not reach agreement on a suitable methodology or environmental regionalisation which could be used as a framework for determining the deficiencies in the existing protected area estate or in setting priorities for filling these gaps.

The need for a national system of protected areas in Australia has been recognised for some time. Two inquiries by the Federal House of Representatives Standing Committee on Environment, Recreation and the Arts (HoRSCERA 1992, 1993 a and b) on the role of community based action and of protected areas systems in maintaining biodiversity and ecosystem function, recommended the adoption of a bioregional approach to assessment, planning and management. The Prime Minister in his Environment Statement in December 1992 committed the Commonwealth to the progressive establishment, in cooperation with the States and Territories, of a comprehensive, adequate and representative system of protected areas by the year 2000. The development and implementation of a bioregional approach to the identification of reserves was endorsed in that Statement.

A total of $16.85m over four years was provided in the Environment Statement for a range of programs to support implementation of the initiative. The bulk of the funding is administered by the ANCA as the National Reserves System Cooperative Program (NRSCP).

An initial assessment by the Commonwealth of the comprehensiveness of "natural regions" represented in the existing system of protected areas (Thackway and Cresswell in press) used three continental regionalisations, namely biophysical regions (Laut *et al* 1975), environmental regions (Thackway and Cresswell 1992) and natural vegetation (AUSLIG 1990). Generally the response of the State and Territory stakeholders to this analysis was that there was a need to develop an agreed national biogeographic regionalisation specific to the NRSCP, derived primarily from State and Territory data and information. Hence, a technical meeting was proposed to ANCA by State and Territory representatives.

The aim of this report is to document the approach taken in developing the Interim Biogeographic Regionalisation of Australia (IBRA) and the subsequent development of a range of conservation planning attributes (CPAs). The IBRA and its CPAs have primarily been developed for the NRSCP. In particular, it will assist decision makers identify deficiencies in the national system of reserves and help them set priorities for funding project proposals under the ANCA NRSCP program.

1.2 Setting the Scene for Developing the IBRA

1.2.1 Determining what product is required and who is the audience /client

Initially, an outline of the product required for the IBRA was developed by the ANCA: a map (the scale of which is designed to fit Australia into an A3 page) with accompanying region names, together with a report describing the background, methods and results, with a discussion of how the IBRA might be used for the NRSCP. One of the key features of the map was that the names and region boundaries needed to be clearly recognisable to the wider community.

The application and refinement of the IBRA and its associated *conservation planning attributes* for conservation planning and management came out of the Alice Springs meeting and is expected to be an ongoing and dynamic process.

The success of the IBRA will be measured on three fronts:

- the utility of the IBRA in assessments by officers in the managing agencies who are responsible for reviewing, revising, value adding and using their jurisdiction's component of the IBRA products for planning and management;
- broader support for the IBRA within the managing agencies and within ANZECC in the decision making processes; and
- the value of the IBRA in the wider community; for example how well it represents their understanding of an area, also how well it communicates information about an area to individuals and communities who live adjacent to, and/or utilise the region/s for a wide range of activities.

IBRA is a flexible, dynamic and pragmatic approach to developing an ecologically meaningful regionalisation. It seeks to define, map and describe the major ecosystems in Australia. IBRA is one of many environmental regionalisations; there will be others. While the primary purpose for developing the IBRA will be in the context of developing a national reserves system it will be of value for a range of other conservation planning and management applications.

1.2.2 Terms of Reference for developing the IBRA and Associated Conservation Planning Attributes

1. Develop a procedure for integration of the existing biogeographic regionalisations
   a) define which are the key data sets, including the existing State and Territory and continental regionalisations, as well as the ERIN vegetation map of Australia derived from interpretation of NOAH satellite data (i.e. normalised difference vegetation index (NDVI)),
   b) develop a set of guidelines for defining the desired scale, for drawing 'firm' and 'fuzzy' boundaries, and for splitting and lumping regions,
   c) define the level of attributes required to describe each region, (geology, geomorphology, climate, present (or natural) vegetation, disturbance, flora and fauna),
   d) develop an agreed nomenclature for each IBRA region, including an index to relate IBRA names and map codes to existing State and Territory region common names and map codes.
2. Develop an agreed set of caveats for the applications of the IBRA in the context of the NRSCP.

3. Develop an agreed suite of methods for deriving a series of four conservation planning attributes based upon the IBRA regions:

   a) the level of reservation status
   b) the level of bias within protected areas i.e. how comprehensively the existing protected areas sample the known environmental heterogeneity
   c) the constraints and limitations to planning the NRS, and
   d) the opportunities for alternate conservation management measures

4. Develop procedures to ensure the custodianship of the IBRA and its associated conservation planning attributes are vested in the States', Territories' and Commonwealth nature conservation agencies, i.e those agencies responsible for planning and managing the NRS.

5. Develop procedures for identifying gaps in the NRS and for establishing priorities for allocation of resources under the NRSCP.

2. METHOD

2.1 Defining an Agreed Scope of Work for Developing the IBRA

Based on the above Terms of Reference the developers of the IBRA worked collectively from those jurisdictions which were perceived to share the largest number of ecosystems in common with other jurisdictions. In the first instance, this involved cross-border matching of existing regions between Northern Territory/South Australia/Western Australia, and from these investigations, discussion proceeded to broader issues which needed to be resolved. This procedure provided a process for documenting the assumptions and limitations of the derived regionalisation, as well as, it stimulated discussion on the constraints and uses of the IBRA.

Table 1 summarises the steps involved in the development of the IBRA and its conservation planning attributes.

2.2 Nominal Resolution of the Data Used in the IBRA

The resolution of the input data used in the IBRA varied between States and Territories but was nominally about 1:500,000 scale (see Table 2). Where possible, data layers and procedures were linked to State, Territory and Commonwealth GIS facilities.

2.3 Nominal Attributes for the IBRA

The major attributes used to delineate IBRA boundaries and to describe the IBRA regions are listed below. Due to the difference in the scale of data sets between jurisdictions, the contribution of these data and information varies between jurisdictions. The sources of the original data which have been synthesised into the IBRA map and report are presented in Table 2.

- Climate
- Lithology/Geology
- Landform
- Vegetation
- Flora and Fauna
- Land use
- Other attributes if needed

2.4 Procedure for Delineating IBRA Region Boundaries

The IBRA was derived by compiling the best available data and information about each State and Territory including field knowledge, published resource and environmental reports, and biogeographic regionalisations for each State and Territory, as well as continental data sets.

Where finer scale GIS data sets were available these were aggregated to derive the coarser IBRA boundaries. Regions were aggregated where the taxonomy and/or hierarchy of the regions and their descriptions were known. Table 3 summarises methodologies utilised. Two main methods were used:

1. map unit boundaries and descriptions were interpreted / integrated and transferred on to paper maps or drafting film, and then these boundaries were digitised, as in the case of NT, WA, ACT/NSW and Qld; and
2. where finer scale GIS data were available, these were interpreted and aggregated using a combination of paper base maps and GIS; as in the case of Vic, Tas and SA.

2.5 Comparison of Biogeographic Terms Used Within Each State and Territory

In order to determine the most appropriate hierarchical level for developing the IBRA, the Adelaide meeting compiled a list of relevant terms used in existing biogeographic classification systems developed by research institutions, land management and nature conservation agencies, as well as private researchers. The following criteria were used to select the most appropriate level:

- is there a compatible hierarchical taxonomy within the existing classification systems from which to derive a consistent hierarchical taxonomy for regions across all jurisdictions; and
- is there a convergence between the hierarchical levels present within the existing State and Territory classification systems.

2.6 Nomenclature of IBRA Regions

Where possible region names and descriptions for the IBRA utilised existing common names and referenced source documents. Where no appropriate names and descriptions were available field knowledge was used to generate these.

Where region names were restricted to a particular State or Territory, and were terms relative to that jurisdiction, eg Murray Mallee (Vic), these names were revised to provide a more meaningful name in the IBRA context eg Murray-Darling Depression.

2.7 Data Management and Updating the IBRA

2.7.1 Building the IBRA as a GIS Data Set

Biogeographic data sets were supplied as GIS coverages to ANCA prior to the Adelaide technical meeting to enable them to be loaded into the ARC/INFO GIS platform on the ERIN network. These data included a map unit code (i.e. polygon identifier), a region name / number, and associated linkages between map units (i.e. polygons). The steps presented in Table 4 were used by ANCA in building, checking, editing, documenting and distributing the IBRA to State and Territory nature conservation agencies.

2.7.2 Revising the IBRA and Incorporating New or More Detailed Data

The developers of the IBRA recognise that it reflects the best information available at the time of its development. As regional surveys are undertaken new data and information will need to be incorporated into the IBRA and its conservation planning attributes. A system of version numbers for the IBRA report was adopted by the ANCA to keep a track of these changes.

As a result of the first Technical Meeting held in Adelaide a total of 80 regions were identified and Version 1.0 was prepared as a proceeding of that Meeting. Successive versions of the IBRA were prepared and circulated both to the developers of the IBRA and to the wider community. Each new version comprised new information and corrections on the previous version. In the lead up to the Technical Meeting in Alice Springs Version 3.5 was prepared.

After the Alice Springs meeting ANCA circulated an ERIN alternative view of the number regions and the placement of boundaries based on the first IBRA map. The developers of the IBRA agreed to review the ERIN classification of structural vegetation for Australia derived from a time series of continental satellite coverages of vegetation greenness, and to revise the IBRA where appropriate. The list of proposed changes are presented in Table 5.

2.8 Verification and validation of the IBRA

During the Adelaide Technical Meeting the IBRA regions were plotted at 1:3 million scale and verified with other data sets and expert knowledge. Subsequently, agencies responsible for development of the IBRA were sent copies of the IBRA map as GIS data files. A process of peer review in each agency has been a key feature of the verification process. Where anomalies or omissions have been detected, or new information has come to light, these changes have been incorporated into successive revisions of the IBRA map and report.

The developers of the IBRA welcome the opportunity to work collaboratively with other agencies and individuals to verify the boundaries, descriptions as well as the range of conservation planning attributes.

2.9 Deriving IBRAs Conservation Planning Attributes

In order to provide a systematic framework for identifying the deficiencies in the existing system of protected areas, as well as for establishing priorities to fill these gaps, the developers of the IBRA derived four conservation planning attributes based on the IBRA bioregional framework:

1. the reservation status of each IBRA region
2. the level of bias within protected areas i.e. how comprehensively the existing protected areas sample the known environmental heterogeneity
3. determining the constraints and limitations to planning the NRS, and
4. opportunities for alternate conservation management measures

2.9.1 Determining the level of reservation status of the IBRA regions

The Adelaide Technical Meeting developed a method for determining the reservation status within each jurisdiction by calculating the relative area of each IBRA region conserved in protected areas. Initially, each State and Territory supplied the ANCA with their latest data on protected areas within their respective IBRA regions and subsequently ANCA determined a value for reservation status across the total area of each IBRA region. The final estimate of reservation status were then forwarded to the respective jurisdictions for checking.

Reservation status was defined as the area of each IBRA region sampled within protected areas. Five classes of reservation were defined as follows:

Percent reservation	Reservation status
<1%	Low
1% to <5%	Low to moderate
5% to <10%	Moderate to high
>10%	High

2.9.2 Determining the bias in the comprehensiveness of protected areas

It is widely acknowledged that the system of protected areas does not comprise a comprehensive sample of the variety of environments and landscapes. An index of bias in comprehensiveness was calculated for each region to determine the extent of this bias.

The Adelaide meeting developed a procedure for intersecting protected areas with more detailed environmental and/or biological data to determine a measure of the heterogeneity within each IBRA region.

Bias in the comprehensiveness of protected areas was defined as the extent to which the existing system of protected areas fails to include examples of the most extensive ecosystems (or land systems); those that characterise entire sub-regions.

The index was determined within each IBRA region for each jurisdiction using finer scale State and Territory data. Initially, each State and Territory supplied the ANCA with their data on bias within their respective IBRA regions and subsequently ANCA determined a value for bias across the total area of each IBRA region. The final estimate of reservation status were then forwarded to the respective jurisdictions for checking.
Five classes are distinguished:

Bias class	Bias description	Averaged bias status class
Nil	All environments or land systems represented	1
Low	Most land systems in proportion to their occurrence	2
Moderate	Most land systems, but with a bias in their representation	3
High	Few of the environments represented or one or more important land systems missed	4
No representation	No reserves	5

Due to the lack of consistency between biophysical data sets across the continent, assessments of bias in the comprehensiveness of ecosystems represented in protected areas are at present only possible at a very general level. Because of limited data, the West Australian bias classes were calculated using the definitions in section 4.7.2.

2.9.3 Determining the Constraints and Limitations to Planning the NRS

The Alice Springs Technical Meeting agreed that one of the major constraints and limitations to planning the NRS was the dominant land use and/or threatening processes within each IBRA region. This information could be used to assist the ANCA NRSCP rank funding proposals based on degree of risk or threat.

The developers of the IBRA noted this to be a complex topic and that considerable work was already under way in each State and Territory. Rather than duplicate this work it was agreed there was a need for general categories which provide a broad overview of the region, which should reflect the finer detail work being developed in other fora. The data included here would provide the context for the type of problems which may be expected in planning a regional system of protected areas within an IBRA region, and what actions are likely to be required to maintain viable protected areas in the respective regions.

Each jurisdiction provided ANCA with relevant text on the dominant land use or threatening process within each IBRA region. The categories agreed to for collating this information included:

Codes for Condition		Descriptions for condition of IBRA regions
A	=	Modified ecosystems dominant i.e. only small areas of indigenous ecosystems remain
L	=	Indigenous ecosystems present but coexisting with pastoral / timber industries
M	=	Indigenous ecosystems dominant with no widespread degrading land use, however processes of disturbance (feral pests, fire, tourism etc.) present
H	=	Indigenous ecosystems dominant with no known risk

The developers of the IBRA compiled the following codes for documenting the dominant land use and/or threatening process in each IBRA region:

Codes for Constraints		Descriptions for constraints and limitations to planning the NRS
AG	=	Agriculture
CLE	=	Clearing
CRO	=	Cropping
DCWRM	=	Declining of critical weight range mammals occurring
EX-CWRM	=	Extinction of critical weight range mammals occurring
FER	=	Ferals (general)
FERB	=	Feral buffalo
FERR	=	Feral rabbits
FERC	=	Feral camels
FIRE	=	Wildfire
FOR	=	Forest timber production / harvesting
GRAZ	=	Grazing, pastoral
HOR	=	Horticulture
MIN	=	Mining
SALT	=	Salination
TOU	=	Tourism
URB	=	Urbanisation
WEED	=	Weeds

2.9.4 Determining opportunities for alternate conservation management measures

The Alice Springs Technical Meeting agreed that the development of a NRS based solely on strict protected areas was unlikely to be either acceptable or practical in all IBRA regions and therefore it was necessary to document for each region a suite of appropriate alternate conservation management measures, including strict protected areas.

This information would provide a knowledge base for ranking NRSCP funding proposals, as well as an invaluable input into ongoing discussions about the 'real' level funding necessary to address the deficiencies in the NRS in the medium and long terms. This information was also identified as necessary for integrating the NRSCP with other funding programs and "off park" initiatives, which together contribute to the conservation of biodiversity within the landscape matrix.

Each State and Territory representative provided a textual description of the most appropriate conservation management measures for each IBRA region within their jurisdiction. Three categories for documenting conservation management measures included:

Codes for conservation measures		Descriptions of alternate conservation management measures
1	=	Land purchase (including purchase of pastoral leases),
2	=	Voluntary agreements (Heritage Agreements, Covenants, Regional Forest Agreements, inter-governmental agreements).
3	=	Planning instruments (e.g. changing various types of Crown Reserves such as Vacant Crown Land and Recreation Reserves to nature conservation vesting and purposes),

2.9.5 Determining priorities for filling the Gaps in the NRS

A combination of the first three IBRA conservation planning attributes are proposed to be used to establish three levels of priority for the allocation of resources under the NRSCP, namely:

a) the level of reservation status
b) the level of bias within protected areas i.e. how comprehensively the existing protected areas sample the known environmental heterogeneity, and
c) the constraints and limitations to planning the NRS.

Opportunities for alternate conservation management measures provide a guide for ensuring compatibility with other conservation programs within the same region as well as potentially between jurisdictions. While not used as a basis for funding decisions, those alternate conservation management measures which afford the highest security of tenure for conservation management are preferred.

In determining priorities it is necessary to take into account all three conservation planning attributes of a region. Thus the highest priority is to be the greatest need for action, i.e. to increase reservation status and reduce bias and minimise the threat imposed by current land management activities. Second and third level priorities were allocated to lesser needs.

2.9.6 Custodianship of the IBRA and its Conservation planning attributes

Given that the IBRA is based primarily on the existing regionalisations, plus the best available ecological data and information held by the respective State and Territory nature conservation agencies, the developers of the IBRA agreed that the custodianship for the IBRA should vest jointly with the respective jurisdictions and with the Commonwealth regarding the whole IBRA data set.

Since one of the planned uses of the IBRA by the NRSCP is for ranking funding proposals received from the respective State and Territory nature conservation agencies, the developers of the IBRA agreed that it was necessary for the primary custodians to regularly supply the ANCA with the most up-to-date information. In other words, by vesting the custodianship of the IBRA with the respective State and Territory jurisdictions and with the Commonwealth it provides an incentive for each jurisdiction to ensure that the most up-to-date information is used by the ANCA to decide priorities for competing project proposals.

3. RESULTS

3.1 History of IBRA's Successive Version Numbers 1.0 to 4.0

The proceedings of the first Technical Meeting held in Adelaide resulted in a report called the ***Draft Interim Biogeographic Regionalisation for Australia (IBRA)***. Versions 1.0 to 3.1 of the proceedings of that Meeting were circulated to the developers of the IBRA. Version 3.2 of this report was widely circulated for discussion and comment.

Versions 3.3 and 3.4 were internal ANCA versions which contained successive edits based on comments received on Version 3.2. Version 3.5 was prepared for discussion at the Alice Springs Technical Meeting.

Version 4.0 comprises a thoroughly revised text and map for the IBRA following that meeting. Given these revisions, the developers of the IBRA decided to drop the term ***Draft*** from this version.

3.2 Key Decisions Which Led to IBRA

3.2.1 Integrated Landscape Level Classification of Biophysical Attributes

At the outset, the developers of the IBRA agreed on a conceptual process model as the basis for understanding and explaining ecological patterns and processes. Namely, it is the physical processes which drive ecological processes, which in turn are responsible for driving the observed patterns of biological productivity and the associated patterns of biodiversity. Specialist ecological knowledge combined with appropriate regional and continental scale biophysical data sets were interpreted to describe these patterns.

IBRA is an integrated classification of both biotic and abiotic variation. IBRA regions represent a landscape based approach to classifying the land surface, including attributes of climate, geomorphology, landform, lithology, and characteristic flora and fauna.

The resulting integrated regions were ascribed the term *biogeographic regions*. The developers of the IBRA acknowledge that new information through time will modify our understanding of the regions, hence the term *interim* in the title of the IBRA.

3.2.2 Cross Border Changes to Existing State and Territory Biogeographic Regionalisations

Table 6 presents the record of investigations into possible region boundary changes which were undertaken in the process of deriving the Version 4.0 of the IBRA.

Where commonalities were observed between the descriptions and boundaries in the existing State and Territory biogeographic regionalisations, these provided the basis for synthesising descriptions and remapping or joining the borders between jurisdictions. Many of the changes listed reflect agreement that regions identified in one jurisdiction are often represented in the adjacent State or Territory, but possibly with a different region name.

3.2.3 Selection of an Appropriate Hierarchical Level for the IBRA

Table 7 presents a list of the hierarchical biogeographic terms used by each of the State and Territory nature conservation agencies along with those terms derived for use with the IBRA. The IBRA was named at the *Region* level as the existing State and Territory biogeographic classification systems showed a convergence at this level. The exceptions to this were in Victoria where *Geomorphic Units*, and in Western Australia where *Districts*, broadly equated to the *Region* level of other jurisdictions.

3.3 The IBRA - A Brief Description

Following the first Technical Meeting in Adelaide a total of 80 IBRA regions were identified and described. Version 3.2 of the IBRA report, which was widely circulated, presented the proceedings of that meeting.

The second Technical Meeting held at Alice Springs reviewed and revised the IBRA report and map. This Version of the IBRA report documents numerous changes made to Version 3.2, both to the map and the report. Table 8 presents a summary of these changes. Coincidentally after implementing the agreed changes, the IBRA continues to have 80 regions.

Table 9 and Map 1 present the legend and map for IBRA regions for Australia. Each IBRA region is described in Appendix 1. The list of descriptions was supplied by the respective State and Territory nature conservation agency. *Further refinement and revision of these descriptions is required in order to develop a consistent and comparable description of each IBRA region.*

Table 10 presents a list sorted by ascending order of the relative areas of each IBRA region and Figure 1 presents these data as a bar chart. Three broad size classes may be recognised

- <49 999 sq km,
- 50 000 sq km to 149 999 sq km,
- >150,000 sq km.

In the smallest size class (<49 9999 sq km) there are 31 IBRA regions. These all occur within 300 kilometres from the coastline, have relatively high rainfall in their growing season, and many have relatively high topographic relief. It is worth noting that all IBRA regions defined for Tasmania and most of those for Victoria occur in this size class.

In the mid-range size class (50 000 to 149 999 sq km) there are 33 IBRA regions. There are no obvious patterns to the distribution or ecological character of this size class.

In the largest area class (>150 000 sq km) there are 16 IBRA regions. Most of these regions are situated in remote arid and semi-arid areas and are found predominantly in areas which have low to very low topographic relief. The largest two regions are approximately 400,000 sq km in area, being the Great Victoria Desert (GVD) and Great Sandy Desert (GSD).

The relative area of each IBRA region within each State and Territory is presented in Appendix 2.

3.4 Relationships between IBRA regions and Respective Jurisdictions

3.4.1 Comparison of Each Jurisdictions -Pre and Post IBRA

Prior to the development of the IBRA there were 130 regions shared between the 8 jurisdictions. This number was reduced by approximately 40% to 80 IBRA regions (see Table 11). This table has been summarised from Appendix 3 which presents a list of the regions used by each jurisdiction prior to IBRA and their association with IBRA regions.

The jurisdiction with the largest number of IBRA regions is Western Australia with 26 regions. The Northern Territory, Queensland, New South Wales and South Australia recorded 20, 19, 17 and 15 regions respectively. Victoria, Tasmania and the Australian Capital Territory recorded 11, 8 and 2 regions respectively.

The table shows some jurisdictions gained additional regions for the purpose of the IBRA, including Queensland, Northern Territory and Western Australia. These increases resulted from recognising patterns previously classified as sub-regions within existing State and Territory regionalisations as extensions of regions largely lying outside that State or Territory.

Some jurisdictions declined in the numbers of regions through the development of the IBRA, including Victoria, Tasmania and South Australia. These decreases were the result of re-mapping or aggregating finer scale regionalisations in order to be compatible with the coarser continental scale required for the IBRA.

Collectively, New South Wales and the Australian Capital Territory show no change in the numbers of regions from existing State and Territory biogeographic regionalisations to that of the IBRA as no accepted regionalisation was available prior to the development of IBRA.

3.4.2 Shared and Restricted IBRA Regions

3.4.2.1 IBRA Regions Shared in Common Between States and Territories

Table 12 presents a list of 30 IBRA regions which are shared between jurisdictions and their frequency between the respective jurisdictions. This table has been summarised from Appendix 3 which presents which State and Territory regions are either restricted or are shared with other jurisdictions.

This table shows that 24 IBRA regions occur within two States or Territories. Four IBRA regions (Australian Alps (AA), Central Ranges (CR), Murray Darling Depression (MDD)and South East Highlands(SEH)) occur in three jurisdictions and two IBRA regions (Simpson-Strzelecki Dunefields (SSD) and Channel Country (CHC)) occur in four jurisdictions, respectively.

3.4.2.2 IBRA Regions Restricted to a Particular State or Territory

Table 13 presents the total numbers of IBRA regions for each State and Territory, which are restricted to that jurisdiction. The Table shows that 50 of all IBRA regions only occur in one jurisdiction.

Western Australia has the highest occurrence of restricted IBRA regions, with 18 regions. The Northern Territory, South Australia, Tasmania and Queensland have between 4 and 8 restricted regions, and Victoria and New South Wales have 2 and 3 restricted regions, respectively.

Relatively, Tasmania has the highest proportion of restricted regions (88%), followed by Western Australia (69%) Queensland (44%) and Northern Territory (40%). Jurisdictions with less than 30% restricted regions are Victoria (30%), South Australia (27%), and New South Wales (12%). The Australian Capital Territory recorded 0% as it has no restricted regions.

3.5 IBRAs Conservation planning attributes

3.5.1 Reservation status of IBRA regions

Map 2 and Table 14 presents the reservation status of each IBRA region. Data for this table were derived from data supplied by the State and Territory nature conservation agencies and are presented in Appendix 4.

Examination of Map 2 and Table 14 shows those regions with >10% of each bioregion reserved are generally situated around the margin of the continent, with the exception of Western Australia and South Australia, which have several large inland regions. The clear pattern to emerge is that at the 10% threshold, most biogeographic regions are under-represented in protected areas.

Regions with 5-10% of their area in protected areas are typically located adjacent to the regions with >10% reserved, and occur more frequently in southern Australia. This is strongly influenced by the inclusion of South Australian Regional Reserves.

Regions within the 1-5% area reserved class are more frequently situated in the northern half of Australia, apart from several regions situated in inland New South Wales, central and southern Victoria, northern Tasmania, and in the south west of Western Australia. Regions with <1% of area in protected areas occur mostly in inland Australia in all mainland States, except in Victoria and the Australian Capital Territory.

Regions which have no reserves cover 4% of the land area of Australia and occur in Western Australia, Northern Territory and South Australia. It is worth noting that all of these regions contain large areas owned and managed by Aboriginal communities and are perceived to have nil to very low threats to nature conservation values under current management regimes.

3.5.2 Bias in the Comprehensiveness of Protected Areas

Map 3 and Table 14 presents the bias in the comprehensiveness of protected areas for each IBRA region. Data for this table were derived from data supplied by the State and Territory nature conservation agencies which are presented in Appendix 4.

Estimations of bias were based on the extent to which the system of protected areas within each bioregion represented the known biodiversity. Data and information on environmental and biological entities were used to determine the bias in the protected area estate of each jurisdiction.

Examination of Map 3 and Table 14 shows those regions which have no bias (i.e. 100% reservation) comprise <1% of the area of Australia, and are situated in western Tasmania, with small outliers of regions in Victoria and South Australia. Regions which have low bias within the protected areas estate comprise 16% of the area of Australia and are present in all States without any obvious pattern.

Regions exhibiting moderate bias comprise 32% of the land area of Australia and are present in all States without any obvious pattern. Regions which have high bias comprise 47% of the land area and these regions occur mainly in the inland of Australia. In Victoria, high bias is confined to the Victorian Volcanic Plain. Regions with moderate and high bias occur across almost 80% of Australia.

3.5.3 Constraints and Limitations to Planning the NRS

Table 15 presents a summary of the limiting factors and constraints to conservation planning and management of regional biodiversity for each IBRA region. Data on limiting factors and constraints provide a context for maintaining and developing a viable and adequate protected areas network in each IBRA region. Data for this table were supplied to ANCA by the respective State and Territory nature conservation agencies.

3.5.4 Opportunities for Alternate Conservation Management Measures

Table 16 presents a summary of the alternate conservation management measures which are considered appropriate for developing a protected areas network in each IBRA region. Data for this table were supplied to ANCA by the respective State and Territory nature conservation agencies.

3.5.5 Priorities for filling the Gaps in the NRS

Three levels of priority are identified for the NRSCP using a combination of level of reservation status; the level of bias within protected areas and the constraints and limitations to planning the NRS:

Priority 1

- no reserves or low reservation status
- nil reserves and/or high bias, and
- threatened by current land use management activities

Priority 2

- low to moderate reservation status
- high to moderate bias, and
- threatened by current land use management activities

Priority 3

- moderate to high reservation status
- moderate to low bias, and
- threatened by current land use management activities

The order of these priorities reflect highest priority is to be given to those IBRA regions where there is greatest need. Second and third level priorities were allocated to lesser needs.

In utilising these priorities for the allocation of resources under the NRSCP all three conservation planning attributes will be taken into account.

4. DISCUSSION

This section discusses the results in the light of the requirements of the NRSCP and presents some of the issues associated with potential uses and misuses of the IBRA, given the limitations of the IBRA. Details of how the IBRA should be validated, and how often it should be revised and by whom, are presented as issues that require agreement by all parties involved.

4.1 A Biogeographic Approach for developing the NRS

A biogeographic approach was chosen as the ecological framework to underpin the development of the NRS because of the need to summarise and integrate the complex array of data and information about Australia's ecosystems, which is held by the different nature conservation agencies.

While the systems of classification used by each State and Territory nature conservation agency are similar, nevertheless there are differences in the character of regions delineated, the sizes of regions between jurisdictions, and in the emphasis on different attributes used between different areas of Australia. The recognition of some regions in one jurisdiction may be treated as a sub-region in another jurisdiction. The developers of the IBRA recognised these deficiencies and through a process of discussion, analysis and interpretation of data, and peer review, have revised the existing biogeographic regionalisations to compile the IBRA.

The process of establishing the IBRA recognises that the nature conservation agencies are responsible for managing the conservation values of ecosystems within their jurisdiction. The role of the Commonwealth is that of facilitator, bringing the respective custodians together to develop systematic and agreed procedures for assessing ecosystems many of which may not be wholly contained within a single administrative jurisdiction but shared between jurisdictions.

The IBRA represents a 'milestone' product, meaningful to both field based ecologists and land managers. It is acknowledged that validation of the regions is now required. Subsequent revisions will be necessary to incorporate the results of such studies, as well as data at the sub-regional level.

4.2 Purpose for developing the IBRA

The primary client for the IBRA was the National Reserves System Cooperative Program (NRSCP), which needed a classification of ecosystems agreed between the Commonwealth and the State and Territory nature conservation agencies. The IBRA was developed to provide an ecologically sound framework within which to identify the gaps in the NRS and to set priorities for filling these gaps.

By itself the IBRA is of little value in assisting decision makers determine gaps and set priorities. The value of the IBRA for this purpose lies in the development of *conservation planning attributes* for each IBRA region. Conservation planning requires details of the following attributes for each region and for sub-regions therein:

- key conservation values;
- reservation status;
- deficiencies within the existing system of protected areas;
- types of threats; and
- alternative conservation management measures.

4.3 Hierarchy of Biophysical Patterns

The IBRA embodies a hierarchical information structure which minimises the internal heterogeneity at each level in the hierarchy. Each level is quantified and described explicitly.

The IBRA represents the coarsest or top layer of information, which is designed to be compatible with finer scale ecological data sets available within each jurisdiction.

This structure will enable the IBRA to be used to explain patterns within their context i.e. local, regional, continental. It will also assist conservation planners to define which is the appropriate level to conduct assessments and allocate priorities. More detailed information is required to identify within-region and local-scale patterns.

4.4 Assumptions and Limitations Underlying the IBRA

Appropriate regionalisations may be used in accordance with the developer's *terms and conditions of use* statements. Regionalisations provide a valued and meaningful basis for focussing attention, summarising patterns, aggregating information and allocating resources and priorities.

Regionalisations, like the IBRA, which have been derived primarily by aggregating existing biogeographic regionalisations have a number of limitations including: it is usually not possible to reliably derive the underlying primary attribute data by disaggregating pre-classed environmental or biological data; typically, raw data are absent and the regionalisations are cartographic products with accompanying descriptive reports; existing pre-classed data are usually not complete and have usually not been collected systematically across each jurisdiction; data are usually not consistent in quality between and within different areas of the continent; data available from different sources are typically not available in a form which can readily be stored and queried in spatial and/or relational database technologies.

Conversely, it is recognised that considerable knowledge and investment of effort has gone into the development of the existing biogeographic classification systems used by the State and Territory nature conservation agencies. Simply joining these region boundaries together is not an acceptable solution because of problems with scale, type and number of attributes used, temporal differences between data sets and the different analytical methods used to generate the various regionalisations.

Development of the IBRA required interpretation, reanalysis and revision of the existing biogeographic regionalisations for each State and Territory to form a continental level regionalisation. The approach implemented in the development of the IBRA is a flexible, repeatable and hierarchical procedure. The IBRA can be readily changed depending on changing objectives, taxa and scales both in space and time.

4.4.1 Assumptions Underlying the IBRA and Limitations on the Uses of the IBRA

A number of assumptions underlie the development of the IBRA, these are presented below.

Assumption 1: The IBRA embodies an integrated classification of ecosystems and environmental regions. The delineation of region boundaries and the description of the environmental regions seeks to underpin and explain the distribution of the characteristic biotic elements of each ecosystem.

Limitation: The theory of landscape ecology supports such an assumption but it is recognised that there needs to be more rigorous testing of the boundaries using a range of regional and continental data sets and analytical tools.

The different methodologies used by State and Territory nature conservation agencies, to derive their respective regionalisations, create inconsistencies relating to scale of attributes and boundaries. The State and Territory regionalisations have been developed using different attributes for different purposes and at somewhat differing scales. As far as possible these differences have been taken into account in the development of the IBRA.

Given that the State and Territory nature conservation agencies are the custodians of the individual elements which comprise the IBRA, the revision of these elements is the responsibility of the respective State and Territory agencies.

Assumption 2: An implicit hierarchy of natural regions exists and may be delineated in terms of groups of associated environmental attributes eg geology, soils, geomorphology etc which are also evidenced in the patterns of the flora and fauna.

Limitation: The above assumption has not been extensively or rigorously tested at the 1:3 million scale and therefore caution needs to be applied when attempting to fit patterns observed in the biotic environment or to explain patterns of biota in terms of the broad environmental regions of the IBRA. The IBRA regions are at best a convenient approximation of the complexity observed in the real world and it should not be expected that they will yield highly precise answers in all situations, particularly in fine scale situations and applications involving individual species. It is recognised that there is a need to periodically test, refine and revise the regions and descriptions.

Assumption 3: That a hierarchy of information exists within and between regions, embodying known levels of heterogeneity.

Limitation: Stringent application of the IBRA hierarchy is unrealistic given the intuitive nature of the process by which the regions and their descriptions have been derived. The hierarchy represents a reasonable rule of thumb which has been repeatedly revised over many years of practical ecological field surveys. It is recognised that there is a need to test or validate this "hierarchy".

Assumption 4: While existing State and Territory biogeographic regionalisations have been developed at different scales, by experts who are specialists in different scientific disciplines, using different data sets and at different times without consultation across jurisdictions, these issues are not sufficient grounds to prohibit the development of a single biogeographic regionalisation of Australia.

Limitation: Caution needs to be exercised in comparing statistics and indices derived for the same type of region between jurisdictions given the disparate nature of their origins. Constraints on the interpretation of such comparisons include the following:

a. There is a strong dependency between classification resolution and derived estimates of reservation adequacy or bias, therefore it should be recognised that the choice of resolution needs to be explicitly defined and justified.

b. The analysis of heterogeneity within each region, using data sets which may be restricted to that region, may confound comparisons of reservation adequacy or bias between regions.

c. The assessment of heterogeneity within regions will be biased by the level of information available for those regions. That is, well studied or mapped regions will naturally appear more heterogeneous than less well known regions. The crucial point is that estimates of reservation bias will themselves be biased if the regions are not classified to a consistent, and explicitly defined, level of resolution and homogeneity.

4.5 Terms and Conditions for Use of the IBRA

The following set of terms and conditions were agreed by the developers of IBRA.

1. Parties wishing to use the IBRA shall acknowledge that the IBRA has been derived by a combination of expert field ecological knowledge and interpretation of existing State and Territory regionalisations.
2. Commonwealth, State and Territory nature conservation agencies acknowledge that the IBRA has been developed for the NRSCP.
3. Any jurisdiction wishing to use the IBRA for purposes other than the NRSCP must acknowledge the reason why the IBRA was developed and that it may not be appropriate for purposes other than the NRSCP.
4. Commonwealth, State and Territory nature conservation agencies reserve the right to develop and use regionalisations other than the IBRA for their own purposes.
5. State and Territory nature conservation agencies are not constrained from producing further regionalisations in addition to those regionalisations included in the IBRA.
6. Commonwealth, State and Territory nature conservation agencies recognise that new methodologies and data sets are likely to modify the IBRA and that there is a need to periodically revise the IBRA to reflect these revisions.
7. That the IBRA and biogeographic regionalisations per se should not be viewed as the only basis for assessing national reservation priorities and gaps.
8. States and Territories reserve the right to seek ratification of the IBRA products from their respective governments.
9. Amendments to the IBRA and its associated conservation planning attributes are to be agreed between respective jurisdictions before they are forwarded to ANCA for loading onto the ERIN network.

4.6 Purposes for Which the IBRA Should and Should Not be Used

4.6.1 National reserve system

The IBRA was developed to assist the State and Territory and Commonwealth nature conservation agencies to identify and set priorities for filling the major deficiencies in the national system of reserves. IBRA may be used for identification of gaps but should not be used for selection of land parcels for reservation. Selection of parcels needs to occur at a much finer scale. Similarly, the IBRA should never be seen as the sole criterion for allocating priorities in the selection of areas for reservation.

The developers of the IBRA agreed that the focus, and therefore priority setting of the NRSCP, may not be at the level of the IBRA, but at a finer scale within the IBRA regions. Any future development or revision of the IBRA should include analysis of fauna distribution as well as traditional land system/flora mapping analysis.

The IBRA does not take into account special values which may include outstanding natural features, cultural values and landscape values.

It is understood that the IBRA will in part be used to address the reserve selection criteria of comprehensiveness and representativeness. However, given that adequacy requires variables which have not been included in the development of IBRA, it cannot be used to address the criterion of adequacy. Factors such as the level of threat to biodiversity need to be taken into account in developing measures of reserve adequacy.

4.6.2 Other conservation and biodiversity related applications

The developers of the IBRA acknowledge that it has potential for a wide range of conservation and biodiversity related applications other than the NRSCP, since it is based on a conceptual model which seeks to describe and explain regional patterns of biological diversity and productivity.

Where requests have been received by the editors to use the IBRA for applications other than the NRSCP, attention is drawn to the *Terms and Conditions of Use, and the Assumptions and Limitations* discussed above.

The editors are aware of a number of these applications which include:

- defining the pattern and extent of biodiversity related funding programs
- defining the status and extent of information on biodiversity
- planning of long-term monitoring sites
- reviewing the state of environment
- providing a framework for bioregional planning for conservation
- identifying priority regions for increased resources: - planning, management and research
- planning eco-tourism opportunities
- reviewing the status of conservation planning and management of native grasslands in Australia
- defining the national regions for use in the National Forest Policy Strategy
- providing a model for developing a similar approach in the coastal and marine environments for establishing a national system of coastal and marine protected areas.

It needs to be recognised that not all applications of the IBRA may be appropriate or suitable, particularly where such applications require access to finer scale data and/or other attributes than those which have been built into the IBRA. Inappropriate applications may yield misleading and even wrong results. For example, caution needs to be taken in the application of regionalisations for wild rivers, old growth forests, wilderness, rare and endangered species and communities and National Estate values. Where such applications may benefit by utilising a biogeographic planning framework, such as IBRA, the developers of the IBRA suggest that separate technical assessments be undertaken to assess the merits and limitations of the IBRA in relation to each application. To assist those users with access to GIS, a list of the IBRA regions sorted by numeric mapping code is presented in Appendix 5.

4.7 Conservation Planning Attributes Associated with the IBRA

4.7.1 Environmental Heterogeneity and the Bias within Protected Areas

Information about the environmental variability or heterogeneity within each IBRA region is necessary if the NRS is to be representative, comprehensive and adequate. When environmental heterogeneity is combined with data on protected areas this yields information on how comprehensive the system of reserves represents the known environmental variability. It also provides a measure of the *bias* within the reserve system in each IBRA region.

By value adding information on representation and bias within IBRA regions this enables decision makers to make comparisons between IBRA regions, and to determine gaps and priorities for the NRS. Information compiled in this report shows that our level of information on environmental heterogeneity varies considerably between IBRA regions and between jurisdictions.

Where information on environmental heterogeneity is adequate, it is clear that the existing system of protected areas is biased toward certain environmental elements. For example, areas of high relief, low soil fertility, and steep rainfall gradients are more commonly sampled in protected areas than areas considered important for agriculture or other resource consumptive land uses. These typically occur on lands of low relief or higher fertility soils. We therefore need to acknowledge this bias and actively seek to design a more representative protected areas system.

4.7.2 Limitations on the Uaes of Environmental Hetarogeneity and Biaa

The developers of the IBRA acknowledge that the four categories of bias are skewed towards discriminating between reserve systems that more comprehensively sample the known ecosystems (i.e. 3 of the 4 categories). Major differences in the comprehensiveness of reserve systems in poorly reserved regions are not distinguished (one category i.e. high bias). Because the original set of bias categories do not discriminate those regions that are "highly biased", therefore consideration should be given to revising the estimates of bias using the following categories:

	Bias class	Bias description
1	Nil	All known land systems represented in proportion to their occurrence;
2	Low	Most land systems are represented, but not in proportion to their occurrence;
3	Moderate	The land systems missed include some of the extensive ecosystems that characterise the region;
4	High	Entire sub-regions, or many of the extensive ecosystems that characterise the region, are missed;
5	No Reserves	No reserves present within the IBRA region.

4.7.3 Limiting factors and constraints in developing a viable NRS

Threatening processes act as constraints in developing and maintaining an adequate system of reserves. Information compiled in this report shows that our level of information on limiting factors and constraints in developing a viable NRS varies considerably between IBRA regions and between jurisdictions.

It is intended that data in the IBRA report on limiting factors and constraints provide an indication to decision makers that further detailed information is required before making a commitment to establish a new reserve in a region or provide assistance to alternative conservation management measures.

The data presented in this report are coarse, based on data at a finer scale held by the respective State and Territory agencies. More work is needed to review and revise information on limiting factors and constraints to developing a viable NRS. Initially, some projects are being funded under the NRSCP to help compile these data.

4.7.4 Alternative Conservation Management Measures

The development of a representative system of protected areas is but one of the conservation management measures available to jurisdictions as we endeavour to conserve biodiversity on a landscape scale. The Draft National Strategy for the Conservation of Australia's Biological Diversity clearly incorporates the principle that the conservation of biodiversity will not be achieved through reserves alone, but rather will depend on managing threatening processes over as much of the landscape as possible. Principle 8 of the draft National Strategy recognises that viable protected areas are only a component of an overall conservation strategy and program, and that these areas need to be integrated with measures to protect biodiversity outside formal reserves.

It is important that the NRSCP be integrated with the range of "off-reserve" conservation programs currently under way. The effectiveness and viability of most, if not all, reserves are directly related to the impacts of surrounding land and water uses. The inclusion of a feature (eg major portion of a sub-region within an IBRA region) in a reserve is insufficient of itself. Long-term protection can only be guaranteed by appropriate management of threatening processes within and outside of reserves.

5. CONCLUSIONS

The development of the IBRA represents an important Commonwealth-State and Territory initiative. It also provides a significant first step in the development of a common conservation planning framework for establishing an agreed classification of the major ecosystems in Australia.

In the context of developing the NRS, it is recognised that the IBRA should not drive the selection of land parcels. IBRA has a valuable contribution to make in relation to providing an ecologically sound framework to assess regional reserve selection criteria of representativeness and comprehensiveness, but not adequacy.

The conservation planning attributes associated with the IBRA have been used by the ANCA to assist in the setting priorities for funding projects under the NRSCP.

5.1 Issues to be Resolved

5.1.1 Validation and Updating of the IBRA and its Conservation planning attributes

The IBRA is a dynamic product which needs to be continually reviewed and revised by stakeholders. There is a need to validate the IBRA boundaries and descriptions to assess its value for use for establishing the NRS as well as other conservation related activities.

As to when the IBRA becomes the biogeographic regionalisation of Australia is dependent on the nature conservation agencies which are the stakeholders in the IBRA. It remains to be determined what performance measures or quality checks could be used to determine when we have reached the end point of the development process of the IBRA.

5.1.2 Overcoming the limitations of the IBRA

5.1.2.1 Determining more accurate percentages for reservation status

Where regions are shared between jurisdictions the percent reservation status of each region was averaged across jurisdictions using data supplied by each of the State and Territory nature conservation agencies.

This procedure resulted in inaccuracies. There is a need to develop a consistent national protected areas data set to derive more accurate percentages for reservation status. ANCA and the State and Territory nature conservation agencies are compiling such a data set which will overcome the problems encountered by not have a uniform national data set.

5.1.2.2 Determining which types of Parks and Reserves that comprise the protected areas system

The report has not addressed the plethora of types of Parks and Reserves that comprise the protected area systems which are managed by the Commonwealth and State and Territory nature conservation agencies.

In order to gain agreement on the types of Parks and Reserves that comprise the protected areas system ANCA and the State and Territory nature conservation agencies are compiling a national protected areas data set. The types of Parks and Reserves are being categorised by the ANCA and State and Territory nature conservation agencies according to IUCN protected areas categories. ANCA and ERIN are also investigating methods for deriving uniform estimates for reservation status for each region in relation to IUCN protected areas categories.

5.1.2.3 Deriving a uniform measure of bias for all regions

The report has not addressed how to derive a standard method for determining bias in the comprehensiveness of ecosystems contained in the protected areas system. Results presented in this report are not completely consistent between jurisdictions, in that the results presented are derived from different approaches within each jurisdiction (eg. the West Australian bias classes were calculated using the definitions in section 4.7.2.)

In order to address these deficiencies ANCA is undertaking further work with ERIN, to investigate alternate methods for deriving uniform estimates of bias for each region across Australia.

5.1.2.4 Periodic reviews and updating of the IBRA

There is a need to develop protocols and to review them periodically, as well as developing rigorous methods for validating and testing the veracity of the IBRA, given the purpose for which it was developed.

Each State and Territory nature conservation agency should develop clear procedures for linking their more detailed data and regionalisations to the IBRA. These procedures would enable the IBRA to be maintained by the State and Territory agencies as a dynamic tool to support decision making and for regular up-loading to the ANCA.

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Table 1: Agreed procedure for developing the IBRA

1.	Delineate a series of region boundaries at the continental scale from available maps and digital regionalisations at approximately 1 to 3 million scale. Ensure the boundaries are consistent within and between States and Territories, nationally uniform, and based on an interpretation of existing biogeographic regionalisations, geology, geomorphology, climate, present and natural vegetation, and biogeographic knowledge about flora and fauna. Commence with a north-south band through central Australia ie SA and NT, move then to WA and Qld, and then to NSW, ACT, Vic & Tas.
2.	Develop an agreed set of names for each biogeographic region. As a guideline use the accepted common names where the region is most extensive within a particular State or Territory.
3.	Develop a table to compare the landscape scale spatial regions mapped and described by each agency eg province, region, land system, land unit etc.
4.	Develop a brief description of each region based on dominant or overriding diagnostic criteria.
5.	Develop an index of heterogeneity to describe the variability within each biogeographic region based on more detailed spatial data eg land systems, vegetation etc.
6.	Develop an agreed statement to describe how the IBRA should and should not be used, including a process for seeking ratification.
7.	Develop agreed methods for deriving a series of value added products based on the IBRA, including a) the level of reservation status of the IBRA regions b) the level of bias within protected areas i.e. how comprehensively the existing protected areas sample the known environmental heterogeneity c) determining the constraints and limitations to planning the NRS, and d) opportunities for alternate conservation management measures These measures or indices were capable of being plotted within or adjacent to an IBRA region.

Table 2: List of biogeographic regionalisations for each State and Territory and an indicative list of the data sets uaeful for refinement of the biogeographic regionalisationa

Victoria

- Land systems and geomorphic units developed by the Land Conservation Council at 1:500,000 scale
- Flora of Victoria (1993)

Tasmania

- Nature Conservation Regions (Orchard 1988) 1:500,000 scale.

New South Wales and Australian Capital Territory

- Coarse scale (1:100,000) vegetation mapping for eastern one-third of NSW derived from Landsat TM imagery (NSW NPWS)
- Detailed vegetation maps (1:250,000) for selected areas of NSW (Royal Botanic Gardens)
- Land systems in western NSW (NSW CaLM)
- Thematic soils maps for parts of NSW (NSW CaLM).
- Riparian vegetation mapping for selected major rivers in NSW (NSW Dept. of Water Resources)
- Natural Regions of NSW, incorporating Morgan and Terrey (1992)
- Regional and provincial mapping at 1:1,000,000 scale
- Geology mapping (BMR and NSW Dept. of Mineral Resources)
- Vegetation model for SE NSW (NSW NPWS)
- Vegetation maps for NE NSW (NSW NPWS and State Forests of NSW)
- State Environmental Planning Policy 26 - Littoral Rainforest (NSW Dept. of Planning)
- State Environmental Planning Policy 14 - Coastal Wetlands (NSW Dept. of Planning)
- Digital Elevation model of NSW (NSW NPWS)
- Climatic surface models of NSW (NSW NPWS)
- Predictive models of species distributions (Course scale for the whole of the State, detailed models for selected regions) (NSW NPWS)

Australian Capital Territory

- Vegetation type data - 1:25 000

South Australia

- Environments of South Australia (Laut et al 1977) 1:500,000 scale

Western Australia

- Beard (1980)
- Geological Map of Western Australia, 1: 250,000. Geol. Survey of WA. (Myers, J.S. and Hocking, R.M. (compilers), 1988.)

Northern Territory

- Land system mapping developed by CSIRO and CCNT
- Vegetation mapping
- Environmental domains
- Biogeographic domains

Queensland

- Land system mapping at 1:500,000 scale
- Biogeographic Regions at 1:2,500,000 scale

Continental

- Vegetation units derived from NOAA satellite data (ERIN 1991)
- Geology (BMR series at 1:2,500,000)
- Vegetation of Australia (AUSLIG 1990) 1:5,000,000
- Digital Soil Atlas of Australia (NRIC and CSIRO 1991)

Table 3: Methodology used to modify existing State/Territory regionalisations to derive the State/Territory components of the IBRA

Victoria
The baseline data set for Victoria was the 1:500,000 scale land systems and geomorphic units produced by the Land Conservation Council. Given the nominal scale required for the IBRA, existing land systems and geomorphic map units were aggregated by grouping regions with similar landform, vegetation, and geology. Information from the "Flora of Victoria" was used to refine the regionalisation and to develop descriptions for each region.

Tasmania
The baseline data set for Tasmania was the 1:500,000 scale Nature Conservation Regions (Orchard 1988). Map regions were aggregated by grouping regions with similar climate, landform, geology/lithology, vegetation and floristics.

New South Wales and Australian Capital Territory
The natural regions or biogeographic regions for NSW and the ACT have been derived by expert assessment of available information on the distribution of geological, geomorphological and biological elements. The environmental regions developed by Morgan and Terrey (1992) were used as a regionalisation of the environment west of the Great Dividing Range.

South Australia
The baseline data set for South Australia was the 1:500,000 scale Environments of South Australia (Laut et al 1977). Map units were aggregated by grouping regions with similar landform, geology/lithology, vegetation, climate and floristics. The current regions represent an interpretation of all previous regionalisations tempered with field based knowledge.

Western Australia
The baseline data set for WA was Beard (1980) modified in consultation with N L. McKenzie, G J Keighery, K F Kenneally and G Wardell Johnston (WA CALM) and R E Johnstone and L A Smith (WAM), after discussions with J S Beard. Cross-border adjustments were then made in consultation with M Fleming and D Howe (CCNT) and P Copley (SA DENR). Attributes considered were climate, geology, vegetation formations and floristics, and vertebrates. The current regions represent an interpretation of all previous regionalisations tempered by field based knowledge.

Northern Territory
The base data sets for the NT included land system mapping developed by CSIRO and the CCNT, vegetation mapping, environmental domains and biogeographic domains. Map regions were reclassified and aggregated to reflect affinities with those of adjacent States and Territories by grouping regions with similar geology, landform, soils and vegetation. The current regions represent an interpretation of all previous regionalisations tempered by field based knowledge.

Queensland
The base data set for Queensland consisted of the 1:500,000 scale land system mapping, 1:2,500,000 scale, Biogeographic Regions and a number of other resource and environmental reports. Map regions were aggregated by grouping regions with similar geology, landform, soils and vegetation.

Table 4: Steps used to develop the IBRA aa a GIS data set

1.	Load the digital data supplied to ANCA by the custodian onto the ARC/INFO GIS platform.
2.	View the digital data and check that it agrees with paper copies of the region boundaries supplied by the custodian. As required, amend the digital copy in consultation with the custodian.
3.	View the digital attributes for polygons and check that these agree with paper copies supplied to ANCA by the custodian. As required, amend the digital copy in consultation with custodian.
4.	As required, build the respective State and Territory GIS data sets by joining the polygon and attributes data sets (ie 2 and 3 above).
5.	Plot the IBRA regions and region names for each State and Territory. As required, amend the digital copy in consultation with the custodian.
6.	Cross-match biogeographic region boundaries and region names for each jurisdiction and document:
a.	those region names which are unique within jurisdictions and those which are shared between jurisdictions;
b.	those regions where the boundary was shared between jurisdictions but where the region name was not shared between jurisdictions;
c.	those regions which share the same region names but where the boundary does not match at the border of the jurisdictions;
d.	those region names which are specific to a particular State or Territory but are ambiguous at the national scale
7.	Develop a look-up table comprising unique region names and codes to equate IBRA names to the region names used by State and Territory nature conservation agencies.
a.	rename region names within a State and Territory using the region name from the adjacent State and Territory where that jurisdiction has the greatest area of the IBRA region;
b.	rename region names where the name was relative to that jurisdiction to provide a more meaningful name in the Australia-wide context
8.	Plot the IBRA regions and region names for Australia. As required, amend the digital copy in consultation with the custodian.
9.	Calculate the area of each IBRA region and develop a summary table showing the total area and the relative areas of each region within each State and Territory.
10.	Document the IBRA data set on the ERIN Data Dictionary and Catalogue.
11.	Distribute the IBRA as a GIS data set to all State and Territory custodians.

Table 5: List of Proposed Changes to Version 3.2 Arising From the Alice Springs Meeting

State and Territory	Proposed changes to Version 3.2
NT	Investigate remapping of the Tanami in the NT to define more detail
NT and Qld	Investigate remapping the Cape York Peninsula in Qld or the Top End of the NT to have consistent level of mapping
Qld	Investigate remapping the Mitchell Grass Downs and the Channel Country in Qld
NT	Investigate extending the east boundary of the Sturt Plateau to go down the Roper River
Qld	Investigate splitting the Brigalow region to reflect a major biogeographic boundary in central Qld
NSW	Investigate splitting the Brigalow region to reflect differences between the Brigalow region belt in Qld and NSW
Qld & NSW	Investigate splitting the Eastern Coast and Ranges to reflect a major biogeographic boundary in south east Qld
Vic & NSW	Investigate splitting the Victorian midlands out of the South East Inland Slopes to reflect a major biogeographic boundary in Vic
NSW	Investigate simplifying the detail of mapping in the Murray Darling Depression to remove the delineation of the flood plain
NSW & Vic	Remove slivers in the coverage along the border
NT & WA	Align some boundaries on the State border
NT & Qld	Align some boundaries on the State border
NT & SA	Align some boundaries on the State border
WA & SA	Extend Hampton in SA to reflect discussion within the meeting. Correct mismatch of boundary of SA/WA border

Table 6: Cross border changes to existing State and Territory biogeographic regionalisations

WA/NT	
-	WA and NT scales are remarkably similar ie conceptual scales 1:1M.
-	Need for refinement of Tanami and Great Sandy Desert regions.
-	Great Sandy Desert & Giles Botanical District realigned slightly in association with geology and vegetation unit boundaries.
-	Tanami Desert boundary modified to re-enter WA and include Lake Mackay and peripheral vegetation units but dune fields and salt pans immediately north of Lake Mackay stay in the Great Sandy Desert. The Great Sandy Desert now extends into the NT. The dune fields in adjacent areas of the NT are included in the Great Sandy Desert both south and north of Lake Mackay.
-	The Victoria River Plateau extends westward to Cambridge Gulf ; this area was previously included in Beard's Gardner District.
-	The northern parts of the Hall Botanical District are continuous with Victoria River Plateau region of the NT. The boundaries of these already matched.
QLD/NT	
-	The NT Coastal Gulf Unit has been adjusted, with the Qld Gulf Region terminating just inside the NT.
-	Simpson Desert area's eastern edge has been matched with the unit in the Qld Channel Country region.
-	NT Gidgee region has been matched with the Qld Mitchell Grass Region.
NSW/QLD	
-	NSW north-west slopes to extend slightly into Qld.
-	The northern sandstones of NSW are continuous with the brigalow belt of Qld.
-	Upper Darling Riverine Plains extend into Qld Brigalow Belt.
-	Warrego Fans in NSW relationship to be determined with Qld.
-	Eastern boundary of North-west Sands NSW and Mulga / Brigalow boundary to be clarified.
-	Bulloo Overflow subregion continuous with Channel Country Qld.
-	Tibooburra Downs NSW synonymous with sub-region 5C in Qld.
SA/QLD	
-	SA needs further analysis for the Simpson Desert, as do the Cooper and Diamantina Systems. Qtherwise, there is good agreement in this region.
SA/NT	
-	Broad agreement on the major regions with minor inclusions in NT of SA regions; these regions need to be drawn on the map of IBRA. Simpson Desert, Giles Botanical Region, Gibber Region and Everard Region of SA.
TAS/VIC	
-	There was discussion about the similarities between north-eastern portion of Tasmania and the Victoria Coastal Plain region. It was agreed that Victoria's region should not be grouped with Tasmania's north eastern region (NCRs 2, 5 & 6). However there is good argument for amalgamating the Victorian Wilsons Promontory region with Tasmania's NCR 2 (Furneaux Group), on the basis of similar climate, vegetation, geology and geomorphology.
-	No other amalgamations between Victoria and Tasmania are justified on biogeographic grounds.
VIC/NSW	
-	Five Victorian regions extend into NSW and preliminary matching of the boundaries was agreed subject to confirmation by NSW.

Table 6 (Contd)

VIC/SA	
-	There was agreement that the two regions in western Victoria extended into South Australia and a matching of boundaries across the State border was achieved.
WA/SA	
-	The Hampton District of WA extends into SA as far as Koonalda.
-	The northern edge of the Nullarbor already matched with Laut boundary in SA.
-	The southern boundary of the Central Ranges/Warburton District/Petermann/Giles Botanical District realigned along Beard's vegetation unit boundary then matched up with the SA boundary quite accurately in WA. The difference was a smoothing decision used by Beard.
-	WA and SA scales are remarkably similar ie conceptual scales 1:1M.

Table 7: List of biogeographic terms compiled by State and Territory representatives for their jurisdictions.

Victoria		
1.	Land Component	
2.	Land system	
3.	Natural Regions (16)	
4.	Geomorphic Units (9)	
5.	Natural Divisions (3)	
Tasmania		
1.	Vegetation Type	
2.	Land System	
3.	Regions (11)	
New South Wales and the Australian Capital Territory		
1.	Land Unit	
2.	Land System/Major Ecosystem	
3.	Province / Sub-Region	
4.	Region (17)	
5.	Phytogeographic Regions (5)	
South Australia		
1.	Land Unit	
2.	Association	
3.	Region (35)	
4.	Province (8)	
Western Australia		
1.	Ecosystem (Vegetation)	
2.	Caternary sequence	
3.	District (20)	
4.	Province (3)	
Northern Territory		
1.	Land Unit	
2.	Land System	
3.	Region (16)	
4.	Province (3)	
Queensland		
1.	Land Type (Unit)	
2.	Land system	
3.	Province/Sub Region (29)	
4.	Region (13)	
Indicative IBRA Terms		
1.	Land Unit	
2.	Land System	
3.	Province	
4.	**Region**	**IBRA**

NB: 1. The numbers in brackets represent the numbers of regions within each jurisdiction.
2. The list of numbers for each jurisdiction refers 1 = fine to 5 = coarse scale patterns.

Table 8: The obvious changes which have occurred between Version 3.2 and 4.0 are as follows:

IBRA region code Version 3.2	IBRA region name Version 3.2	Change made between Version 3.2 and 4.0	IBRA code Version 4.0	IBRA region name Version 4.0
ARC DAC TIW	Arnhem Coast Darwin Coastal Tiwi-Cobourg	DAC, ARC lumped with TIW to form TEC	TEC	Top End Coastal
PCK ARP	Pine Creek Arnhem Plateau	PCK lumped with ARP to form PCA	PCA	Pine-Creek Arnhem
BRB	Brigalow Belt	Split to form BBS and BBN	BBS BBN	Brigalow Belt South Brigalow Belt North
ECR	Eastern Coast and Ranges	Split to form SEQ and NNC	SEQ NNC	South East Queensland NSW North Coast
MID	Midlands	Code and name changed to form TM	TM	Tasmanian Midlands
NET	New England Tablelands	Name changed to remove s from Tablelands	NET	New England Tableland
SES	South East Inland Slopes	Split to form VM and NSS	VM NSS	Victorian Midlands NSW South-western Slopes
MDD	Murray Darling Depression	Simplified the detail of mapping to remove the delineation of the flood plain	MDD	Murray Darling Depression
		Corrected some boundaries on State borders for NSW & Vic, NT & WA, NT & Qld, NT & SA, WA & SA		

Table 9: Legend to the IBRA Map

IBRA Code	IBRA Name	Map Code
AA	Australian Alps	6
AW	Avon Wheatbelt	70
BBN	Brigalow Belt North	22
BBS	Brigalow Belt South	76
BEN	Ben Lomond	11
BHC	Broken Hill Complex	25
BRT	Burt Plain	48
CA	Central Arnhem	77
CAR	Carnarvon	54
CH	Central Highlands	16
CHC	Channel Country	21
CK	Central Kimberley	55
CMC	Central Mackay Coast	43
COO	Coolgardie	56
CP	Cobar Peneplain	24
CR	Central Ranges	28
CYP	Cape York Peninsula	40
DAB	Daly Basin	73
DE	D'Entrecasteaux	15
DEU	Desert Uplands	45
DL	Dampierland	58
DRP	Darling Riverine Plains	17
EIU	Einasleigh Uplands	44
ESP	Esperance Plains	57
EYB	Eyre and Yorke Blocks	35
FIN	Finke	29
FOR	Flinders and Olary Ranges	37
FRE	Freycinet	13
FUR	Furneaux	9
GAS	Gascoyne	53
GAW	Gawler	31
GD	Gibson Desert	59
GFU	Gulf Fall and Uplands	46
GS	Geraldton Sandplains	67
GSD	Great Sandy Desert	60
GUC	Gulf Coastal	72
GVD	Great Victoria Desert	32
HAM	Hampton	34
JF	Jarrah Forest	61
GUP	Gulf Plains	39

IBRA Code	IBRA Name	Map Code
LB	Lofty Block	36
LSD	Little Sandy Desert	63
MAC	MacDonnell Ranges	47
MAL	Mallee	64
MDD	Murray-Darling Depression	1
MGD	Mitchell Grass Downs	41
MII	Mount Isa Inlier	38
ML	Mulga Lands	18
MUR	Murchison	65
NAN	Nandewar	23
NCP	Naracoorte Coastal Plain	2
NET	New England Tableland	26
NK	Northern Kimberley	66
NNC	NSW North Coast	27
NSS	NSW South western Slopes	7
NUL	Nullarbor	33
OVP	Ord-Victoria Plains	51
PCA	Pine-Creek Arnhem	75
PIL	Pilbara	68
RIV	Riverina	8
SB	Sydney Basin	20
SCP	South east Coastal Plain	4
SEC	South East Corner	10
SEH	South Eastern Highlands	5
SEQ	South Eastern Queensland	74
SSD	Simpson-Strzelecki Dunefields	19
STP	Stony Plains	30
STU	Sturt Plateau	50
SWA	Swan Coastal Plain	69
TAN	Tanami	49
TEC	Top End Coastal	79
TM	Tasmanian Midlands	12
VB	Victoria Bonaparte	52
VM	Victorian Midlands	78
VVP	Victorian Volcanic Plain	3
WAR	Warren	62
WOO	Woolnorth	80
WSW	West and South West	14
WT	Wet Tropics	42
YAL	Yalgoo	71

Present Conservation Status of IBRA

SCALE: 1:20,000,000

Environmental Resources Information Network (1995)
Map version 4.0 - 27 March 1995

BACKGROUND:

The results show the averaged conservation status of IBRA regions as determined by the State and Territory nature conservation agencies.
Derived from Table 14.

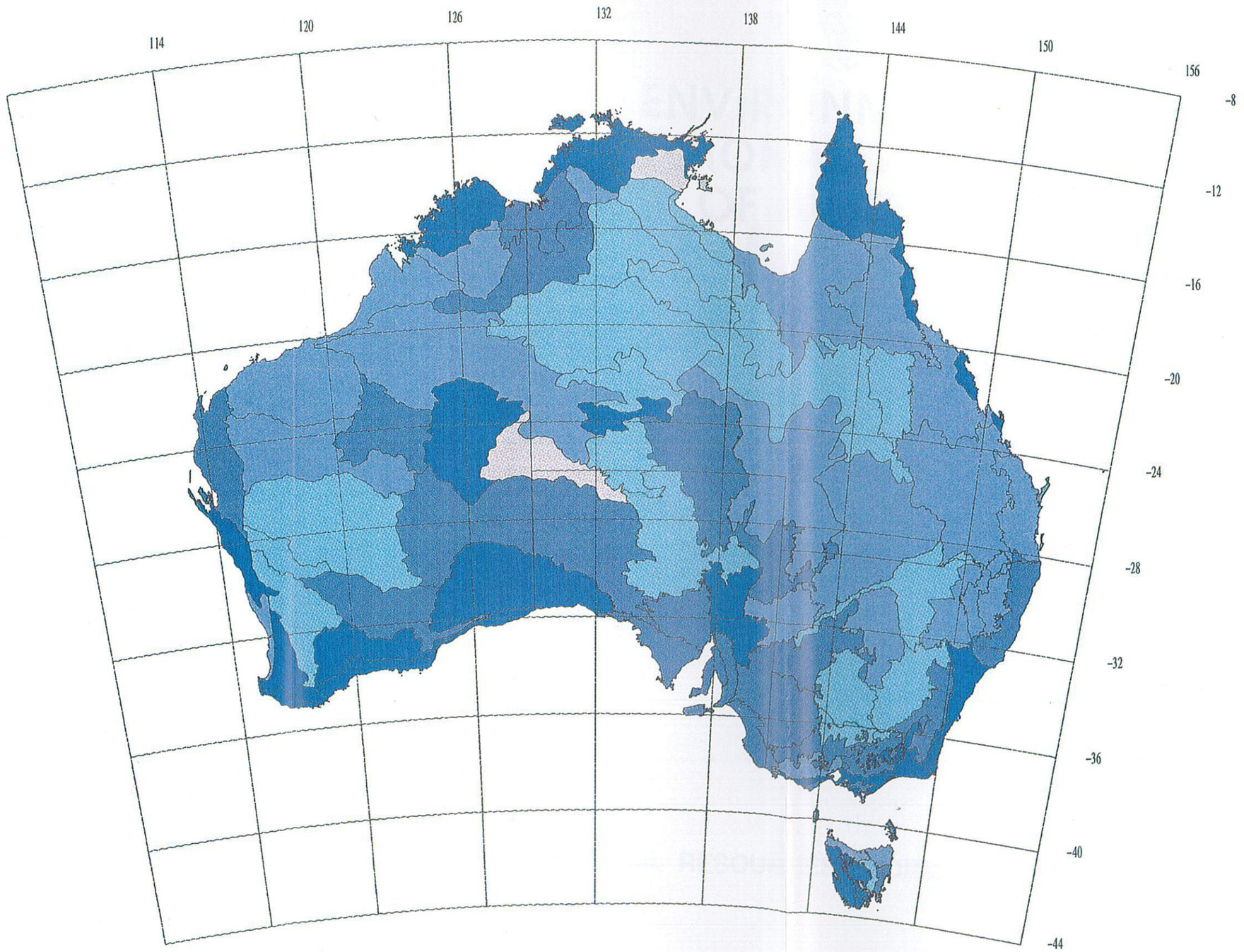
SOURCES:

ANCA (1995). 'IBRA digital data set'.
AUSLIG (1993). 'Coastline. 1:100,000 digital data set'.

CAVEATS:

The data used in the analysis have been assumed by ERIN to be correct as received from the data suppliers.

Projection: Albers Equal Area.
Standard Parallels 18 and 36 degrees South.
Central Meridian 132 degrees East.
Australian Spheroid.



LEGEND

- 1 = No Reserves
- 2 = < 1 %
- 3 = 1 - 5 %
- 4 = 5 - 10 %
- 5 = > 10 %

Bias in the representation of Biodiversity in Protected Areas within the IBRA

SCALE: 1:20,000,000

Environmental Resources Information Network (1995)
Map version 4.0 - 27 March 1995

BACKGROUND:

The results show the averaged bias as determined by the State and Territory nature conservation agencies.
Derived from Table 14.

SOURCES:

ANCA (1995). 'IBRA digital data set'.
AUSLIG (1993). 'Coastline. 1:100,000 digital data set'.

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Projection: Albers Equal Area.
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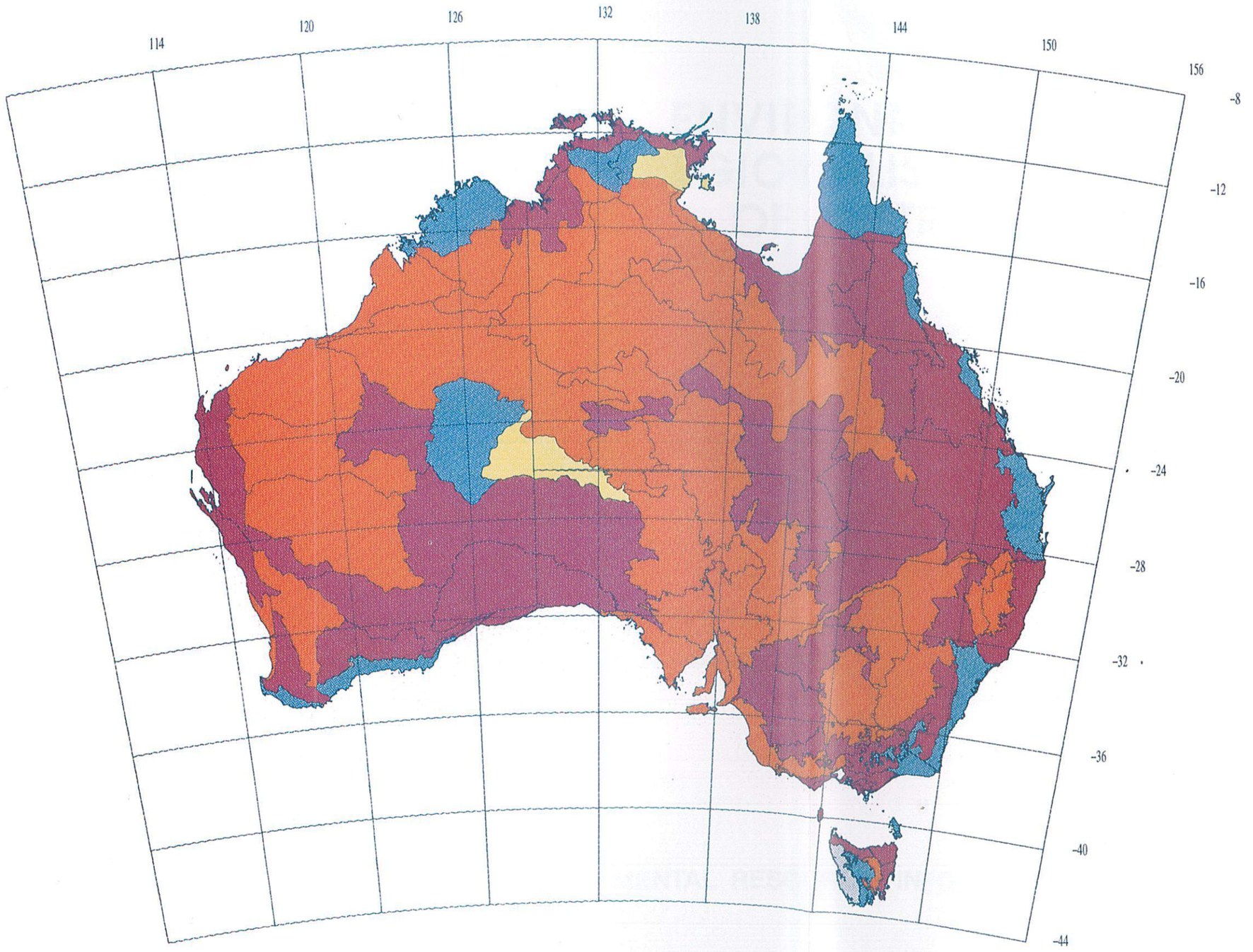
Australian Spheroid.



LEGEND

- 1 = Nil Bias
- 2 = Low
- 3 = Moderate
- 4 = High
- 5 = No Reserves

Table 10: List of IBRA Regions Sorted by Area (Square Kilometres)

IBRA region name	IBRA Code	IBRA Mapping Code	IBRA region areas (sq kms)
Furneaux	FUR	9	2372
D'Entrecasteaux	DE	15	4203
Freycinet	FRE	13	6414
Tasmanian Midlands	TM	12	7762
Ben Lomond	BEN	11	8645
Woolnorth	WOO	80	9645
Warren	WAR	62	10420
Central Highlands	CH	16	11032
Australian Alps	AA	6	11718
Hampton	HAM	34	12235
Central Mackay Coast	CMC	43	14343
Swan Coastal Plain	SWA	69	15181
West and South West	WSW	14	18269
Wet Tropics	WT	42	18497
South East Coastal Plain	SCP	4	18813
Daly Basin	DAB	73	20921
Victorian Volcanic Plain	VVP	3	22139
Lofty Block	LB	36	23752
Nandewar	NAN	23	27322
South East Corner	SEC	10	27477
Gulf Coastal	GUC	72	27807
Naracoorte Coastal Plain	NCP	2	28905
New England Tableland	NET	26	29347
Esperance Plains	ESP	57	35370
Yalgoo	YAL	71	36115
Sydney Basin	SB	20	36655
Central Arnhem	CA	77	36898
MacDonnell Ranges	MAC	47	36986
Victorian Midlands	VM	78	37025
Geraldton Sandplains	GS	67	38272
Jarrah Forest	JF	61	46078
Pine-Creek Arnhem	PCA	75	51576
Broken Hill Complex	BHC	25	57055
Gawler	GAW	31	60308
Eyre and Yorke Blocks	EYB	35	60661
NSW North Coast	NNC	27	60794
Mount Isa Inlier	MII	38	66586
Top End Coastal	TEC	79	68681
South Eastern Queensland	SEQ	74	68726
Desert Uplands	DEU	45	68816
Burt Plain	BRT	48	71809
Victoria Bonaparte	VB	52	72970
Cobar Peneplain	CP	24	73501
Finke	FIN	29	75157

Table 10 (Contd)

IBRA region name	IBRA Code	IBRA Mapping Code	IBRA region areas (sq kms)
Central Kimberley	CK	55	76907
Flinders and Olary Ranges	FOR	37	77490
Mallee	MAL	64	79874
South Eastern Highlands	SEH	5	82576
NSW South western Slopes	NSS	7	84278
Northern Kimberley	NK	66	87017
Dampierland	DL	58	89595
Riverina	RIV	8	90534
Carnarvon	CAR	54	91960
Avon Wheatbelt	AW	70	94148
Central Ranges	CR	28	97061
Sturt Plateau	STU	50	99719
Darling Riverine Plains	DRP	17	105511
Little Sandy Desert	LSD	63	109613
Brigalow Belt North	BBN	22	112780
Cape York Peninsula	CYP	40	115477
Gulf Fall and Uplands	GFU	46	118975
Ord-Victoria Plains	OVP	51	125177
Coolgardie	COO	56	125398
Einasleigh Uplands	EIU	44	128075
Gibson Desert	GD	59	155530
Pilbara	PIL	68	179287
Gascoyne	GAS	53	181273
Stony Plains	STP	30	181591
Nullarbor	NUL	33	194946
Murray-Darling Dépression	MDD	1	197480
Gulf Plains	GUP	39	211584
Mulga Lands	ML	18	257850
Simpson-Strzelecki Dunefields	SSD	19	277876
Murchison	MUR	65	278360
Brigalow Belt South	BBS	76	279496
Channel Country	CHC	21	305543
Tanami	TAN	49	316656
Mitchell Grass Downs	MGD	41	319788
Great Sandy Desert	GSD	60	394599
Great Victoria Desert	GVD	32	423751
Total area			**7684968**

Figure 1: Bar Chart of the Areas of each IBRA region Sorted by Ascending Area

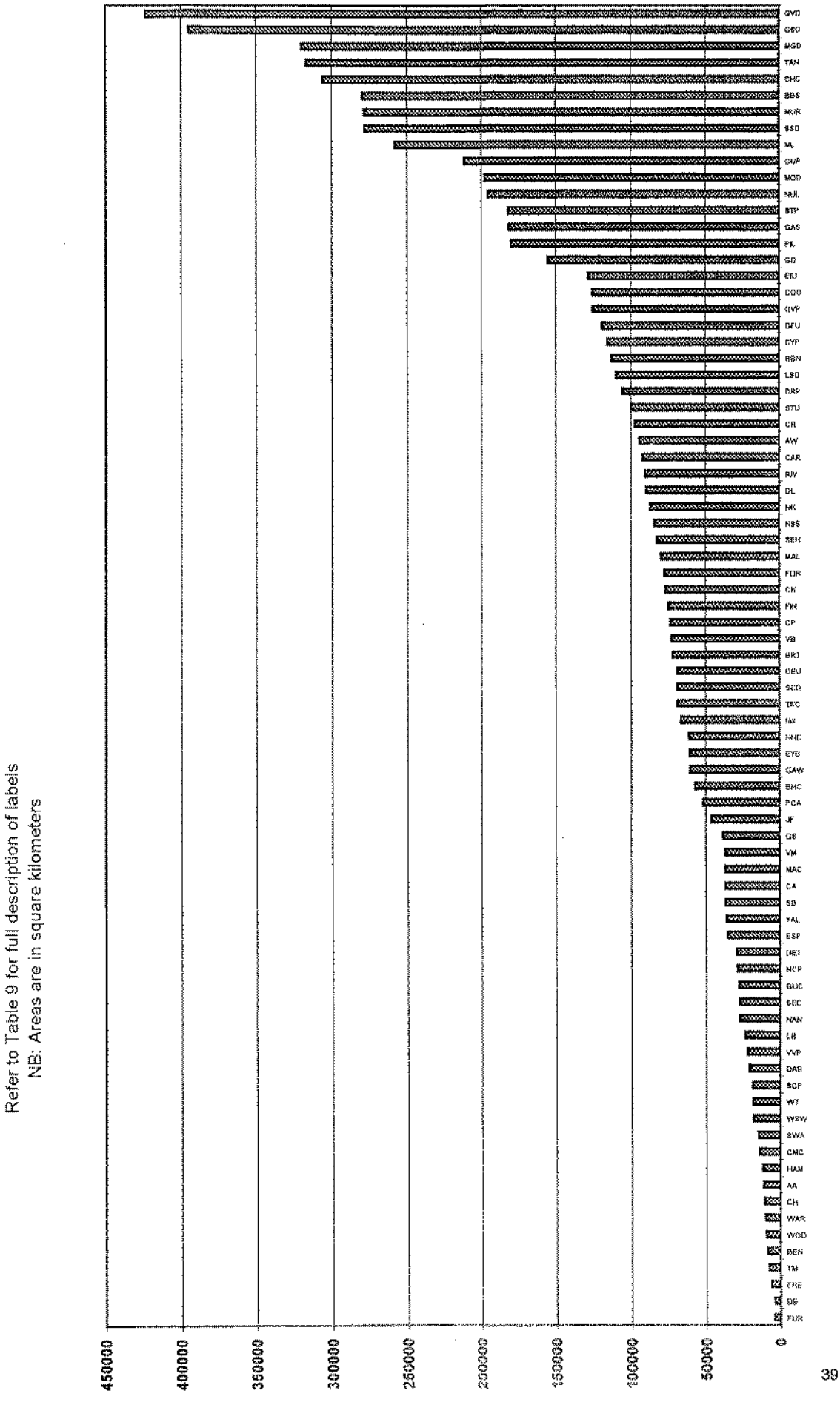


Table 11: Comparison of the existing number of State and Territory biogeographic regions with those agreed to for the IBRA.

	Existing Numbers of Biogeographic Types	Numbers of IBRA Regions
Victoria (Natural Region)	15	10
Tasmania (Regions)	14	8
Australian Capital Territory and New South Wales (Region)	17	17
South Australia (Region)	34	15
Western Australia (District)	21	26
Northern Territory (Region)	16	20
Queensland (Region)	13	18
Total numbers	**130**	**80**

* Appendix 3 provides a list of IBRA regions in each State and Territory

Table 12: List of 30 IBRA Regions Shared Between States and Territorias and Their Frequency

IBRA REGION NAME	IBRA CODE	VIC	TAS	ACT	NSW	SA	WA	NT	QLD	Freq-uency
Brigalow Belt South	BBS				S				S	2
Broken Hill Complex	BHC				S	S				2
Darling Riverine Plains	DRP				S				S	2
Finke	FIN					S		S		2
Furneaux	FUR	S	S							2
Great Sandy Desert	GSD						S	S		2
Great Victoria Desert	GVD					S	S			2
Gulf Fall and Uplands	GFU							S	S	2
Gulf Plains	GUP							S	S	2
Hampton	HAM					S	S			2
Mitchell Grass Downs	MGD							S	S	2
Mulga Lands	ML				S				S	2
Nandewar	NAN				S				S	2
Naracoorte-Coastal Plain	NCP	S				S				2
New England Tableland	NET				S				S	2
NSW North Coast	NNC				S				S	2
NSW South-western Slopes	NSS	S			S					2
Nullarbor	NUL					S	S			2
Ord-Victoria Plains	OVP						S	S		2
Riverina	RIV	S			S					2
South East Corner	SEC	S			S					2
Stony Plains	STP					S		S		2
Tanami	TAN						S	S		2
Victoria-Bonaparte	VB						S	S		2
Australian Alps	AA	S		S	S					3
Central Ranges	CR					S	S	S		3
Murray-Darling Depression	MDD	S			S	S				3
South East Highlands	SEH	S		S	S					3
Channel Country	CHC				S	S		S	S	4
Simpson-Strzelecki Dunefields	SSD				S	S		S	S	4
		8	1	2	15	11	8	12	11	

Table 13: Summary of IBRA regions restricted and shared between State and Territory jurisdictions.

	Number of restricted IBRA regions	Number of IBRA regions shared *	Total
Victoria	3	8	11
Tasmania	7	1	8
Australian Capital Territory	0	2	2
New South Wales	2	15	17
South Australia	4	11	15
Western Australia	18	8	26
Northern Territory	8	12	20
Queensland	8	11	19
Total	**50**	**68**	**118**

* Table 10 provides a list of IBRA regions shared between each State and Territory

NB:

- Total number of IBRA regions for Australia = 80.
- There are 30 IBRA regions from Table 12 are shared in common between the States and Territories. Therefore each of these 30 regions occur two or more times giving a total of 68 regions shared in common.

Table 14: Reservation of each IBRA region and the relative bias sampling the major environmental heterogeneity within each region.

IBRA name	IBRA code	Reservation status	Averaged Reserv-ation codes	Index of bias *	Averaged bias codes
Australian Alps	AA	>10% (ACT), >10%(Vic), >10%(NSW)	5	Nil (ACT), L(Vic), L(NSW)	2
Avon Wheatbelt	AW	<1%	2	H	4
Brigalow Belt North	BBN	1-5% (Qld),	2	M(Qld)	3
Brigalow Belt South	BBS	1-5%(Qld), 1-5%(NSW)	2	M(Qld), H(NSW)	3
Ben Lomond	BEN	1-5%	3	M	3
Broken Hill Complex	BHC	<1%(SA), 1-5%(NSW)	3	H(SA), H(NSW)	4
Burt Plain	BRT	<1%	2	H	4
Central Arnhem	CA	0%	1	-	5
Carnarvon	CAR	5-10%	4	M	3
Central Highlands	CH	>10%	5	L-M	2
Channel Country	CHC	0%(NT), 1-5%(Qld), >10%(SA), >10%(NSW)	3	-(NT), M(Qld), M(SA), M(NSW)	3
Central Kimberley	CK	1-5%	3	H	4
Central Mackay Coast	CMC	>10%	5	L	2
Coolgardie	COQ	5-10%	4	M	3
Cobar Peneplain	CP	1-5%	3	H	4
Central Ranges	CR	0%(SA), 0%(NT), 0%(WA)	1	-(SA), -(NT), -(WA)	5
Cape York Peninsula	CYP	>10%	5	L	2
Daly Basin	DAB	1-5%	3	H	4
D'Entrecasteaux	DE	>10%	5	L-M	2
Desert Uplands	DEU	<1%	2	M	3
Dampierland	DL	1-5%	3	H	4
Darling Riverine Plains	DRP	1-5%(Qld), <1%(NSW)	2	M(Qld), H(NSW)	4
Einasleigh Uplands	EIU	1-5%	3	M	3
Esperance Plains	ESP	>10%	5	L	2
Eyre and Yorke Block	EYB	5-10%	4	H	4
Finke	FIN	0%(SA), <1%(NT)	2	-(SA), H(NT)	4
Flinders and Olary Ranges	FOR	>10%	5	H	4
Freycinet	FRE	5-10%	4	M	3
Furneaux	FUR	1-5%(Tas), >10%(Vic)	4	M(Tas), Nil(Vic)	2
Gascoyne	GAS	1-5%	3	H	4
Gawler	GAW	5-10%	4	H	4
Gibson Desert	GD	>10%	5	L	2
Gulf Fall and Uplands	GFU	<1%(NT), >10%(Qld)	2	H(NT), L(Qld)	4
Geraldton Sandplains	GS	>10%	5	M	3

Table 14 (Contd)

IBRA name	IBRA code	Reservation status	Averaged Reserv-ation codes	Index of bias *	Averaged bias codes
Great Sandy Desert	GSD	<5%(WA), 1-5%(NT)	3	H(WA), H(NT)	4
Gulf Coastal	GUC	<1%	2	H	4
Gulf Plains	GUP	0%(NT), 1-5%(Qld)	2	-(NT), M(Qld)	3
Great Victoria Desert	GVD	>10%(SA), 5-10%(WA)	4	M(SA), L(WA)	3
Hampton	HAM	>10%(WA), >10%(SA)	5	M(WA), Nil(SA)	3
Jarrah Forest	JF	>10%	5	M	3
Lofty Block	LB	5-10%	4	H	4
Little Sandy Desert	LSD	<10%	4	M	3
MacDonnell Ranges	MAC	>10%	5	M	3
Mallee	MAL	>10%	5	M	3
Murray-Darling Depression	MDD	>10%(Vic), 1-5%(NSW), >10%(SA)	4	L(Vic), M(NSW), H(SA)	3
Mitchell Grass Downs	MGD	<1%(NT), <1%(Qld)	2	H(NT), H(Qld)	4
Mount Isa Inlier	MII	<1%	2	H	4
Mulga Lands	ML	1-5%(Qld), 1-5%(NSW)	3	L(Qld), H(NSW)	2
Murchison	MUR	<1%	2	H	4
Nandewar	NAN	1-5%(Qld), 1-5%(NSW)	3	M(Qld), H(NSW)	4
Naracoorte Coastal Plain	NCP	5-10%(SA), >10%(Vic)	4	H(SA), L(Vic)	4
New England Tableland	NET	5-10%(Qld), 1-5%(NSW)	3	M(Qld), H(NSW)	4
Northern Kimberley	NK	>10%	5	L	2
NSW North Coast	NNC	>10%(Qld), 5-10%(NSW)	4	L(Qld), M(NSW)	3
NSW South-western Slopes	NSS	<1%(NSW), 5-10%(VIC)	2	H(NSW), M(VIC)	4
Nullarbor	NUL	>10%(WA), >10%(SA)	5	M(WA), M(SA)	3
Ord-Victoria Plains	OVP	5-10%(NT), 5-10%(WA)	4	H(WA), H(NT)	4
Pine Creek Arnhem	PCA	>10%	5	L	2
Pilbara	PIL	1-5%	3	H	4
Riverina	RIV	<1%(NSW), 1-5%(Vic)	2	H(NSW), M(Vic)	4
Sydney Basin	SB	>10%	5	L	2
South East Coastal Plain	SCP	>10%	5	M	3
South East Corner	SEC	>10%(NSW), >10%(Vic)	5	M(NSW), L(Vic)	2
South Eastern Highlands	SEH	>10% (ACT), 5-10%(NSW), >10%(Vic)	4	L (ACT), H(NSW), M(Vic)	3

Table 14 (Contd)

IBRA name	IBRA code	Reservation status	Averaged Reserv-ation codes	Index of bias *	Averaged bias codes
South East Queensland	SEQ	1-5%(Qld)	3	L(Qld),	2
Simpson-Strzelecki Dunefields	SSD	5-10%(NSW), >10%(SA), >10%(Qld), <1%(NT)	4	M(NSW), L(SA), L(Qld), H(NT)	3
Stony Plains	STP	5-10%(SA), 0%(NT)	4	H(SA), -(NT)	4
Sturt Plateau	STU	<1%	2	H(NT)	4
Swan Coastal Plain	SWA	1-5%	3	H	4
Tanami	TAN	0%(WA), <1%(NT)	2	-(WA), H(NT)	4
Top End Coastal	TEC	>10%	5	M	3
Tasmanian Midlands	TM	<1%	2	H	4
Victoria Bonaparte	VB	5-10%(WA), >10%(NT)	4	M(NT), M(WA)	3
Victorian Midlands	VM	5-10%(VIC)	4	M(Vic)	3
Victorian Volcanic Plain	VVP	1-5%	3	H	4
Warren	WAR	>10%	5	L	2
Woolnorth	WOO	1-5%	3	M	3
West and South West	WSW	>10%	5	Nil	1
Wet Tropics	WT	>10%	5	L	2
Yalgoo	YAL	<1%	2	M	3

* Abbreviations supplied to ANCA by the nature conservation agencies:

Averaged reservation status code	State & Territory Codes	State and Territory Descriptions of reservation codes
1	0%	Nil Reserves
2	<1%	% of the total IBRA region reserved
3	1-5%	% ot the total IBRA region reserved
4	5-10%	% of the total IBRA region reserved
5	>10%	% of the total IBRA region reserved

Averaged bias code	State & Territory Codes	State and Territory Descriptions ot bias codes
1	Nil	No bias
2	L	Low index of bias
3	M	Moderate index of bias
4	H	High index of bias
5	·	Nil Reserves (ie an index ot bias not applicable)

Table 15: Limiting Factors and Constraints to Conservation Planning and Management Within Each IBRA Region

IBRA Region Name	IBRA code	Dominant condition i.e. context [1]	Dominant limiting factors and constraint codes [2]	Comments
Australian Alps	AA	M (ACT), M (Vic), M (NSW)	FIRE (ACT), FOR, GRAZ, WEED, TOUR (Vic), FER, FERR, FIRE, FOR, TOU (NSW)	The majority of the area is public land and essentially intact native vegetation. Some limited on-going grazing (Vic),
Avon Wheatbelt	AW	A	EXCWRM, SALT, FER, WEED, CLE, AG, CRO	
Ben Lomond	BEN	L	FOR, MIN, AG	
Brigalow Belt North	BBN	A (Qld)	CLE(Qld)	
Brigalow Belt South	BBS	A (Qld), A (NSW)	CRO, GRAZ (Qld), AG, CRO, CLE, EXCWRM, FER, FERR, FOR, GRAZ, MIN, SALT, WEED (NSW)	
Broken Hill Complex	BHC	L (SA), L (NSW)	GRAZ (SA), EXCWRM, FER, FERR, GRAZ, MIN (NSW)	Mostly extensive sheep pastoral country(SA)
Burt Plain	BRT	L	GRAZ, FER	
Cape York Peninsula	CYP	L	FIRE, GRAZ	
Carnarvon	CAR	L	EXCWRM, GRAZ, FER, WEED	
Central Arnhem	CA	M	FIRE, FERB	
Central Highlands	CH	M	GRAZ, FOR	
Central Kimberley	CK	L	EXCWRM, GRAZ, FOR	
Central Mackay Coast	CMC	A	CRO, TOU, URB	
Central Ranges	CR	M-H(SA), M (NT), M (WA)	FER, GRAZ (SA), FER (NT), EXCWRM, FIRE, FER (WA),	Entirely Aboriginal land (WA & SA),
Channel Country	CHC	L (NT), M (Qld), L (SA), L (NSW)	GRAZ, FER (NT), GRAZ, FER(Qld), GRAZ (SA), EXCWRM, FER, FERR, GRAZ (NSW)	Mostly extensive cattle pastoral country(SA)
Cobar Peneplain	CP	L	AG, CRO, CLE, EXCWRM, FER, FERR, GRAZ, MIN, SALT, WEED	
Coolgardie	COO	M	EXCWRM, FIRE, FER	
D'Entrecasteaux	DE	L	FOR, AG	
Daly Basin	DAB	L	CRO, CLE	
Dampierland	DL	L	EXCWRM, GRAZ, FER, FIRE	
Darling Riverine Plains	DRP	A (Qld), L (NSW)	CRO (Qld), AG, CRO, EXCWRM, CLE, FER, GRAZ, SALT, WEED (NSW)	

Table 15 (Contd)

IBRA Region Name	IBRA code	Dominant condition i.e. context [1]	Dominant limiting factors and constraint codes [2]	Comments
Desert Uplands	DEU	L-M	GRAZ, CLE	
Einasleigh Uplands	EIU	L	GRAZ, CLE	
Esperance Plains	ESP	A	EXCWRM, FER, CLE, CRO, FIRE	
Eyre and Yorke Block	EYB	A	AG, GRAZ	Extensively cleared for cereal cropping and grazing; highly fragmented
Finke	FIN	L (SA), L (NT)	GRAZ (SA), GRAZ, FER (NT)	Mostly extensive cattle pastoral country(SA),
Flinders and Olary Ranges	FOR	L	GRAZ	Mostly extensive sheep pastoral country
Freycinet	FRE	L	AG, FOR	
Furneaux	FUR	M (Vic), A (Tas)	TOUR, WEED (Vic), GRAZ (Tas)	Surrounded by the waters of Bass Strait and Corner Inlet (Vic),
Gascoyne	GAS	L	EXCWRM, GRAZ, FER, WEED	
Gawler	GAW	L	GRAZ	Mostly extensive sheep pastoral country
Geraldton Sandplains	GS	A-L	EXCWRM, GRAZ (north), FER	
Gibson Desert	GD	M	EXCWRM, FIRE, FER (cats, fox), FERC	
Great Sandy Desert	GSD	M(WA), M (NT)	EXCWRM, FIRE, FER (cat), FERC, CRO (WA), FER, GRAZ (NT)	
Great Victoria Desert	GVD	M (H)(SA), M (WA),	FER, SELP (SA), EXCWRM, FIRE, FER (cat, fox) FERC (WA)	Significant areas of Aboriginal lands; no pastoralism; feral animals sparsely distributed(SA),
Gulf Coastal	GUC	L	FER, GRAZ	
Gulf Fall and Uplands	GFU	L (NT), M (Qld)	GRAZ, FER (NT), GRAZ (Qld)	
Gulf Plains	GUP	M (NT), M (Qld)	FER (NT), GRAZ, WEED (Qld)	
Hampton	HAM	L (WA), M (SA)	EXCWRM, GRAZ, FER, FIRE (WA), FER (SA)	Natural with feral animals(SA)
Jarrah Forest	JF	L	EXCWRM, FOR	
Little Sandy Desert	LSD	M	FIRE, FER (cat, fox) FERC	
Lofty Block	LB	A	AG, URB	Extensively cleared for agriculture and urban development; highly fragmented
MacDonnell Ranges	MAC	L	URB, TOU	
Mallee	MAL	A	SALT, FER, CLE, WEED, AG	
Mitchell Grass Downs	MGD	L (NT), M (Qld)	GRAZ, FER (NT), GRAZ, WEED (Qld)	
Mount Isa Inlier	MII	M	GRAZ	

Table 15 (Contd)

IBRA Region Name	IBRA code	Dominant condition i.e. context [1]	Dominant limiting factors and constraint codes [2]	Comments
Mulga Lands	ML	L (Qld), L (NSW)	GRAZ, WEED (Qld), EXCWRM, FER, FERR, GRAZ (NSW)	
Murchison	MUR	L	EXCWRM, GRAZ, FER, WEED	
Murray-Darling Depression	MDD	M (Vic), L (NSW), A (SA)	FER, SALT, AG, WEED (Vic), CRO, EXCWRM, FER, FERR, FIRE, GRAZ (NSW), AG (SA)	Most of the surrounding land is used for grain production and sheep farming (Vic), Extensively cleared for agriculture; highly fragmented(SA)
Nandewar	NAN	A (Qld), L (NSW)	GRAZ, CLE (Qld), AG, CLE, EXCWRM, FER, FERR, FOR, GRAZ, MIN, WEED (NSW)	
Naracoorte Coastal Plain	NCP	A (SA), L (Vic)	AG (SA), FOR, CLE(Vic)	Extensively cleared for agriculture; highly fragmented(SA), Land extensively used for agriculture (Vic)
New England Tableland	NET	A (Qld), A (NSW)	GRAZ, CLE, HOR (Qld), AG, CLE, CRO, FER, EXCWRM, FERR, FIRE, FOR, GRAZ, MIN, WEED (NSW)	
Northern Kimberley	NK	M	FIRE, DCWRM, FER (donkey, cat), GRAZ	
NSW North Coast	NNC	A (Qld), L (NSW)	URB, HOR (Qld), AG, CLE, CRO, FER, FIRE, FOR, GRAZ, HQR, MIN, TOU, URB, WEED (NSW)	
NSW South-western Slopes	NSS	L (NSW), L (VIC)	AG, CRO, CLE, EXCWRM, FER, FERR, GRAZ, MIN, SALT, WEED (NSW), ? (VIC)	
Nullarbor	NUL	M (WA), M (SA)	EXCWRM, FER, WEED, FIRE(WA), FER, WEED (SA)	Disturbed natural (feral animals, weeds)(SA)
Ord-Victoria Plains	OVP	L (WA), L (NT)	EXCWRM, FER, WEED, FIRE(WA), GRAZ, FER (NT)	
Pilbara	PIL	L	EXCWRM, FIRE, FER (cat, fox), WEED, GRAZ	
Pine Creek Arnhem	PCA	L-H	GRAZ, AG, MIN, SELP	

Table 15 (Contd)

IBRA Region Name	IBRA code	Dominant condition i.e. context [1]	Dominant limiting factors and constraint codes [2]	Comments
Riverina	RIV	L (NSW), A (Vic)	AG, CLE, CRO, EXCWRM, FER, FERR, GRAZ, HOR, SALT, WEED (NSW), FER, GRAZ, AG, WEED, WEED (Vic)	Most of the land is used for intensive agriculture(Vic)
Simpson-Strzelecki Dunefields	SSD	L (NSW), M-L (SA), M (Qld), M (NT)	EXCWRM, FER, FERR, GRAZ (NSW), GRAZ, FER (SA), FERR (Qld), FERR, FERC (NT)	Significant areas reserved. Significant areas grazed by cattle and also degraded by feral animals(SA),
South East Coastal Plain	SCP	A	AG, URB, GRAZ, CLE, FER, WEED	Most of the land is used for agriculture or forestry
South East Corner	SEC	L (NSW), L (Vic)	AG, CLE, CRO, FER, FIRE, FOR, GRAZ, TOU, URB(NSW), FOR, WEED (Vic)	Most of the surrounding land is State Forest (Vic)
South East Queensland	SEQ	A (Qld)	URB, AG (Qld)	
South Eastern Highlands	SEH	M (ACT), L (NSW), L (Vic)	GRAZ, FIRE, URB(ACT), AG, CLE, CRO, EXCWRM, FER, FERR, FIRE, FOR, GRAZ, HOR, MIN, SALT, WEED (NSW), FOR, WEED (Vic)	Grasslands particularly subjected to grazing, fire, urbanisation pressures (ACT), Most of the adjoining land is State Forest (Vic)
Stony Plains	STP	L (SA), L (NT)	GRAZ (SA), GRAZ, FER (NT)	Extensive cattle grazing country(SA),
Sturt Plateau	STU	L	GRAZ, FER	
Swan Coastal Plain	SWA	A	URB, FER, WEED, CLE, AG	
Sydney Basin	SB	L	AG, CLE, CRO, FER, FIRE, FOR, HOR, MIN, TOU, URB, WEED	
Tanami	TAN	M (WA), M (NT)	EXCWRM, FIRE, FER (WA), FER (NT)	
Tasmania Midlands	TM	A	AG, GRAZ	
Top-End Coastal	TEC	L-M	URB, HOR, FER	
Victoria Bonaparte	VB	M (NT), L (WA)	FER (NT), FIRE, FER, EXCWRM (WA)	
Victorian Midlands	VM	L	FOR, FER, AG, WEED	Most land is used for forestry or agriculture
Victorian Volcanic Plain	VVP	A	AG, CLE, WEED, GRAZ	Very little public land remaining. Most freehold is cleared for agriculture
Warren	WAR	L	EXCWRM, FOR, CLE, FER	

Table 15 (Contd)

IBRA Region Name	IBRA code	Dominant condition i.e. context [1]	Dominant limiting factors and constraint codes [2]	Comments
West and South West	WSW	M	MIN, FOR	
Wet Tropics	WT	A-L	CRO, URB, TOU	
Woolnorth	WOO	L-M	FOR, AG	
Yalgoo	YAL	L	EXCWRM, GRAZ, FIRE, FER	

This table has been compiled by the Australian Nature Conservation Agency from inputs supplied by the State and Territory nature conservation agencies.

NB: 1 = Codes used to describe the dominant condition of the IBRA region

A = Modified ecosystems dominant i.e. very little indigenous ecosystems remain
L = Indigenous ecosystems present but coexisting with pastoral / timber industries
M = Indigenous ecosystems dominant with no widespread degrading land use, however processes of disturbance (e.g. feral pests, fire, tourism etc.) present
H = Indigenous ecosystems present with no known threatening processes

NB: 2 = Codes used to describe the dominant land use and/or threatening process:

AG = Agriculture
CLE = Clearing
CRO = Cropping
HOR = Horticulture
DCWRM = Decline of critical weight range mammals occurring
EXCWRM = Extinction of critical weight range mammals occurring
FER = Ferals, FERB = Feral buffalo, FERR = Feral rabbits, FERC = Feral camels
FIRE = Wildfire
FOR = Forest timber production / harvesting
GRAZ = Grazing, pastoral
MIN = Mining
SALT = Salination
TOU = Tourism
URB = Urbanisation
WEED = Weeds

Definitions

AG = Agriculture	A generic term referring to any form of crop or live stock raising, which does not rely on native pasture or native vegetation
CRO = Cropping	Cultivation of annual plants such as wheat or vegetables
HOR = Horticulture	Cultivation of long lived crops such as fruit
GRAZ = Grazing, pastoral	Raising of live stock on either native or introduced pasture

Table 16: Alternate Conservation Management Measures Within Each IBRA Region

IBRA region name	IBRA code	Alternative conservation management measures		
		Existing Measures [1]	Potential Measures [1]	Comments
Australian Alps	AA	3 (ACT), 3 (Vic), 1, 2, 3 (NSW)	NA (ACT), 2 (Vic), 1, 2, 3 (NSW)	ACT - 100% conserved, Alps national park adjoins state forest and rural freehold(NSW)
Avon Wheatbelt	AW	1, 2, 3	1, 2, 3	
Ben Lomond	BEN	1, 2, 3	1, 2, 3	Greater controls on vegetation protection planning schemes would be highly desirable
Brigalow Belt North	BBN	1	1, 2, 3	
Brigalow Belt South	BBS	1 (Qld), 1, 3 (NSW)	1, 2, 3 (Qld), 1, 2, 3, (NSW)	Community based programs important because of small size and fragmented nature of remnants (NSW)
Broken Hill Complex	BHC	1, 2 (SA), 1, 3 (NSW)	1, 2 (SA), 1, 2, 3 (NSW)	Land tenure mainly western division leasehold
Burt Plain	BRT	1	2	
Cape York Peninsula	CYP	1, 3	2, 3	
Carnarvon	CAR	1, 2, 3	1, 2, 3	1 is essential**
Central Arnhem	CA	Nil	2	All Aboriginal land
Central Highlands	CH	3	3, 2	Mostly public land
Central Kimberley	CK	1, 2, 3	1, 2, 3	
Central Mackay Coast	CMC	1, 3	2, 3	
Central Ranges	CR	Nil	2(NT)	All Aboriginal land
Channel Country Complex	CHC	Nil	1, 2(NT)	
Cobar Peneplain	CP	1, 3	1, 2, 3,	Clearing much more extensive in central than western division
Coolgardie	COO	1, 2, 3	1, 2, 3	3 is best option
D'Entrecasteaux	DE	3, 2, 1	1, 2, 3	Greater controls on vegetation protection planning schemes would be highly desirable
Daly Basin	DAB	1	1, 2, 3	
Dampierland	DL	1, 2, 3	1, 2, 3	
Darling Riverine Plains	DRP	1 (Qld), 1, 3 (NSW)	1, 2, 3 (Qld), 1, 2, 3 (NSW)	Few secure conservation reserves. Clearing much more extensive in central than western division (NSW)

Table 16 (Contd)

IBRA region name	IBRA code	Alternative conservation management measures		
		Existing Measures[1]	Potential Measures[1]	Comments
Desert Uplands	DEU	1	1, 2, 3	
Einasleigh Uplands	EIU	1	1, 2, 3	
Esperance Plains	ESP	2, 3	2, 3	3 is best
Eyre and Yorke Block	EYB	1, 2	1, 2	
Finke Plains	FNK	1	1, 2	
Flinders and Olary Ranges	FOR	1, 2	1, 2	
Freycinet	FRE	3, 2, 1	2, 3, 1	With significant amounts of private land, voluntary agreements are likely to be important with protection of remants.
Furneaux	FUR	? (Tas), 3 (VIC)	? (Tas), NA (VIC)	100% of region is in National Park (Vic). Greater controls on vegetation protection planning schemes would be highly desirable (Tas)
Gascoyne	GAS	1, 2, 3	1, 2, 3	1 is essential**
Gawler	GAW	1, 2	1, 2	
Geraldton Sandplains	GS	2, 3	2, 3	
Gibson Desert	GD	2, 3	2, 3	
Great Sandy Desert	GSD	1 (NT)	1, 2 (NT)	All Aboriginal land
Great Victoria Desert	GVD	2, 3 (WA), 2 (SA)	2, 3 (WA), 2 (SA)	3 is best (WA), Mostly Aboriginal land (SA)
Gulf Coastal	GUC	2	1, 2	
Gulf Fall and Uplands	GFU	1, (NT)	1, 2 (NT)	
Gulf Plains	GUP	Nil (NT)	1, 2 (NT)	
Hampton	HAM	1, 2, 3 (WA), 1 (SA)	1, 2, 3 (WA), Nil (SA)	All reserved (SA)
Jarrah Forest	JF	2, 3	2, 3	
Little Sandy Desert	LSD	2, 3	2, 3	
Lofty Block	LB	1, 2	1, 2	2 is best
MacDonnell Ranges	MAC	1	1, 2	
Mallee	MAL	1, 2, 3	1, 2, 3	
Mitchell Grass Downs	MGD	1, 2 (NT)	1, 2 (NT)	
Mount Isa Inlier	MII	1	1, 2, 3	
Mulga Lands	ML	1, 3 (Qld), 1, 3 (NSW)	1, 2, 3 (Qld), 1, 2, 3 (NSW)	Land tenure mainly western division leasehold (NSW)

Table 16 (Contd)

IBRA region name	IBRA code	Alternative conservation management measures		
		Existing Measures[1]	Potential Measures[1]	Comments
Murchison	MUR	1, 2, 3	1, 2, 3	1 is essential**
Murray-Darling Depression	MDD	3 (Vic), 1, 3 (NSW), 1, 2 (SA),	2,1 (Vic), 1, 2, 3 (NSW) 1, 2 (SA),	Land tenure mainly western division leasehold (NSW), 2 is best (SA)
Nandewar	NAN	1 (Qld), 1, 3 (NSW)	1, 2, 3 (Qld), 1, 2, 3 (NSW)	Reserves all located on margin of this region (NSW)
Naracoorte Coastal Plain	NCP	1, 2 (SA), 3 (Vic),	1, 2 (SA), 2,1 (Vic),	2 is best (SA)
New England Tablelands	NET	1 (Qld), 1, 2, 3, (NSW)	2, 3 (Qld), 1, 2, 3 (NSW)	Planning instruments could be more widely applied. Community based programs important because of small size and fragmented nature of remnants (NSW)
Northern Kimberley	NK	2, 3	2, 3	
NSW North Coast	NNC	1 (Qld), 1, 2, 3 (NSW)	2, 3 (Qld), 1, 3 (NSW)	Heritage agreements could be applied more widely. Cost of land purchase high (NSW)
NSW South-western Slopes	NSS	1, 3 (NSW), 3 (VIC)	1, 2, 3 (NSW) 2,1 (VIC)	Few secure conservation reserves. Community based programs important because of small size and fragmented nature of remnants (NSW)
Nullarbor	NUL	2, 3 (WA), ? (SA)	2, 3 (WA), ? (SA)	
Ord-Victoria Plains	OVP	1 (NT)	1, 2 (NT)	
Pilbara	PIL	1, 2, 3	1, 2, 3	1 is essential**
Pine Creek Arnhem	PCA	1	1, 2	Largely Aboriginal land
Riverina	RIV	1, 3 (NSW), 3 (VIC)	1, 2, 3 (NSW), 2,1 (VIC)	Few secure conservation reserves. Clearing much more extensive in central than western division (NSW)
Simpson-Strzelecki Dunefields	SSD	1	1, 2	Mostly Aboriginal land or under Land Claim (NT)
South East Coastal Plain	SCP	3	2,1	
South East Corner	SEC	1, 2, 3 (NSW) 3 (VIC)	1, 3 (NSW), 2,1 (VIC)	Region largely dominated by state forests and conservation reserves (NSW)

Table 16 (Contd)

IBRA region nama	IBRA code	Alternative conservation management measures		
		Existing Measurea[1]	Potential Measures[1]	Comments
South East Queensland	SEQ	1	2,3	
South Eastern Highlands	SEH	3 (ACT), 1, 2, 3,(NSW), 3 (Vic)	2, 3 (ACT), 1, 2, 3 (NSW), 2,1 (Vic)	Remnant grasslands priority focus (ACT), Planning instruments could be more widely applied. Reserves adjoin forestry land and rural freehold land (NSW)
Stony Plains	STP	1, 2 (SA), Nil (NT)	1, 2 (SA), 1, 2 (NT)	2 is best (SA)
Sturt Plateau	STU	1	1, 2	
Swan Coastal Plain	SWA	1, 2, 3	1, 2, 3	
Sydney Basin	SB	1, 2, 3	1, 3	Reserves mostly in Water Board catchments. Cost of land purchase high
Tanami	TAN	1	1,2	Largely Aboriginal land
Tasmanian Midlands	TM	2, 1, 3	1, 2, 3	Vegetation remnants are highly fragmented. Greater controls on vegetation protection planning schemes would be highly desirable
Top-End Coastal	TEC	1, 2	1, 2	Largely Aboriginal land
Victoria Bonaparte	VBT	1, (NT)	1, 2 (NT)	
Victorian Midlands	VM	3	2,1	
Victorian Volcanic Plain	VVP	3	2,1	
Warren	WAR	1, 2, 3	1, 2, 3	
West and South West	WSW	3	3	
Wet Tropics	WT	1, 3	2, 3	
Woolnorth	WOO	3, 1, 2	3, 2, 1	Greater controls on vegetation protection planning schemes would be highly desirable
Yalgoo	YAL	1, 2, 3	1, 2, 3	1 is essential**

Table 16 (Contd)

This table has been compiled by the Australian Nature Conservation Agency from inputs supplied by the State and Territory nature conservation agencies.

NB: List of codes and descriptions for alternate conservation management measures:

1 = Land purchase (including purchase of pastoral leases),
2 = Voluntary agreements (Heritage Agreements, Covenants, Regional Forest Agreements),
3 = Planning instruments (e.g. changing various types of crown reserves such as vacant Crown land and recreation reserves to nature conservation vesting and purposes),

NB: NSW NPWS abbreviations used for conservation measures:

IBRA Code	NSW NPWS Code	NSW NPWS descriptions
1	SCR	Secure conservation reserve, such NPWS reserves or flora reserves.
1	LPUR	Land purchase, generally for addition to conservation reserves.
2	AA/MOU	The Australian Alps memorandum of understanding.
2	HERAG	Heritage agreements such as conservation agreements, wilderness protection agreements or wildlife refuges.
2	CBP	Community based programs such as Landcare and Greening Australia.
3	PLAN	Planning instruments, including local and regional environment plans, and state environment planning policies.
3	CLR	Clearing restrictions imposed by lease conditions, protected land mapping or in that part of the Murray Geological Basin within the western division.
3	PRORD	Permanent or interim protection orders.
3	MUR	Multiple use reserves, such as travelling stock reserves, or forests managed for both timber extraction and conservation features.

List of Appendices

APPENDIX 1:

Description of IBRA Regions for Australia

AA Australian Alps

A series of high elevation plateaux capping the South Eastern Highlands (Region SEH) and the southern tablelands in NSW. The geology consists largely of granitic and basaltic rocks. Vegetation is dominated by alpine herbfields, and other treeless communities, snow gum woodlands and montane forests dominated by alpine ash.

AW Avon Wheatbelt

Area of active drainage dissecting a Tertiary plateau in Yilgarn Craton. Gently undulating landscape of low relief. Proteaceous scrub-heaths, rich in endemics, on residual lateritic uplands and derived sandplains; mixed eucalypt, *Allocasuarina huegeliana* and Jam-York Gum woodlands on Quaternary alluvials and eluvials. Semi-arid (Dry) Warm Mediterranean.

BEN Ben Lomond

Moist and dry subhumid warm coastal plains mantled in siliceous gravels, and humid cool/cold mountain ranges comprised of Devonian granites and Silurian-Devonian siltstones and mudstones, covered with sandy loams and siliceous gravels. Lowland vegetation comprising mainly open sclerophyll woodlands and heath while the upper slopes consist of wet sclerophyll forests, some rainforest and alpine vegetation in the highest regions. Land use primarily forestry, mining and agriculture (grazing).

BHC Broken Hill Complex

Hills and colluvial fans on Proterozoic rocks; desert loams and red clays, lithosols and calcareous red earths; supporting chenopod shrublands *Maireana spp.* - *Atriplex spp.* shrublands, and mulga open shrublands *Acacia aneura.*

BBN Brigalow Belt North

Permian volcanics and Permian-Triassic sediments of the Bowen and Galilee Basins, Carboniferous and Devonian sediments and volcanics of the Drummond Basin and coastal blocks, Cambrian and Ordovician rocks of the Anakie inlier and associated Tertiary deposits. Subhumid to semiarid. Woodlands of ironbarks (*E. melanophloia, E. crebra*), poplar box and Brown's box (*E. populnea, E. brownii*) and brigalow (*Acacia harpophylla*), blackwood (*A. Argyrodendron*) and gidgee (*A. cambagei*). Region reaches the coast in the dry caostal corridor of Proserpine - Townsville.

BBS Brigalow Belt South

Predominantly Jurassic and younger deposits of the Great Artesian Basin and Tertiary deposits with elevated basalt flows. Subhumid. Eucalyptus woodlands and open forests of ironbarks, poplar box, spotted gum (*E. maculata*), cypress pine (*Callitris glaucophylla*), Bloodwoods (eg. *E. trachyphloia, E. hendersonii* ms) brigalow-belah forests (*E. harpophylla, Casuarina cristata*) and semi-evergreen vine thicket.

BRT Burt Plain

Plains and low rocky ranges of Pre-Cambrian granites with mulga and other acacia woodlands on red earths.

CA Central Arnhem

Gently sloping terrain and low hills on Cretaceous sandstones and siltstones and lateritised Tertiary material; yellow earthy sands and shallow stony sands; Darwin Woollybutt and Darwin Stringybark open forest to woodland with grass understorey.

CAR Carnarvon

Quaternary alluvial, aeolian and marine sediments overlying Cretaceous strata. A mosaic of saline alluvial plains with samphire and saltbush low shrublands, Bowgada low woodland on sandy ridges and plains, Snakewood scrubs on clay flats, and tree to shrub steppe over hummock grasslands on and between red sand dune fields. Limestone strata with *Acacia startii / bivenosa* shrublands outcrop in the north, where extensive tidal flats in sheltered embayments support Mangal. Arid

CH Central Highlands

Perhumid cool to cold high plateau surface underlain by Jurassic dolerite and Tertiary basalts, with skeletal soils to alluvium in valleys, and humid cool to cold lower plateau surface underlain by Jurassic dolerite, Permo-Triassic sediments and Tertiary basalts, with sandy to clay loam soils. Vegetation ranging from dry sclerophyll woodlands and wet sclerophyll forest on the lower plateau to alpine complexes and coniferous forest patches on the higher plateau. Land use a combination of conservation, forestry, agriculture (grazing) and water catchment.

CHC Channel Country

Low hills on Cretaceous sediments; forbfields and Mitchell grass downs, and intervening braided river systems of coolibah *E.coolibah* woodlands and lignum/saltbush *Muehlenbeckia sp./Chenopodium sp.* shrublands. (Includes small areas of sand plains.)

CK Central Kimberley

Hilly to mountainous country with parallel siliceous ranges of Proterozoic sedimentary rocks with skeletal sandy soils supporting *Plectrachne pungens* hummock grasses with scattered trees, and with earths on Proterozoic volcanics in valleys supporting Ribbon Grass with scattered trees. Open forests of River Gum and Pandanus occur along drainage lines. Dry hot tropical, sub-humid to semi-arid, summer rainfall.

CMC Central Mackay Coast

Humid tropical coastal ranges and plains. Rainforests (complex evergreen and semi-deciduous notophyll vine forest), *Eucalyptus* open forests and woodlands, *Melaleuca* spp. wetlands.

COO Coolgardie

Granite Strata of Yilgarn Craton with Archaean Greenstone intrusions in parallel belts. Drainage is occluded. Mallees and scrubs on sandplains associated with lateritised uplands, playas and granite outcrops. Diverse woodlands rich in endemic eucalypts, on low greenstone hills, valley alluvials and broad plains of calcareous earths. In the west, the scrubs are rich in endemic Proteaceae, in the east they are rich in endemic acacias. Arid to Semi-arid Warm Mediterranean.

CP Cobar Peneplain

Plains and low hills on Palaeozoic rocks; earths, lithosols; *E. populnea* and *E. intertexta* woodlands.

CR Central Ranges

High proportion of Proterozoic ranges and derived soil plains, interspersed with red Quaternary sandplains. The sandplains support low open woodlands of either Desert Oak or Mulga over *Triodia basedowii* hummock grasslands. Low open woodlands of Ironwood (*Acacia estrophiolata*) and Corkwoods (*Hakea* spp.) over tussock and hummock grasses often fringe ranges. The ranges support mixed wattle scrub or *Callitris glaucophylla* woodlands over hummock and tussock grasslands. Arid, with summer and winter rain.

CYP Cape York Peninsula

Low hills and plains, tropical humid/maritime; *Eucalyptus* and *Melaleuca* woodlands,

DAB Daly Basin

Gently undulating plains and scattered low plateau remnants on Palaeozoic sandstones, siltstones and limestones; neutral loamy and sandy red earths; Darwin Stringybark and Darwin Woollybutt open forest with perennial and annual grass understorey.

DE D'Entrecasteaux

Mainly humid cool mountainous areas with some undulating coastal lowlands. Permo-Triassic sediments and Jurassic dolerite, mantled with sandy to clay loams. Vegetation heavily forested, grading from mixed forest, wet sclerophyll forest and patches of rainforest in the uplands to dry sclerophyll forest and heath on the coastal lowlands. Land use primarily forestry and agriculture (grazing and cropping).

DEU Desert Uplands

Ranges and plains on dissected Tertiary surface and Triassic sandstones; woodlands of *E.whitei*, *E.similis* and *E.trachyphloia*.

DL Dampierland

(1) Quaternary sandplain overlying Jurassic and Mesozoic sandstones with Pindan. Hummock grasslands on hills.
(2) Quaternary marine deposits on coastal plains, with Mangal, samphire - *Sporobolus* grasslands, *Melaleuca acacioides* low forests, and *Spinifex - Crotalaria* strand communities.
(3) Quaternary alluvial plains associated with the Permian and Mesozoic sediments of Fitzroy Trough support tree savannas of *Crysopogon - Dichanthium* grasses with scattered *Eucalyptus microtheca - Lysiphyllum cunninghamii*. Riparian forests of River Gum and Cadjeput fringe drainages.
(4) Devonian reef limestones in the north and east support sparse tree steppe over *Triodia intermedia* and *T. wiseana* hummock grasses.
Dry hot tropical, semi-arid summer rainfall.

DRP Darling Riverine Plain

Alluvial fans and plains; summer/winter rainfall in catchments, including occasional cyclonic influence; grey clays; woodlands and open woodlands dominated by *Eucalyptus spp.*

EIU Einasleigh Uplands

High plateau of Palaeozoic sediments, granites, and basalts; dominated by ironbark (*Eucalyptus spp*) woodlands.

ESP Esperance Plains

Proteaceous Scrub and mallee heaths on sandplain overlying Eocene sediments; rich in endemics. Herbfields and heaths (rich in endemics) on abrupt granite and quartzite ranges that rise from the plain. Eucalypt woodlands occur in gullies and alluvial foot-slopes. Warm Mediterranean.

EYB Eyre and Yorke Block

Archaean basement rocks and Proterozoic sandstones overlain by undulating to occasionally hilly calcarenite and calcrete plains and areas of aeolian quartz sands, with mallee woodlands, shrublands and heaths on calcareous earths, duplex soils and calcareous to shallow sands, now largely cleared for agriculture.

FIN Finke

Arid sandplains, dissected uplands and valleys formed from Pre-Cambrian volcanics with spinifex hummock grasslands and acacia shrublands on red earths and shallow sands

FOR Flinders and Olary Ranges

Semi-arid to arid Proterozoic ranges, alluvial fans and plains, and some outcropping volcanics, with native cypress, black oak (belah) and mallee open woodlands, Eremophila and Acacia shrublands, and bluebush/saltbush chenopod shrublands on shallow, well-drained loams and moderately-deep, well-drained red duplex soils

FRE Freycinet

Subhumid cool to subhumid warm coastal plains and low mountain ranges comprised of Jurassic dolerite and Permo-Triassic sediments with significant areas of granite. Soils predominantly clay to sandy loams. Vegetation predominantly dry sclerophyll forest, with patches of wet sclerophyll forest, relict rainforest, coastal heath and dry coniferous forest. Land use primarily agriculture (grazing) and forestry.

FUR Furneaux

Moist subhumid warm granitic island chain, comprising coastal plains dominated by siliceous soils and low ranges with sandy loams. Vegetation comprising a gradation from heath, scrub and dry woodlands to dry sclerophyll forest with gullies of wet sclerophyll forest and rainforest remnants on the ranges. Coastal plain region heavily modified by agriculture (grazing).

GAS Gascoyne

Rugged low Proterozoic sedimentary and granite ranges divided by broad flat valleys. Open mulga woodlands occur on shallow earthy loams over hardpan on the plains, with mulga scrub and Eremophila shrublands on the shallow stony loams of the ranges. The Carnegie Salient, in the east, is characterised by extensive salt lake features supporting succulent steppes. Arid.

GAW Gawler

Semi-arid to arid, flat-topped to broadly rounded hills of the Gawler Range Volcanics and Proterozoic sediments, depositional plains and salt-encrusted lake beds, with black oak (belah) and myall low open woodlands, open mallee scrub, bluebush/saltbush open chenopod shrublands and tall mulga shrublands on shallow loams, calcareous earths and hard red duplex soils

GD Gibson Desert

Lateritised upland on flat-lying Jurassic and Cretaceous sandstones of Canning Basin. Mulga parkland over *Triodia basedowii* on lateritic "buckshot" plains. Mixed shrub steppe of Acacia, Hakea and Grevillea over *Triodia pungens* on red sand plains and dune fields. Lateritic uplands support shrub steppe in the north and mulga scrub in the south. Quaternary alluvia associated with palaeo-drainage features support Coolabah woodlands over bunch grasses. Arid, mainly summer rainfall.

GFU Gulf Fall Uplands

Undulating terrain with scattered low, steep hills on Proterozoic and Palaeozoic sedimentary rocks, often overlain by lateritised Tertiary material; skeletal soils and shallow sands; Darwin Boxwood and Variable-barked Bloodwood woodland to low open woodland with spinifex understorey.

GS Geraldton Sandplains

Mainly proteaceous scrub-heaths, rich in endemics, on the sandy earths of an extensive, undulating, lateritic sandplain mantling Permian to Cretaceous strata. Extensive York Gum and Jam woodlands occur on outwash plains associated drainage. Semi-arid (Dry) warm Mediterranean.

GSD Great Sandy Desert

Mainly tree steppe grading to shrub steppe in south; comprising open hummock grassland of *Triodia pungens* and *Plectrachne schinzii* with scattered trees of *Owenia reticulata* and Bloodwoods, and shrubs of *Acacia* spp, *Grevillea wickhamii* and *G. refracta*, on Quaternary red longitudinal sand dune fields overlying Jurassic and Cretaceous sandstones of the Canning and Armadeus Basins. *Casuarina decaisneana* (Desert Oak) occurs in the far east of the region. Gently undulating lateritised uplands support shrub steppe such as *Acacia pachycarpa* shrublands over *Triodia pungens* hummock grass. Calcrete and evaporite surfaces are associated with occluded palaeo-drainage systems that traverse the desert; these include extensive salt lake chains with samphire low shrublands, and *Melaleuca glomerata - M. lasiandra* shrublands. Monsoonal influences are apparent in the north-western sector of this region. Arid tropical with summer rain.

GUC Gulf Coastal

Gently undulating plains with scattered rugged areas on Proterozoic sandstones and Tertiary sediments; sandy red earths and shallow gravelly, sandy soils; Darwin Stringybark woodland with spinifex understorey.

GUP Gulf Plains

Marine and terrestrial deposits of the Carpentaria and Karumba basins; plains, plateaus and outwash plains; woodlands and grasslands.

GVD Great Victoria Desert

Arid active sand-ridge desert of deep Quaternary aeolian sands overlying Permian and Mesozoic strata of the Officer Basin. Tree steppe of *Eucalyptus gongylocarpa*, Mulga and *E. youngiana* over hummock grassland dominated by *Triodia basedowii*. Arid, with summer and winter rain.

HAM Hampton

Quaternary marine dune systems on a coastal plain of the Eucla Basin, backed by stranded limestone scarp. Areas of marine sand are also perched along the top edge of the scarp. Various mallee communities dominate the limestone scree slopes and pavements, as well as the sandy surfaces. Alluvial and calcareous plains below the scarp support eucalypt woodlands and Myall open low woodlands.

JF Jarrah Forest

Duricrusted plateau of Yilgarn Craton characterised by Jarrah-Marri forest on laterite gravels and, in the eastern part, by Marri-Wandoo woodlands on clayey soils. Eluvial and alluvial deposits support *Agonis* shrublands. In areas of Mesozoic sediments, Jarrah forests occur in a mosaic with a variety of species-rich shrublands. Warm Mediterranean.

LB Lofty Block

Temperate, well-defined uplands of Cambrian and Late Proterozoic marine sediments with eucalypt open forests and woodlands and heaths on mottled yellow and ironstone gravelly duplex soils in the wetter areas and red duplex soils in drier areas; now largely cleared for agriculture and urban development

LSD Little Sandy Desert

Red Quaternary dune fields with abrupt Proterozoic sandstone ranges of Bangemall Basin. Shrub steppe of acacias, *Thryptomene* and grevilleas over *Plectrachne schinzii* on sandy surfaces. Sparse shrub-steppe over *Triodia basedowii* on stony hills, with River Gum communities and bunch grasslands on alluvial deposits in and associated with ranges. Arid with summer rainfall.

MAC MacDonnell Ranges

High relief ranges and foothills covered with spinifex hummock grassland, sparse acacia shrublands and woodlands along watercourses.

MAL Mallee

The south-eastern part of Yilgarn Craton is gently undulating, with partially occluded drainage. Mainly mallee over myrtaceous-proteaceous heaths on duplex (sand over clay) soils. Melaleuca shrublands characterise alluvia, and Halosarcia low shrublands occur on saline alluvium. A mosaic of mixed eucalypt woodlands and mallee occur on calcareous earth plains and sandplains overlying Eocene limestone strata in the east. Semi-arid (Dry) Warm Mediterranean.

MDD Murray - Darling Depression

An extensive gently undulating sand and clay plain of Tertiary and Quaternary age frequently overlain by aeolian dunes. Vegetation consists of semi-arid woodlands of Black Oak / Belah, Bullock Bush/ Rosewood and *Acacia spp.*, mallee shrublands and heathlands and savanna woodlands.

MGD Mitchell Grass Downs

Undulating downs on shales and limestones; *Astrebla spp.* grasslands and *Acacia* low woodlands. Grey and brown cracking clays.

MII Mount Isa Inlier

Rugged hills and outwash, primarily associated with Proterozoic rocks; skeletal soils; low open eucalypt woodlands dominated by *Eucalyptus leucophloia* and *E.pruinosa*, with a *Triodia pungens* understorey. Semi-Arid.

ML Mulga Lands

Undulating plains and low hills on Cainozoic sediments; red earths and lithosols; *Acacia aneura* shrublands and low woodlands.

MUR Murchison

Mulga low woodlands, often rich in ephemerals, on outcrop and fine-textured Quaternary alluvial and eluvial surfaces mantling granitic and greenstone strata of the northern part of the Yilgarn Craton. Surfaces associated with the occluded drainage occur throughout with hummock grasslands on Quaternary sandplains, saltbush shrublands on calcareous soils and Halosarcia low shrublands on saline alluvia. Areas of red sandplains with mallee-mulga parkland over hummock grasslands occur in the east.

NAN Nandewar

Hills on Palaeozoic sediments; lithosols and earths; *Eucalyptus albens* woodlands; summer rainfall.

NCP Naracoorte Coastal Plain

A broad coastal plain of Tertiary and Quaternary sediments with a regular series of calcareous sand ridges separated by inter-dune swales. Vegetation is dominated by heathy woodlands and mallee shrublands with wet heaths in the inter-dune swales. Now extensively cleared for agriculture

NET New England Tableland

Elevated plateau of hills and plains on Palaeozoic sediments, granites and basalts; dominated by stringy bark/peppermint/box species, including *E. caliginosa, E. nova-anglica, E. melliodora* and *E. blakleyi.*

NK North Kimberley

Dissected plateau of Kimberley Basin. Savanna woodland of Woolybutt and Darwin Stringy bark over high Sorghum grasses and *Plectrachne schinzii* hummock grasses on shallow sandy soils on outcropping Proterozoic siliceous sandstone strata. Savanna woodlands on *Eucalyptus tectifica - E. grandiflora* alliance over high Sorghum grasses on red and yellow earths mantling basic Proterozoic volcanics. Riparian closed forests of paperbark trees and *Pandanus* occur along drainage lines. Extensive Mangal occurs in estuaries and sheltered embayments. Numerous small patches of monsoon rainforest are scattered through the district. Dry hot tropical, sub-humid, summer rainfall.

NNC NSW North Coast

?????????? Humid; hills, coastal plains and sand dunes; *Eucalyptus - Lophostemon confertus* tall open forests, *Eucalyptus* open forests and woodlands, rainforest often with *Araucaria cunninghamii* (complex notophyll and microphyll vine forest), *Melaleuca quinquenervia.* wetlands, and heaths.

NSS NSW South West Slopes

An extensive area of foothills and isolated ranges comprising the lower inland slopes of the Great Dividing Range extending through southern New South Wales to western Victoria. Vegetation consists of wet/damp sclerophyll forests, peppermint forests and box/ironbark woodlands.

NUL Nullarbor

Tertiary limestone plain; subdued arid karst features. Bluebush - Saltbush steppe in central areas; low open woodlands of Myall over bluebush in peripheral areas, including *Myoporum platycarpum* and *E. oleosa* in the east and west. Arid Non-seasonal.

OVP Ord-Victoria Plains

Level to gently undulating plains with scattered hills on Cambrian volcanics and Proterozoic sedimentary rocks; vertosols on plains and predominantly skeletal soils on hills; grassland with scattered Bloodwood and Snappy Gum with spinifex and annual grasses. Dry hot tropical, semi-arid summer rainfall. The lithological mosaic has three main components:

(1) Abrupt Proterozoic and Phanerozoic ranges and scattered hills mantled by shallow sand and loam soils supporting *Triodia* hummock grasslands with sparse low trees.
(2) Cambrian volcanics and limestones form extensive plains with short grass (*Enneapogon* spp.) on dry calcareous soils and medium-height grassland communities (*Astrebla* and *Dichanthium*) on cracking clays. Riparian forests of River Gums fringe drainage lines.
(3) In the south-west, Phanerozoic strata expressed as often lateritised upland sandplains with sparse trees. This component recurs as the Sturt Plateau Region in central Northern Territory.

PCA Pine Creek- Arnhem

(1) PCK Pine Creek: Hilly to rugged terrain on Proterozoic sandstones and siltstones; skeletal soils and shallow, silty profiles; Darwin Boxwood and Round-leaved Bloodwood woodland with sorghum understorey.
(2) ARP Arnhem Plateau: Rugged dissected terrain and plateaux on Proterozoic sandstones; skeletal soils and rock outcrop; variable-barked Bloodwood and Darwin Woollybutt low open forest to woodland with spinifex understorey.

PIL Pilbara

There are four major components to the Pilbara Craton.

(1) Hamersley. Mountainous area of Proterozoic sedimentary ranges and plateaux with Mulga low woodland over bunch grasses on fine textured soils and Snappy Gum over *Triodia brizoides* on skeletal sandy soils of the ranges.
(2) The Fortescue Plains. Alluvial plains and river frontages. Salt marsh, mulga-bunch grass, and short grass communities on alluvial plains. River Gum woodlands fringe the drainage lines. This is the northern limit of Mulga (*Acacia aneura*).
(3) Chichester. Archaean granite and basalt plains supporting shrub steppe characterised by *Acacia pyrifolia* over *Triodia pungens* hummock grasses. Snappy Gum tree steppes occur on ranges.
(4) Roebourne. Quaternary alluvial plains with a grass savanna of mixed bunch and hummock grasses, and dwarf shrub steppe of *Acacia translucens* over *Triodia pungens*. Samphire, *Sporobolus* and Mangal occur on marine alluvial flats. Arid tropical with summer rain.

RIV Riverina

An ancient riverine plain and alluvial fans composed of unconsolidated sediments with evidence of former stream channels. Vegetation consists of river red gum and black box forests, box woodlands, saltbush shrublands, extensive grasslands and swamp communities.

SB Sydney Basin

Mesozoic sandstones and shales; dissected plateaus; forests, woodlands and heaths; skeletal soils, sands and podzolics.

SCP South East Coastal Plain

Undulating Tertiary and Quaternary coastal plains. Vegetation consists of heathy woodlands, dry sclerophyll forests and heathlands.

SEC South East Corner

A series of deeply dissected near coastal ranges composed of Devonian granites and Palaeozoic sediments, inland of a series of gently undulating terraces (piedmont downs) composed of Tertiary sediments and flanked by Quaternary coastal plains, dunefields and

inlets. The regional climate is strongly influenced by the Tasman Sea and the close proximity of the coast to the Great Dividing Range. Vegetation consists of high elevation woodlands, wet and damp sclerophyll forests interspersed with rain-shadow woodlands in the Snowy River Valley. Lowland and coastal sclerophyll forests, woodlands, warm temperate rainforest and coastal communities occur in the lower areas.

SEQ South East Queensland

Metamorphic and acid to basic volcanic hills and ranges (Beenleigh, D'Aguilar, Gympie, Yarraman Blocks) sediments of the Moreton, Nambour and Maryborough Basins, extensive alluvial valleys and Quaternary coastal deposits including high dunes. Humid. Eucalyptus-Lophostemon-Syncarpia tall open forests, Eucalyptus open forests and woodlands, rainforests often with *Araucaria cunninghamii* emergents (complex notophyll and microphyll), *Melaleuca quinquenervia* wetlands and Banksia low woodlands and heaths.

SEH South Eastern Highlands

Steep dissected and rugged ranges extending across southern and eastern Victoria and southern NSW. Geology predominantly Palaeozoic rocks and Mesozoic rocks. Vegetation predominantly wet and dry sclerophyll forests, woodland, minor cool temperate rainforest and minor grassland and herbaceous communities.

SSD Simpson - Strzelecki Dunefields

Arid dunefields and sandplains with sparse shrubland and spinifex hummock grassland, and cane grass on deep sands along dune crests

STP Stony Plains
Arid stony silcrete tablelands and gibber and gypsum plains with sparse low chenopod shrublands on duplex soils and calcareous earths

STU Sturt Plateau
Gently undulating plains on lateritised Cretaceous sandstones; neutral sandy red and yellow earths; variable-barked Bloodwood woodland with spinifex understorey.

SWA Swan Coastal Plain
Low lying coastal plain, mainly covered with woodlands. It is dominated by Banksia or Tuart on sandy soils, *Allocasuarina obesa* on outwash plains, and paperbark in swampy areas. In the east, the plain rises to duricrusted Mesozoic sediments dominated by Jarrah woodland. Warm Mediterranean. Three phases of marine sand dune development provide relief. The outwash plains, once dominated by *A. obesa*-marri woodlands and *Melaleuca* shrublands, are extensive only in the south.

TAN Tanami Desert
Mainly red Quaternary sandplains overlying Permian and Proterozoic strata which are exposed locally as hills and ranges. The sandplains support mixed shrub steppes of *Hakea suberea*, desert bloodwoods, acacias and grevilleas over *Triodia pungens* hummock grasslands. Wattle scrub over *T. pungens* hummock grass communities occur on the ranges. Alluvial and lacustrine calcareous deposits occur throughout. In the north they are associated with Sturt Creek drainage, and support *Crysopogon* and *Iseilema* short-grasslands often as savannas with River Gum. Arid tropical with summer rain.

TEC Top End Coastal
(1) ARC Arnhem Coast: Gently undulating plains and low plateaux on lateritised Cretaceous sandstones and siltstones; sandy red and yellow earths and siliceous sands; Darwin Woollybutt/Darwin Stringybark open forest with sorghum understorey.
(2) DAC Darwin Coastal: Gently undulating plains on lateritised Cretaceous sandstones and siltstones; sandy and loamy red and yellow earths and siliceous sands; Darwin Woollybutt/Darwin Stringybark open forest with sorghum understorey, and flood plains on recent alluvium; vertosols, sedgeland and grassland.
(3) TIW Tiwi-Cobourg: Gently sloping terrain on lateritised Cretaceous sandstones and siltstones; sandy and loamy red and yellow earths and siliceous sands; Darwin

Woollybutt/Darwin Stringybark/Melville Island Bloodwood open forest with sorghum understorey.

TM Tasmanian Midlands

Dry-moist subhumid cool inland lowland plain underlain by Tertiary basalts, Jurassic dolerite, Permo-Triassic sandstones, and recent alluvium. Heavily modified vegetation comprising grasslands and grassy woodlands on deep loams and alluvium. Land use primarily agriculture (grazing) with some forestry.

VB Victoria Bonaparte

Phanerozoic strata of the Bonaparte Basin in the north-western part are mantled by Quaternary marine sediments supporting Samphire - *Sporobolus* grasslands and mangal, and by red earth plains and black soil plains with an open savanna of high grasses. Plateaux and abrupt ranges of Proterozoic sandstone, known as the Victoria Plateau, occur in the south and east, and are partially mantled by skeletal sandy soils with low tree savannas and hummock grasslands. In the south east are limited areas of gently undulating terrain on a variety of sedimentary rocks supporting low Snappy Gum over hummock grasslands and also of gently sloping floodplains supporting *Melaleuca minutifolia* low woodland over annual sorghums. Dry hot tropical, semi-arid summer rainfall.

VM Victorian Midlands

An extensive area of foothills and isolated ranges comprising the lower inland slopes of the Great Dividing Range extending from North-eastern Victoria to Casterton in Western Victoria. Vegetation consists of wet/damp sclerophyll forests, peppermint forests and box/ironbark woodlands.

VVP Victorian Volcanic Plain

An extensive basaltic plain with numerous volcanic cones and eruption points. Vegetation formerly consisted of damp sclerophyll forests, woodlands and grasslands, now mostly cleared.

WAR Warren

Dissected undulating country of the Leeuwin Complex and Albany Orogen with loamy soils supporting Karri forest, laterites supporting Jarrah-Marri forest, leached sandy soils in depressions and plains supporting paperbark/sedge swamps, and Holocene marine dunes with *Agonis flexuosa* woodlands. Moderate Mediterranean.

WOO Woolnorth

Humid warm coastal plains and deeply dissected lowland hills, with soils from deep basaltic loams to acid sandy coastal soils. Complexes of Cambrian and Pre Cambrian metasediments, basic-intermediate volcanics, and post-Carboniferous sediments covered with wet sclerophyll, dry sclerophyll and coastal heaths with some rainforest, swamp forest and scrub. Land use primarily forestry and agriculture (cropping).

WSW West and South West

Perhumid cold lowlands, low hills and low ranges, comprising a complex mosaic of rainforest, scrub and buttongrass moorlands. Soils generally oligotrophic acid peat. Principal land uses are conservation, mining and forestry.

WT Wet Tropics

Tropical wet coastal ranges and plains; rainforest and forests.

YAL Yalgoo

Mulga, Callitris-*E. salubris*, and Bowgada open woodlands and scrubs on earth to sandy-earth plains in the western Yilgarn Craton. Rich in ephemerals. This is an inter-zone. Arid to semi-arid warm Mediterranean.

APPENDIX 2:

Relative area of each ibra region in each State and Territory

IBRA Code	State / Territory	iBRA Mapping Code	Area of each IBRA region in each State / Territory (Sq Km)
AA	ACT	6	403
AA	NSW	6	4285
AA	VIC	6	7030
AW	WA	70	94148
BBN	QLD	22	112780
BBS	NSW	76	52458
BBS	QLD	76	227038
BEN	TAS	11	8645
BHC	SA	25	18833
BHC	NSW	25	38222
BRT	NT	48	71809
CA	NT	77	36898
CAR	WA	54	91960
CH	TAS	16	11032
CHC	NSW	21	14289
CHC	NT	21	22806
CHC	SA	21	56836
CHC	QLD	21	211612
CK	WA	55	76907
CMC	QLD	43	14343
COO	WA	56	125398
CP	NSW	24	73501
CR	NT	28	25993
CR	SA	28	26146
CR	WA	28	44922
CYP	QLD	40	115477
DAB	NT	73	20921
DE	TAS	15	4203
DEU	QLD	45	68816
DL	WA	58	89595
DRP	QLD	17	12933
DRP	NSW	17	92578
EIU	QLD	44	128075
ESP	WA	57	35370
EYB	SA	35	60661
FIN	SA	29	19452
FIN	NT	29	55705
FOR	SA	37	77490
FRE	TAS	13	6414
FUR	VIC	9	424
FUR	TAS	9	1948
GAS	WA	53	181273

Appendix 2 (Contd)

IBRA Code	State / Territory	IBRA Mapping Code	Area of each IBRA region in each State / Territory (Sq Km)
GAW	SA	31	60308
GD	WA	59	155530
GFU	QLD	46	6380
GFU	NT	46	112595
GS	WA	67	38272
GSD	NT	60	100625
GSD	WA	60	293974
GUC	QLD	72	119
GUC	NT	72	27687
GUP	NT	39	834
GUP	QLD	39	210750
GVD	WA	32	211188
GVD	SA	32	212563
HAM	SA	34	565
HAM	WA	34	11670
JF	WA	61	46078
LB	SA	36	23752
LSD	WA	63	109613
MAC	NT	47	36986
MAL	WA	64	79874
MDD	SA	1	47103
MDD	VIC	1	65981
MDD	NSW	1	84396
MGD	NT	41	92323
MGD	QLD	41	227465
MII	NT	38	164
MII	QLD	38	66422
ML	NSW	18	65814
ML	QLD	18	192036
MUR	WA	65	278360
NAN	QLD	23	6292
NAN	NSW	23	21030
NCP	VIC	2	5217
NCP	SA	2	23688
NET	QLD	26	1416
NET	NSW	26	27931
NK	WA	66	87017
NNC	QLD	27	2604
NNC	NSW	27	58189
NSS	VIC	7	3404
NSS	NSW	7	80874

Appendix 2 (Contd)

IBRA Code	State / Territory	IBRA Mapping Code	Area of each IBRA region in each State / Territory (Sq Km)
NUL	SA	33	59525
NUL	WA	33	135422
OVP	WA	51	54633
OVP	NT	51	70544
PCA	NT	75	51576
PIL	WA	68	179287
RIV	VIC	8	21466
RIV	NSW	8	69068
SB	NSW	20	36655
SCP	VIC	4	18813
SEC	NSW	10	13459
SEC	VIC	10	14018
SEH	ACT	5	1960
SEH	VIC	5	31845
SEH	NSW	5	48771
SEQ	QLD	74	68726
SSD	NSW	19	20953
SSD	QLD	19	34347
SSD	NT	19	105996
SSD	SA	19	116580
STP	NT	30	1707
STP	SA	30	179885
STU	NT	50	99719
SWA	WA	69	15181
TAN	WA	49	26908
TAN	NT	49	289747
TEC	NT	79	68681
TM	TAS	12	7762
VB	WA	52	19087
VB	NT	52	53882
VM	VIC	78	37025
VVP	VIC	3	22139
WAR	WA	62	10420
WOO	TAS	80	9645
WSW	TAS	14	18269
WT	QLD	42	18497
YAL	WA	71	36115
Grand Total			**7685032**

APPENDIX 3:

Details of State and Territory regions, IBRA regions and which regions are shared or restricted between jurisdictions.

State or Territory	State and Territory (S/T) region name	S/T Code	IBRA region name	IBRA Code	IBRA Map Code	Restricted (R) or shared (S)
Vic	East Gippsland	16	South East Corner	SEC	10	S
Vic	Eastern Highlands	11	South Eastern Highlands	SEH	5	S
Vic	Gippsland Highlands	13	South Eastern Highlands	SEH	5	S
Vic	Gippsland Plain	12	South East Coastal Plain	SCP	4	R
Vic	Grampians	5	Victorian Midlands	VM	78	R
Vic	Lowan Mallee	2	Murray-Darling Depression	MDD	1	S
Vic	Midlands	7	Victorian Midlands	VM	78	R
Vic	Murray Mallee	1	Murray-Darling Depression	MDD	1	S
Vic	Otway Plain	9	South East Coastal Plain	SCP	4	R
Vic	Otway Range	10	South Eastern Highlands	SEH	5	S
Vic	Riverina	6	Riverina	RIV	8	S
Vic	Snowfields	15	Australian Alps	AA	6	S
Vic	Victorian Volcanic Plain	8	Victorian Volcanic Plain	VVP	3	R
Vic	Wannon	4	Murray-Darling Depression	MDD	1	S
Vic	Wannon	4	Naracoorte Coastal Plain	NCP	2	S
Vic	Wannon	4	Victorian Midlands	VM	78	R
Vic	Wilsons Promontory	14	Furneaux	FUR	9	S
Vic	Wimmera	3	Murray-Darling Depression	MDD	1	S
Tas	King Island	1	Woolnorth	WOO	80	R
Tas	Furneaux Group	2	Furneaux	FUR	9	S
Tas	North West	3	Woolnorth	WOO	80	R
Tas	North Coast and Hills	4A	Woolnorth	WOO	80	R
Tas	North Midlands	4B	Tasmanian Midlands	TM	12	R
Tas	North East Lowlands	5	Ben Lomond	BEN	11	R
Tas	North East Highlands	6	Ben Lomond	BEN	11	R
Tas	East Coast Tiers	7A	Freycinet	FRE	13	R
Tas	East Southern Midlands	7B	Tasmanian Midlands	TM	12	R
Tas	Centre	8	Central Highlands	CH	16	R
Tas	West (North)	9A	West and South West	WSW	14	R
Tas	West (South)	9B	West and South West	WSW	14	R
Tas	South (Quartzite)	10A	West and South West	WSW	14	R
Tas	South (Dolerite)	10B	D'Entrecasteaux	DE	15	R
ACT	Australian Alps		Australian Alps	AA	6	S
ACT	Southern Tablelands		South Eastern Highlands	SEH	5	S
NSW	Australian Alps	AUA	Australian Alps	AA	6	S
NSW	Broken Hill Complex	BHC	Broken Hill Complex	BHC	25	S
NSW	Cobar Peneplain	COP	Cobar Peneplain	CP	24	R
NSW	Darling Riverine Plains	DRP	Darling Riverine Plains	DRP	17	S
NSW	Murray Riverine Plains	MRP	Riverina	RIV	8	S

Appendix 3 (Contd)

State or Territory	State and Territory (S/T) region name	S/T Code	IBRA region name	IBRA Code	IBRA Map Code	Restricted (R) or shared (S)
NSW	Murray-Darling Depression	MDD	Murray-Darling Depression	MDD	1	S
NSW	New England Tableland	NET	New England Tableland	NET	26	S
NSW	North Coast	NC	NSW North Coast	NNC	27	S
NSW	North Western Sands	NWS	Simpson-Strzelecki Dunefields	SSD	19	S
NSW	North western Slopes	NWS	Channel Country	CHC	21	S
NSW	North western Slopes	NWS	Nandewar	NAN	23	S
NSW	Northern Sandstones	NS	Brigalow Belt South	BBS	76	S
NSW	South East Coast	SEC	South East Corner	SEC	10	S
NSW	South western Slopes	SWS	NSW South western Slopes	NSS	7	S
NSW	Southern & Central Tablelands	SCT	South Eastern Highlands	SEH	5	S
NSW	Sydney Basin	SYB	Sydney Basin	SB	20	R
NSW	Tibooburra Downs	TD	Channel Country	CHC	21	S
NSW	Warrego Fan	WF	Mulga Lands	ML	18	S
NSW	White Cliffs Plateau	WCP	Mulga Lands	ML	18	S
NSW	White Cliffs Plateau	NWS	Mulga Lands	ML	18	S
SA	Central Mallee Plains and Dunes	4/3	Eyre and Yorke Blocks	EYB	35	R
SA	Central Mallee Plains and Dunes	4/3	Gawler	GAW	31	R
SA	Central Mallee Plains and Dunes	4/3	Great Victoria Desert	GVD	32	S
SA	Central Mallee Plains and Dunes	4/3	Nullarbor	NUL	33	S
SA	Central Salt Lakes and Plateaux	7/3	Flinders and Olary Ranges	FOR	37	R
SA	Central Salt Lakes and Plateaux	7/3	Gawler	GAW	31	R
SA	Central Salt Lakes and Plateaux	7/3	Great Victoria Desert	GVD	32	S
SA	Central Salt Lakes and Plateaux	7/3	Stony Plains	STP	30	S
SA	Central Tablelands	8/3	Central Ranges	CR	28	S
SA	Central Tablelands	8/3	Finke	FIN	29	S
SA	Central Tablelands	8/3	Flinders and Olary Ranges	FOR	37	R
SA	Central Tablelands	8/3	Great Victoria Desert	GVD	32	S
SA	Central Tablelands	8/3	Simpson-Strzelecki Dunefields	SSD	19	S
SA	Central Tablelands	8/3	Stony Plains	STP	30	S
SA	Frances Plateau	1/5	Murray Darling Depression	MDD	1	S
SA	Frances Plateau	1/5	Naracoorte Coastal Plain	NCP	2	S
SA	Gawler Uplands	7/1	Eyre and Yorke Blocks	EYB	35	R
SA	Gawler Uplands	7/1	Flinders and Olary Ranges	FOR	37	R
SA	Gawler Uplands	7/1	Gawler	GAW	31	R
SA	Gawler Uplands	7/1	Great Victoria Desert	GVD	32	S
SA	Great Victoria Desert	7/5	Eyre and Yorke Blocks	EYB	35	R
SA	Great Victoria Desert	7/5	Gawler	GAW	31	R
SA	Great Victoria Desert	7/5	Stony Plains	STP	30	S
SA	Gulf Plains	4/6	Eyre and Yorke Blocks	EYB	35	R

Appendix 3 (Contd)

State or Territory	State and Territory (S/T) region name	S/T Code	IBRA region name	IBRA Code	IBRA Map Code	Restricted (R) or shared (S)
SA	Great Victoria Desert	7/5	Great Victoria Desert	GVD	32	S
SA	Great Victoria Desert	7/5	Nullarbor	NUL	33	S
SA	Gulf Plains	4/6	Flinders and Olary Ranges	FOR	37	R
SA	Gulf Plains	4/6	Lofty Block	LB	36	R
SA	Kangaroo Island	3/1	Lofty Block	LB	36	R
SA	Kingoonya Plains and Dunes	7/4	Flinders and Olary Ranges	FOR	37	R
SA	Kingoonya Plains and Dunes	7/4	Gawler	GAW	31	R
SA	Kingoonya Plains and Dunes	7/4	Great Victoria Desert	GVD	32	S
SA	Kingoonya Plains and Dunes	7/4	Stony Plains	STP	30	S
SA	Lake Eyre Basin	8/4	Broken Hill Complex	BHC	25	S
SA	Lake Eyre Basin	8/4	Channel Country	CHC	21	S
SA	Lake Eyre Basin	8/4	Flinders and Olary Ranges	FOR	37	R
SA	Lake Eyre Basin	8/4	Simpson-Strzelecki Dunefields	SSD	19	S
SA	Lake Eyre Basin	8/4	Stony Plains	STP	30	S
SA	Mid North Wheatlands	3/3	Eyre and Yorke Blocks	EYB	35	13
SA	Mid North Wheatlands	3/3	Flinders and Olary Ranges	FOR	37	R
SA	Mid North Wheatlands	3/3	Lofty Block	LB	36	R
SA	Mid North Wheatlands	3/3	Murray Darling Depression	MDD	1	S
SA	Mt Gambier Volcanics	1/3	Naracoorte Coastal Plain	NCP	2	S
SA	Murray Lakes	2/1	Lofty Block	LB	36	R
SA	Murray Lakes	2/1	Murray Darling Depression	MDD	1	S
SA	Murray Lakes	2	Naracoorte Coastal Plain	NCP	2	S
SA	Northern Calcarenite Ridges and Plains	2/2	Murray Darling Depression	MDD	1	S
SA	Northern Calcarenite Ridges and Plains	2/2	Naracoorte Coastal Plain	NCP	2	S
SA	Northern Complex	6/2	Flinders and Olary Ranges	FOR	37	R
SA	Northern Complex	6/2	Stony Plains	STP	30	S
SA	Northern Myall Plains	4/4	Eyre and Yorke Blocks	EYB	35	R
SA	Northern Myall Plains	4/4	Gawler	GAW	31	R
SA	Northern Uplands and Alluvial Plains	8/1	Central Ranges	CR	28	S
SA	Northern Uplands and Alluvial Plains	8/1	Finke	FIN	29	S
SA	Northern Uplands and Alluvial Plains	8/1	Great Victoria Desert	GVD	32	S
SA	Nullarbor Plain	7/6	Eyre and Yorke Blocks	EYB	35	R
SA	Nullarbor Plain	7/6	Great Victoria Desert	GVD	32	S
SA	Nullarbor Plain	7/6	Hampton	HAM	34	S
SA	Nullarbor Plain	7/6	Nullarbor	NUL	33	S
SA	Olary Spur	5/2	Broken Hill Complex	BHC	25	S
SA	Olary Spur	5/2	Flinders and Olary Ranges	FOR	37	R
SA	Olary Spur	5/2	Lofty Block	LB	36	R

Appendix 3 (Contd)

State or Territory	State and Territory (S/T) region name	S/T Code	IBRA region name	IBRA Code	IBRA Map Code	Restricted (R) or shared (S)
SA	Peninsula Uplands	3/2	Lofty Block	LB	36	R
SA	Peninsula Uplands	3/2	Murray Darling Depression	MDD	1	S
SA	Peninsula Uplands	3/2	Naracoorte Coastal Plain	NCP	2	S
SA	South Coast	1/1	Naracoorte Coastal Plain	NCP	2	S
SA	South East Mallee Heathlands	2/3	Lofty Block	LB	36	R
SA	South East Mallee Heathlands	2/3	Murray Darling Depression	MDD	1	S
SA	South East Mallee Heathlands	2/3	Naracoorte Coastal Plain	NCP	2	S
SA	Southern Basins and Ranges	6/1	Broken Hill Complex	BHC	25	S
SA	Southern Basins and Ranges	6/1	Flinders and Olary Ranges	FOR	37	R
SA	Southern Basins and Ranges	6/1	Lofty Block	LB	36	R
SA	Southern Basins and Ranges	6/1	Simpson-Strzelecki Dunefields	SSD	19	S
SA	Southern Coastal Plains	1/2	Naracoorte Coastal Plain	NCP	2	S
SA	Southern Frome Basin	5/3	Broken Hill Complex	BHC	25	S
SA	Southern Frome Basin	5/3	Flinders and Olary Ranges	FOR	37	R
SA	Southern Frome Basin	5/3	Simpson-Strzelecki Dunefields	SSD	19	S
SA	Southern Highland and Plains	4/1	Eyre and Yorke Blocks	EYB	35	R
SA	Southern Olary Plains	5/1	Broken Hill Complex	BHC	25	S
SA	Southern Olary Plains	5/1	Flinders and Olary Ranges	FOR	37	R
SA	Southern Olary Plains	5/1	Lofty Block	LB	36	R
SA	Southern Olary Plains	5/1	Murray Darling Depression	MDD	1	S
SA	Southern Wetlands and Dune Ranges	1/4	Murray Darling Depression	MDD	1	S
SA	Southern Wetlands and Dune Ranges	1/4	Naracoorte Coastal Plain	NCP	2	S
SA	Southern Yorke Peninsula	4/5	Eyre and Yorke Blocks	EYB	35	R
SA	Torrens Depression	7/2	Eyre and Yorke Blocks	EYB	35	R
SA	Torrens Depression	7/2	Flinders and Olary Ranges	FOR	37	R
SA	Torrens Depression	7/2	Gawler	GAW	31	R
SA	Torrens Depression	7/2	Lofty Block	LB	36	R
SA	Torrens Depression	7/2	Stony Plains	STP	30	S
SA	Upper Murray Lands	2/4	Flinders and Olary Ranges	FOR	37	R
SA	Upper Murray Lands	2/4	Lofty Block	LB	36	R
SA	Upper Murray Lands	2/4	Murray Darling Depression	MDD	1	S
SA	West Coast	4/2	Eyre and Yorke Blocks	EYB	35	R
SA	Western Sandplains	8/2	Central Ranges	CR	28	S
SA	Western Sandplains	8/2	Finke	FIN	29	S
SA	Western Sandplains	8/2	Great Victoria Desert	GVD	32	S

Appendix 3 (contd)

State or Territory	State and Territory (S/T) region name	S/T Code	IBRA region name	IBRA Code	IBRA Map Code	Restricted (R) or shared (S)
SA	Western Sandplains	8/2	Nullarbor	NUL	33	S
SA	Western Sandplains	8/2	Stony Plains	STP	30	S
WA	Avon Wheatbelt (Avon)	WHE	Avon Wheatbelt	AW	70	R
WA	Carnarvon (Carnarvon)	CAR	Carnarvon	CAR	54	R
WA	Central Kimberley (Fitzgerald)	CK	Central Kimberley	CK	55	R
WA	Central Ranges (Giles)	CR	Central Ranges	CR	28	S
WA	Coolgardie (Coolgardie)	COOL	Coolgardie	COO	56	R
WA	Dampierland (Dampier)	FIT	Dampierland	DL	58	R
WA	Esperance Plains (Eyre)	ESP	Esperance Plains	ESP	57	R
WA	Gascoyne (Ashurton)	ASH	Gascoyne	GAS	53	R
WA	Geraldton Sandplains (Irwin)	NS	Geraldton Sandplains	GS	67	R
WA	Gibson Desert (Gibson)	GD	Gibson Desert	GD	59	R
WA	Great Sandy Desert (Canning)	GSD	Great Sandy Desert	GSD	60	S
WA	Great Victoria Desert (Helms)	GVD	Great Victoria Desert	GVD	32	S
WA	Hampton (Eucla)	NUL	Nullarbor	HAM	34	S
WA	Jarrah Forest (Darling)	JAR	Jarrah Forest	JF	61	R
WA	Little Sandy Desert (Keartland)	LSD	Little Sandy Desert	LSD	63	R
WA	Mallee (Roe)	ROE	Mallee	MAL	64	R
WA	Murchison (Austin)	MUR	Murchison	MUR	65	R
WA	Northern Kimberley (Gardiner)	NK	Northern Kimberley	NK	66	R
WA	Nullarbor (Eucla)	NUL	Hampton	NUL	33	S
WA	Ord-Victoria Plains (Hall)	OR	Ord-Victoria Plains	OVP	51	S
WA	Pilbara (Fortesque)	PIL	Pilbara	PIL	68	R
WA	Swan Coastal Plain (Darling)	SWAN	Swan Coastal Plain	SWA	69	R
WA	Tanami (Tanami)	TAN	Tanami	TAN	49	S
WA	Victoria-Bonaparte (Gardiner)	VP	Victoria-Bonaparte	VB	52	S
WA	Warren (Darling)	WAR	Warren	WAR	62	R
WA	Yalgoo (Austin)	YAL	Yalgoo	YAL	71	R
NT	Arnhem Coast	ARC	Top End Coastal	TEC	79	R
NT	Arnhem Plateau	ARP	Pine Creek Arnhem	PCA	75	R
NT	Burt Plain	BRT	Burt Plain	BRT	48	R
NT	Central Arnhem	CA	Central Arnhem	CA	77	R
NT	Central Ranges	CR	Central Ranges	CR	28	S
NT	Channel Country Complex	CHC	Channel Country Complex	CHC	21	S
NT	Daly Basin	DAB	Daly Basin	DAB	73	R
NT	Darwin Coastal	DAC	Top End Coastal	TEC	79	R
NT	Finke Plains	FIN	Finke Plains	FIN	29	S
NT	Gibber Plains	STP	Gibber Plains	STP	30	S
NT	Great Sandy Desert	GSD	Great Sandy Desert	GSD	60	S
NT	Gulf Coastal	GUC	Gulf Coastal	GUC	72	R
NT	Gulf Falls	GFU	Gulf Fall and Uplands	GFU	46	S

Appendix 3 (contd)

State or Territory	State and Territory (S/T) region name	S/T Code	IBRA region name	IBRA Code	IBRA Map Code	Restricted (R) or shared (S)
NT	Gulf Plains	GUP	Gulf Plains	GUP	39	S
NT	MacDonnell Ranges	MAC	MacDonnell Ranges	MAC	47	R
NT	Mitchell Grass Plains	MGD	Mitchell Grass Plains	MGD	41	S
NT	Ord-Victoria	OVP	Ord-Victoria	OVP	51	S
NT	Pine Creek	PCK	Pine Creek Arnhem	PCA	75	R
NT	Simpson - Strzelecki Desert	SSD	Simpson - Strzelecki Desert	SSD	19	S
NT	Sturt Plateau	STU	Sturt Plateau	STU	50	R
NT	Tanami	TAN	Tanami	TAN	49	S
NT	Tiwi-Cobourg	TIW	Top End Coastal	TEC	79	R
NT	Victoria-Bonaparte	VB	Victoria-Bonaparte	VB	52	S
Qld	Brigalow Belt	BRB	Nandewar	NAN	23	S
Qld	Brigalow Belt	BRB	Brigalow Belt North	BBN	22	R
Qld	Brigalow Belt	BRB	Brigalow Belt South	BBS	76	S
Qld	Brigalow Belt	BRB	Darling Riverine Plains	DRP	17	S
Qld	Cape York Peninsula	CYP	Cape York Peninsula	CYP	40	R
Qld	Central Mackay Coast	CMC	Central Mackay Coast	CMC	43	R
Qld	Channel Country	CHC	Channel Country	CHC	21	S
Qld	Channel Country	CHC	Simpson - Strzelecki Desert	SSD	19	S
Qld	Desert Uplands	DEU	Desert Uplands	DEU	45	R
Qld	Einasleigh Uplands	EIU	Einasleigh Uplands	EIU	44	R
Qld	Gulf Plains	GUP	Gulf Plains	GUP	39	S
Qld	Mitchell Grass Downs	MGD	Mitchell Grass Downs	MGD	41	S
Qld	Mulga Lands	MUL	Mulga Lands	ML	18	S
Qld	New England Tableland	NET	New England Tableland	NET	26	S
Qld	North West Highlands	NWH	Gulf Fall and Uplands	GFU	46	S
Qld	North West Highlands	NWH	Mount Isa Inlier	MII	38	R
Qld	South Eastern Queensland	SEQ	South Eastern Queensland	SEQ	74	R
Qld	Wet Tropics	WT	Wet Tropics	WT	42	R

APPENDIX 4:

Reservation status and index of bias of each IBRA region by State and Territory

Region	IBRA Region	Reservation status (% area)	Bias
Victoria			
Murray Darling Depression	MDD	>10%	Moderate
Naracoorte Coastal Plain	NCP	>10%	Low
Victorian Volcanic Plain	VVP	1-5%	High
South East Coastal Plain	SCP	>10%	Moderate
South Eastern Highlands	SEH	>10%	Moderate
Australian Alps	AA	>10%	Low
Victorian Midlands	VM	5-10%	Moderate
Riverina	RIV	1-5%	Moderate
Furneaux	FUR	>10%	Nil
South East Corner	SEC	>10%	Low
Tasmania			
Woolnorth	WOO	1-5%	Moderate
Ben Lomond	BEN	1-5%	Moderate
Midlands	TM	<1%	High
Freycinet	FRE	5-10%	Low-Moderate
West and South West	WSW	>10%	Nil
D'Entrecasteaux	DE	>10%	Low-Moderate
Central Highlands	CH	>10%	Low-Moderate
Furneaux	FUR	1-5%	Moderate
New South Wales			
Australian Alps	AA	>10%	Low
Broken Hill Complex	BHC	1-5%	High
North Coast	NNC	5-10%	Moderate
Cobar Peneplain	CP	1-5%	High
Darling Riverine Plains	DRP	<1%	High
Murray Riverine Plains	RIV	<1%	High
Murray-Darling Depression	MDD	1-5%	Moderate
New England Tableland	NET	1-5%	High
North Western Sands	SSD	1-5%	High
North western Slopes	NAN	1-5%	High
Northern Sandstones	BRB	1-5%	High
South Eastern Coast	SEC	>10%	Moderate
South Western Slopes	NSS	<1%	High
Southern & Central Tablelands	SEH	5-10%	High
Sydney Basin	SB	>10%	Low
Tibooburra Downs	CHC	>10%	Moderate
Warrego Fan	ML	0%	-
White Cliffs Plateau	ML	1-5%	High
Australian Capital Territory			
Australian Alps	AA	>10%	Nil
South Eastern Highlands	SEH	>10%	Low

Appendix 4 (contd)

South Australia

Region	IBRA Region	Reservation Status (% Area)	Bias	Comment
Broken Hill Complex	BHC	<1% (0.1%)	High	1 of 9 environmental associations included no regional reserves
Central Ranges	CR	<1% (0)	Nil reserved	10 environmental associations
Channel Country	CHC	>10% (23.92%)	Moderate	5 of 5 environmental associations included (but mostly in 2 of the 5). if regional reserves excluded then reservation nil
Coorong Coastal Plains	NCP	5 to <10%(5.35 %)	High	32 of 51 environmental associations included
Eyre -Yorke Block	EYB	5 to <10%(6.76 %)	High	30 of 75 environmental associations included
Finke	FNK	<1% (0)	Nil reserved	3 environmental associations
Flinders and Olary Ranges	FOR	>10%(10.18 %)	High	14 of 49 environmental associations included but most consists of the bed of Lake Torrens Regional reserve component negligible
Gawler	GAW	5 to <10% (9.71%)	High	20 of 41 environmental associations included; Mostly lakebeds. If regional reserves excluded, same representation of environmental associations but % of area reserved decreases to 8.28%
Great Victoria Desert	GVD	>10%(25.7 %)	Moderate	9 of 19 environmental associations included; If regional reserves excluded, same representation of environmental associations but % of area reserved decreases to 16.43%
Hampton	HAM	>10%(100%)	Nil	Small portion of a mostly Western Australian region
Lofty Block	LB	5 to <10%(6.46 %)	High	20 of 47 environmental associations included
Murray-Darling Depression	MDD	>10%(14.61 %)	High	14 of 36 environmental associations included If regional reserves excluded, same representation of environmental associations but % of area reserved decreases to 13.03%
Nullarbor	NUL	>10%(58.13 %)	Moderate	4 of 6 environmental associations included; If regional reserves excluded only 2 of 6 environmental associations represented and % of area reserved decreases to 14.95%
Simpson-Strzelecki Dunefields	SSD	>10% (53.39%)	Low	5 of 5 environmental associations included. If regional reserves excluded then 3 of 5 environmental associations are represented incorporating 18.43% of the region in reserves
Stony Plains	STP	5 to <10% (5.27%)	High	9 of 35 environmental associations included If regional reserves excluded then 8 of 35 environmental associations are represented incorporating 4.61% of the region in reserves

Appendix 4 (contd)

Western Australia

Region	IBRA Region	Reservation status (% area)	Bias	Comment
Avon Wheatbelt	AW	<1% <5%	High Moderate	If the >2000 ha. threshold is considered; if all NCR's considered. Quaternary alluvial surfaces are poorly represented and nearly all cleared.
Carnarvon	CAR	<10%	Moderate	Samphire, snakewood and mangrove communities virtually unrepresented.
Central Kimberley	CK	<5%	High	Only significant reserve is in the n-w extremity of the district.
Central Ranges	CR	0%	-	
Coolgardie	COO	<10%	Moderate	Greenstone surfaces, and Quaternary alluvial surfaces derived from granitic sequences, are mostly unrepresented.
Dampierland	DL	<5%	High	Components 1 and 2 are poorly represented. Alluvial surfaces poorly represented.
Esperance Plains	ESP	>10%	Low	
Gascoyne	GAS	2%	High	Alluvial plains virtually unrepresented
Geraldton Sandplains	GS	>10%	Moderate	Outwash plains are not represented.
Gibson Desert	GD	>10%	Low	
Great Sandy Desert	GSD	<5%	High	Only significant reserve is on the desert's south-western edge.
Great Victoria Desert	GVD	<10%	Low	
Hampton	HAM	>10%	Moderate	Diversity of the Hampton Range mallee-scrubs, and coastal Mallees and woodlands, are poorly represented.
Jarrah Forest	JF	>10%	Moderate	All 6 regions are represented. Some areas are in transition to reserve.
Little Sandy Desert	LSD	<10%	Moderate	The only existing reserve is on its northern margin, extensive salt lake features are not represented.
Mallee	MAL	>10%	Moderate	Non-saline alluvial Quaternary surfaces extensively cleared.
Murchison	MUR	<1%	High	Qualernary and greenstone surfaces barely represented; Existing reserves all in eastern parl.
North Kimberley	NK	>10%	Low	Mangal is not represenled.
Nullarbor	NUL	>10%	Moderate	Reserve recommendations made already

Appendix 4 (contd)

Western Australia (Contd)

Region	IBRA Region	Reservation status (% area)	Bias	Comment
Ord-Victoria Plains	OVP	<10%	High	Biased away from components 2 and 3 in WA.
Pilbara	PIL	<5%	High	Components 2 and 4 are virtually unrepresented.
Swan Coastal Plain	SWA	4%	High	Outwash plains are not represented.
Tanami Desert	TAN	0%	-	In Western Australian portion.
Victoria-Bonaparte	VB	<10%	Moderate	
Warren	WAR	>10%	Low	
Yalgoo	YAL	<1%	Moderate	Only one significant reserve in eastern end of the district.

Northern Territory

Region	IBRA Region	Reservation status (% area)	Bias	Reserved Area (km)	No. of PAs
Arnhem Coast	ARC	0		0	0
Arnhem Plateau	ARP	>10%	Low	2919	1
Burt Plain	BRT	<1%	High	22	12
Central Arnhem	CAR	0		0	0
Central Ranges	CR	0		0	0
Channel Country Complex	CHC	0		0	0
Daly Basin	DAB	1-5%	High	393	16
Darwin Coastal	DAC	>10%	Moderate	8148	28
Finke Plains	FNK	<1%	High	37	5
Gibber Plains	GPN	0		0	0
Great Sandy Desert	GSD	1-5%	High	1521	2
Gulf Coastal	GUC	<1%	High	51	1
Gulf Upland and Falls	GUF	<1%	High	80	1
Gulf Plains	GUP	0		0	0
MacDonnell Ranges	MAC	>10%	Moderate	3736	17
Mitchell Grass Plains	MGD	<1%	High	551	3
Ord-Victoria	ORV	5-10%	High	3597	4
Pine Creek- Arnhem	PCA	>10%	Low	13195	14
Simpson and Strzelecki Desert	SSD	<1%	High	50	1
Sturt Plateau	STU	<1%	High	56	1
Tanami	TAN	<1%	High	1352	7
Tiwi-Cobourg	TIW	>10%	Moderate	2064	1
Top End Coastal	TEC	>10%	Moderate		
Victoria-Bonaparte	VBT	>10%	Moderate	6844	9

Appendix 4 (contd)

Queensland

Region	IBRA Region	Reservetion status (% area)	Bias	Comments
Brigalow Belt	NAN	<1%	High	
Brigalow Belt	BRB	1-5%	Moderate	
Brigalow Belt	DRP	<1%	Low?	
Cape York Peninsula	CYP	>10%	Low	
Central Mackay Coast	CMC	>10%	Low	
Channel Country	CHC	<1%	Moderate?	
Channel Country	SSD	>10%	Low	
Desert Uplands	DEU	1-5%	Moderate	
Einasleigh Upland	EIU	<1%	Moderate	
Gulf Plains	GUP	1-5%	Moderate	
Mitchell Grass Downs	MGD	<1%	High	
Mulga Lands	ML	1-5%	Low	
New England Tableland	NET	<1%	Moderate	
North-west Highlands	MII	<1%	High	
North-west Highlands	GFU	>10%	Low	
South Eastern Queensland	SEQ	1-5%	Low	
Wet Tropics	WT	>10%	Low	

APPENDIX 5:

List of IBRA regions sorted by ascending mapping code.

IBRA Mapping Code	IBRA Code	IBRA region name
1	MDD	Murray-Darling Depression
2	NCP	Naracoorte Coastal Plain
3	VVP	Victorian Volcanic Plain
4	SCP	South East Coastal Plain
5	SEH	South Eastern Highlands
6	AA	Australian Alps
7	NSS	NSW South western Slopes
8	RIV	Riverina
9	FUR	Furneaux
10	SEC	South East Corner
11	BEN	Ben Lomond
12	TM	Tasmanian Midlands
13	FRE	Freycinet
14	WSW	West and South West
15	DE	D'Entrecasteaux
16	CH	Central Highlands
17	DRP	Darling Riverine Plains
18	ML	Mulga Lands
19	SSD	Simpson-Strzelecki Dunefields
20	SB	Sydney Basin
21	CHC	Channel Country
22	BBN	Brigalow Belt North
23	NAN	Nandewar
24	CP	Cobar Peneplain
25	BHC	Broken Hill Complex
26	NET	New England Tableland
27	NNC	NSW North Coast
28	CR	Central Ranges
29	FIN	Finke
30	STP	Stony Plains
31	GAW	Gawler
32	GVD	Great Victoria Desert
33	NUL	Nullarbor
34	HAM	Hampton
35	EYB	Eyre and Yorke Blocks
36	LB	Lofty Block
37	FOR	Flinders and Olary Ranges
38	MII	Mount Isa Inlier
39	GUP	Gulf Plains
40	CYP	Cape York Peninsula
41	MGD	Mitchell Grass Downs

Appendix 5: (Contd)

IBRA Mapping Code	IBRA Code	IBRA region name
42	WT	Wet Tropics
43	CMC	Central Mackay Coast
44	EIU	Einasleigh Uplands
45	DEU	Desert Uplands
46	GFU	Gulf Fall and Uplands
47	MAC	MacDonnell Ranges
48	BRT	Burt Plain
49	TAN	Tanami
50	STU	Sturt Plateau
51	OVP	Ord-Victoria Plains
52	VB	Victoria Bonaparte
53	GAS	Gascoyne
54	CAR	Carnarvon
55	CK	Central Kimberley
56	COO	Coolgardie
57	ESP	Esperance Plains
58	DL	Dampierland
59	GD	Gibson Desert
60	GSD	Great Sandy Desert
61	JF	Jarrah Forest
62	WAR	Warren
63	LSD	Little Sandy Desert
64	MAL	Mallee
65	MUR	Murchison
66	NK	Northern Kimberley
67	GS	Geraldton Sandplains
68	PIL	Pilbara
69	SWA	Swan Coastal Plain
70	AW	Avon Wheatbelt
71	YAL	Yalgoo
72	GUC	Gulf Coastal
73	DAB	Daly Basin
74	SEQ	South Eastern Queensland
75	PCA	Pine-Creek Arnhem
76	BBS	Brigalow Belt South
77	CA	Central Arnhem
78	VM	Victorian Midlands
79	TEC	Top End Coastal
80	WOO	Woolnorth

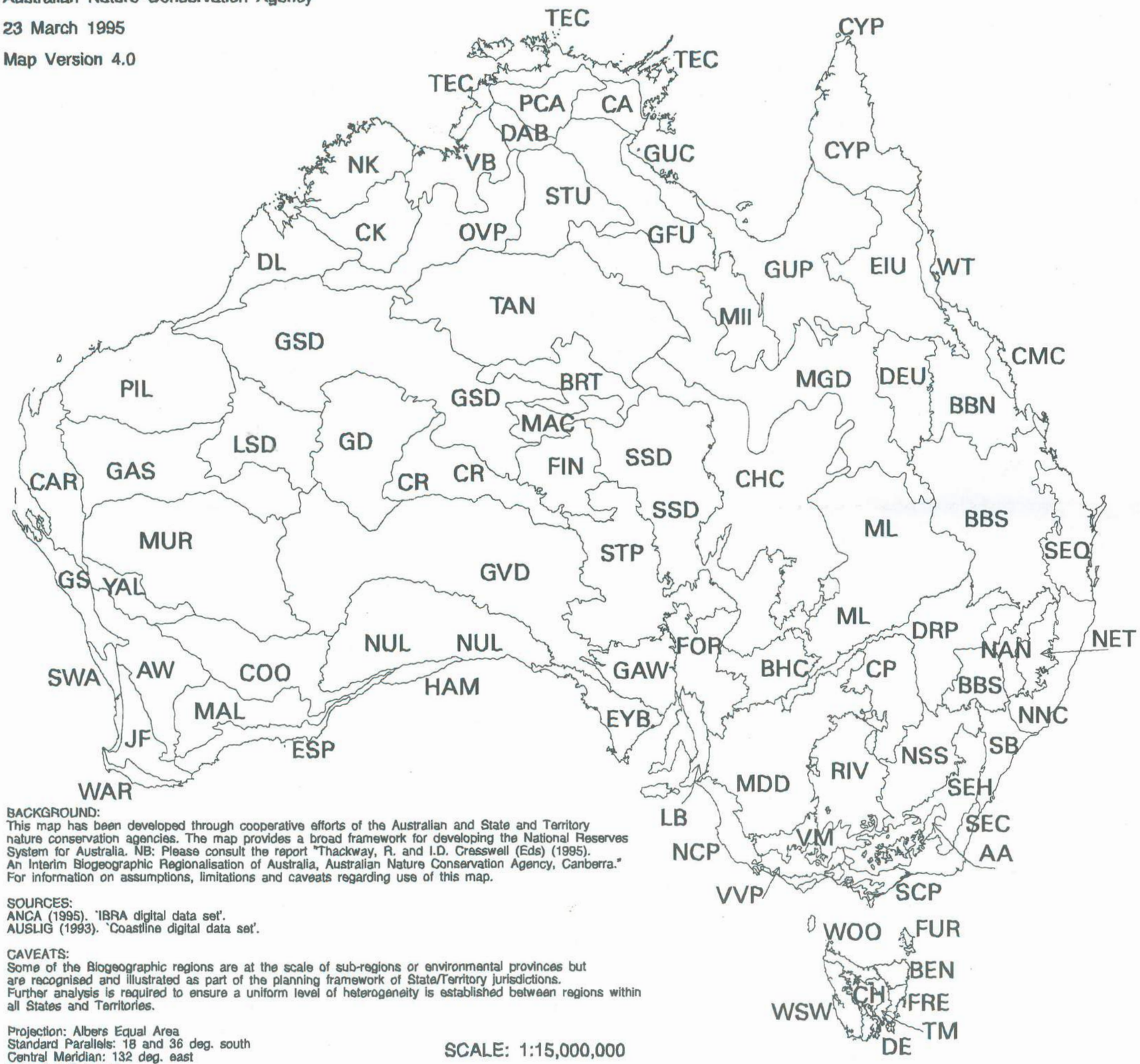
Map 4: Boundaries of IBRA Regions. (Black and white lift out copy of IBRA map suitable for photo-copying.)

Boundaries of IBRA Regions

Australian Nature Conservation Agency

23 March 1995

Map Version 4.0



IBRA CODE: IBRA NAME
AA: Australian Alps
AW: Avon Wheatbelt
BBN: Brigalow Belt North
BBS : Brigalow Belt South
BEN: Ben Lomond
BHC: Broken Hill Complex
BRT: Burt Plain
CA: Central Arnhem
CAR: Carnarvon
CH: Central Highlands
CHC: Channel Country
CK: Central Kimberley
CMC: Central Mackay Coast
COO: Coolgardie
CP: Cobar Peneplain
CR: Central Ranges
CYP: Cape York Peninsula
DAB: Daly Basin
DE: D'Entrecasteaux
DEU: Desert Uplands
DL: Dampierland
DRP: Darling Riverine Plains
EIU: Einasleigh Uplands
ESP: Esperance Plains
EYB: Eyre and Yorke Blocks
FIN: Finke
FOR: Flinders and Olary Ranges
FRE: Freycinet
FUR: Furneaux
GAS: Gascoyne
GAW: Gawler
GD: Gibson Desert
GFU: Gulf Fall and Uplands
GS: Geraldton Sandplains
GSD: Great Sandy Desert
GUC: Gulf Coastal
GUP: Gulf Plains
GVD: Great Victoria Desert
HAM: Hampton
JF: Jarrah Forest
LB: Lofty Block
LSD: Little Sandy Desert
MAC: MacDonnell Ranges
MAL: Mallee
MDD: Murray-Darling Depression
MGD: Mitchell Grass Downs
MII: Mount Isa Inlier
ML: Mulga Lands
MUR: Murchison
NAN: Nandewar
NCP: Naracoorte Coastal Plain
NET: New England Tableland
NK: Northern Kimberley
NNC: NSW North Coast
NSS: NSW South western Slopes
NUL: Nullarbor
OVP: Ord-Victoria Plains
PCA : Pine-Creek Arnhem
PIL: Pilbara
RIV: Riverina
SB: Sydney Basin
SCP: South east Coastal Plain
SEC: South East Corner
SEH: South Eastern Highlands
SEQ : South Eastern Queensland
SSD: Simpson-Strzelecki Dunefields
STP: Stony Plains
STU: Sturt Plateau
SWA: Swan Coastal Plain
TAN: Tanami
TEC: Top End Coastal
TM: Tasmanian Midlands
VB: Victoria Bonaparte
VM : Victorian Midlands
VVP: Victorian Volcanic Plain
WAR: Warren
WOO: Woolnorth
WSW: West and South West
WT: Wet Tropics
YAL: Yalgoo

BACKGROUND:
This map has been developed through cooperative efforts of the Australian and State and Territory nature conservation agencies. The map provides a broad framework for developing the National Reserves System for Australia. NB: Please consult the report "Thackway, R. and I.D. Cresswell (Eds) (1995). An Interim Biogeographic Regionalisation of Australia, Australian Nature Conservation Agency, Canberra." For information on assumptions, limitations and caveats regarding use of this map.

SOURCES:
ANCA (1995). 'IBRA digital data set'.
AUSLIG (1993). 'Coastline digital data set'.

CAVEATS:
Some of the Biogeographic regions are at the scale of sub-regions or environmental provinces but are recognised and illustrated as part of the planning framework of State/Territory jurisdictions. Further analysis is required to ensure a uniform level of heterogeneity is established between regions within all States and Territories.

Projection: Albers Equal Area
Standard Parallels: 18 and 36 deg. south
Central Meridian: 132 deg. east
Australian Spheroid

SCALE: 1:15,000,000