COMMONWEALTH ENVIRONMENTAL AND HERITAGE OBLIGATIONS AND ASSESSMENTS

RELEVANT TO THE REGIONAL FOREST AGREEMENT PROCESS

INFORMATION PAPER

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PREFACE

This paper details Commonwealth environmental and heritage obligations in relation to forests, and complements the position statement, *Regional Forest Agreements - the Commonwealth Position*, released in February 1995. The procedures and requirements outlined in this paper should be read in conjunction with the model regional forest agreement process described in the companion position paper.

The National Forest Policy Statement provides for a cooperative regional forest assessment process, and the use of regional Commonwealth-State agreements to formalise forest management arrangements which enable the obligations of both Governments to be met.

Commonwealth environment and heritage obligations relating to forests have basis in legislation, international agreements or stated policy. Some obligations, such as those required under the *Australian Heritage Commission Act 1975*, require a discrete assessment process against defined criteria. Others, such as the United Nations Statement of Forest Principles, will not require specific assessments, but will nonetheless need to be considered in the development of regional forest agreements.

As emphasised in the position paper, the full range of obligations will not be relevant for every region. In addition, because the aims of many of the obligations overlap, data requirements will be common between obligations. These data requirements will also in many cases correspond with basic information that State Governments need to manage their forests. The Commonwealth will seek to rationalise information collection and analyses to ensure that duplication is minimised and assessments are conducted efficiently.

Commonwealth environmental and heritage obligations related to forests and, where relevant, associated assessment procedures are discussed as follows.

1. National Estate

1.1 Statutory obligations

The *Australian Heritage Commission Act 1975* provides for the identification and protection at a Federal level of aspects of the natural and cultural environments which are of national significance. The Act establishes the Australian Heritage Commission (AHC) whose statutory obligations include:

- to furnish advice to the Minister on matters relating to the National Estate including advice relating to action to conserve, improve and present the National Estate and expenditure by the Commonwealth for the conservation, improvement and presentation of the National Estate;

- to identify places in the National Estate and to prepare a Register of such places; and,

- to encourage public interest in the National Estate and to further training and education in fields related to the conservation, improvement and presentation of the National Estate.

For the purposes of the Act, the National Estate consists of those places that are components of the natural or the cultural environment of Australia with aesthetic, historic, scientific or social significance or other special value for future generations as well as for the present community.

A place may be entered in the Register of the National Estate by the Commission where it considers that place should be recorded as part of the National Estate. Before entering a place in the Register, the Commission must give public notice of its intention to do so and notify persons of their right to make written objection to the proposed entry. In certain circumstances the Minister may direct the Commission to enter a place in the Register.

The Act places a duty on all Commonwealth Ministers and authorities to give such directions and to take such actions as can be given or done for ensuring that their Departments or authorities do not take any action which adversely affects a place which is in the Register, unless there is no feasible and prudent alternative. The only direct restriction upon land use or development imposed by the Act therefore is the requirement that, so far as is feasible and prudent, the actions and decisions of Commonwealth Government authorities must avoid or minimise adverse effects upon the National Estate.

1.2 Criteria for the Register of the National Estate

Criterion A: Importance in the course, or pattern, of Australia's natural or cultural history

A.1 Importance in the evolution of Australian flora, fauna, landscapes or climate;
A.2 Importance in maintaining existing processes or natural systems at the regional or national scale;
A.3 Importance in exhibiting unusual richness or diversity of flora, fauna, landscapes or cultural features;
A.4 Importance for association with events, developments or cultural phases which have had a significant role in the human occupation and evolution of the nation, State, region or community.

Criterion B: Possession of uncommon, rare or endangered aspects of Australia's natural or cultural history

B.1 Importance for rare, endangered or uncommon flora, fauna, communities, ecosystems, natural landscapes or phenomena, or as wilderness;

B.2 Importance in demonstrating a distinctive way of life, custom, process, land use, function or design no longer practised, in danger of being lost, or of exceptional interest.

Criterion C: Potential to yield information that will contribute to an understanding of Australia's natural or cultural history

C.1 Importance for information contributing to a wider understanding of Australian natural history, by virtue of its use as a research site, teaching site, type locality, reference or benchmark site;

C.2 Importance for information contributing to a wider understanding of the history of human occupation of Australia.

Criterion D: Importance in demonstrating the principal characteristics of: (i) a class of Australia's natural or cultural places; or (ii) a class of Australia's natural or cultural environments

D.1 Importance in demonstrating the principal characteristics of the range of landscapes, environments or ecosystems, the attributes of which identify them as being characteristic of their class;

D.2 Importance in demonstrating the principal characteristics of the range of human activities on the Australian environment (including way of life, custom, process, land use, function, design or technique).

Criterion E: Importance in exhibiting particular aesthetic characteristics valued by a community or cultural group.

E.1 Importance for a community for aesthetic characteristics held in high esteem or otherwise valued by the community.

Criterion F: Importance in demonstrating a high degree of creative or technical achievement at a particular period

F.1 Importance for its technical, creative, design or artistic excellence, innovation or achievement.

Criterion G: Strong or special association with a particular community or cultural group for social, cultural or spiritual reasons

G.1 Importance as a place highly valued by a community for reasons of religious, spiritual, symbolic, cultural, educational, or social associations.

Criterion H: Special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history.

H.1 Importance for close associations with individuals whose activities have been significant within the history of the nation, state or region.

1.3 Objectives of a National Estate study

- Identify all values of National Estate significance within the region of interest;
- Assess the extent to which National Estate values within the region are conserved by current tenures and current and proposed management practices;
- Identify places with values of National Estate significance for inclusion on the Register of the National Estate
- Identify options for improving the protection of National Estate values within the region;
- Provide advice to Ministers where appropriate concerning the above.

1.4 Methodology for National Estate assessment

1. compile existing data relevant to identifying values of National Estate significance;

2. undertake surveys and compile additional data as required to establish an adequate data base for National Estate assessment;

3. using available data, assess values within the region against National Estate criteria and identify all values of National Estate significance;

4. determine the distribution across different tenures of values with National Estate significance;

5. assess the extent to which National Estate values identified in the region are represented in the conservation reserve system as a whole as well as the extent to which those values are represented in unreserved areas of the region of study;

6. identify places for inclusion on the Register of the National Estate

7. assess the resilience of unreserved National Estate values to forestry operations (some values are not adversely affected by forestry activities) and the management prescriptions for forestry activity as defined in the Forestry Codes of Practice;

8. develop options for protecting National Estate values of significance within multiple use forest areas;

9. identify particular values which cannot be appropriately assessed within the initial time-period, and determine long-term research and management options for dealing with those values;

10. prepare a report summarising National Estate values, their extent of reservation and options for their protection.

1.5 Data required for National Estate assessment

The information requirements presented here were compiled by the AHC in July 1992 and have been derived from the AHC/Department of Conservation and Land Management (CALM) study of south-west Western Australia. Use of the data needs described for the WA study is intended to be indicative and to provide a base from which to identify an agreed process and data set rather than to be definitive.

Criterion A1 Importance in the evolution of Australian flora, fauna, landscapes or climate

Location and description of disjunct species and communities
Location of concentrations of localised endemic species
Species/communities at the limits of their range
Atypical locations of communities/species
List and location of relict primitive (including Gondwanaland) flora and fauna
Location of geological, geomorphological and soil features which may be significant in understanding landform evolution
Location of fossils
Location of refugia
Location of places showing evidence of former climates

Criterion A2 Importance in maintaining existing processes or natural systems at the regional or national scale

Locations of catchments in the region showing undisturbed catchments/subcatchments
Areas of steep topographic or environmental gradients
Location of mosaics of undisturbed vegetation
Locations of places where landform processes are active
Location of wetlands and bird migratory routes
Location of important wildlife breeding areas
Map showing wilderness values as per NWI procedures
Location of areas which are refuges in times of environmental/climatic stress

Criterion A3 Importance in exhibiting unusual richness or diversity of flora, fauna, landscapes or cultural features

Location of areas of unusual species diversity
Location of areas of unusual geology/landform/landscape features/diversity
Location of areas of unusual structural or vegetation type diversity
Location of areas of unusual cultural site diversity

Criterion A4 Importance for their association with events, developments or cultural phases which have had a significant role in the human occupation and evolution of the nation, state, region or community

Location of Aboriginal archaeological sites showing evidence for phases of the human settlement of Australia, adaptation to differing environments, etc
Location of historic places eg old mill sites, tramways etc
Information on places associated with development, industries and settlement

Criterion B1 Importance for rare, endangered or uncommon flora, fauna, communities, ecosystems, natural landscapes or phenomena, or as a wilderness

Location of rare, endangered or uncommon flora and fauna, and their habitat (also need to know distributions outside the study area)
Location of undisturbed vegetation communities
Location of uncommon faunal assemblages, communities, etc
Map of landform types in the region
Location of uncommon geological/geomorphological features
Map showing wilderness values as per National Wilderness Inventory (NWI) procedures

Criterion B2 Importance in demonstrating a distinctive way of life, custom, process, landuse, function or design no longer practised, in danger of being lost, or of exceptional interest

Information about Aboriginal occupation and activities
Location of Aboriginal archaeological sites

Criterion C1 Importance for information contributing to wider understanding of Australian natural history, by virtue of their use as research sites, teaching sites, type localities, reference or benchmark sites

Location of species type localities for rare etc flora & fauna
Location of undisturbed vegetation
Location of important teaching sites
Location of type localities for geological features and landforms
Location of areas which are or have been significant research sites
Location of reference areas
Location of Aboriginal sites of significance
Location and research of earlier historic landuses

Criterion C2 **Importance for information contributing to a wider understanding of the history of human occupation of Australia**

Location of Aboriginal archaeological sites
Location of places containing evidence of technological, architectural or other cultural value
Sites of innovations in timber getting, milling, mining activities or other landuses

Criterion D1 **Importance in demonstrating the principal characteristics of the range of landscapes, environments or ecosystems, the attributes of which identify them as being characteristic of their class**

Condition and integrity of ecosystems etc. Including fire and logging history, weed occurrence
Location of vegetation and ecosystem types
Location of areas which include the range of variation associated with the type

Criterion D2 **Importance in demonstrating the principal characteristics of the range of human activities in the Australian environment (including way of life, custom, process, landuse, function, design or technique)**

Location of Aboriginal archaeological sites and sites of Aboriginal significance showing the full range of Aboriginal activities
Location of historic sites - coastal exploration, early settlement, mill sites
Information about places which demonstrate the principal characteristics of human activities

Criterion E **Importance for a community for aesthetic characteristics held in high esteem or otherwise valued by the community**

Location of areas of high aesthetic value
Information about landforms, rivers and landscapes which may be relevant to the identification of areas of aesthetic value
Location of places of importance for recreation

Criterion F **Importance for their technical, creative, design or artistic excellence, innovation or achievement**

Information about local technological developments in timber extraction, grazing, mining etc

Criterion G **Importance as places highly valued by a community for reasons of religious, spiritual, cultural, educational or social associations**

Location of Aboriginal sites of significance
Map showing wilderness values as per NWI
Location of places important for education
Location of places of importance for recreation

Criterion H **Importance for their close associations with individuals whose activities have been significant within the history of the nation, state or region**

Information about the development of settlement and exploitation of the area.

1.6 An example of data used in the AHC/CALM study of SW Western Australia

Primary data

- (sources: existing databases, GIS', topographic maps, published and unpublished reports, unpublished data, expert opinion, local knowledge)

1. Catchments, rivers, wetlands
(Criteria A.1, A.2, A.3, D.1)

- mapped locations (scale = 1:250 000 based on 1:250 000 and 1:50 000 maps)

2. Landform, geomorphology, soil
(Criteria A.3; also A.1, A.2, B.1, D.1)

- mapped locations/distribution (scale = 1:250 000 based on 1:100 000 and 1:50 000 maps)

3. Vegetation
(Criteria A.3, B.1, D.1)

- forest types from existing databases (scale = 1:100 000 and 1:250 000; database grid cell size of 2 ha; based on aerial photo interpretation of dominant and co-dominant species)

- mapped vegetation types (scale = 1:250 000 based on mapped vegetation types using structural or floristic attributes)

4. Flora
(Criteria A.1, B.1)

- point data based on records of occurrence of individual plant species (particularly restricted endemics, limits of distribution, refugial species, rare species and communities, endangered species and communities), (scale = 1:250 000; point data mapped at this scale)

5. Fauna

- point data based on records of occurrence of individual animal species (scale = 1:250 000; point data mapped at this scale)

6. Aboriginal archaeological sites

- point/spatial data concerning Aboriginal archaeological sites based on published reports, museum records; some sites are extensive

7. Historic sites

- point/spatial data concerning historic sites based on any available information (eg unpublished records, published reports, local knowledge etc)

Derived data

- based on a range of data sources including the primary data described above

1. Landform/soils

A. Diversity

- qualitative assessment of diversity based on maps of landform/soil distribution (scale = 1:250 000 polygons based on map units)

2. Vegetation

A. Diversity

- qualitative assessment of diversity based on map units for forest or vegetation types, and disturbance (scale = 1:250 000; polygons based on map units)

B. Representative vegetation types

- derived vegetation types formed by grouping vegetation types based on correlations between landform/soil types and vegetation variation; areas above 50-200 ha include (scale = 1:250 000)

C. Representative vegetation assemblages

- derived vegetation communities comprising combinations of mapped vegetation types aggregated on the basis of climate, topography, biogeographic factors etc; areas above 2000 ha included (scale = 1:250 000)

3. Fauna
(Criteria A.1, A.2, B.1)

A. Diversity

- indices based on published and unpublished point data of distribution of animal species, knowledge of vegetation diversity, expert opinion (scale = 1:250 000)

B. Habitat

- indices of habitat importance for fauna based on knowledge of habitat requirements, expert opinion, other site attributes (vegetation, disturbance) etc (scale = 1:250 000)

4. Wilderness

- indices of potential wilderness value constructed using the methodology of Lesslie et al (1987) and mapped; these then compared with mapped information of roads, disturbance etc and final wilderness classification (moderate, high, very high) assigned to particular areas (scale = 1:250 000)

5. Disturbance

- disturbance classes assigned to areas (due to logging, roading, grazing, dieback, and including time and severity of disturbance where possible); based on detailed logging histories, maps, landsat images, expert knowledge (scale = 1:250 000)

1.7 Outputs from a National Estate study

1. A list of locations associated with occurrence of each attribute relevant to a National Estate criterion;

2. An assigned level of significance (for inclusion on the Register of the National Estate) of each location identified in 1;

3. Delineation of boundaries of areas (Indicative Areas) exceeding a threshold of significance for inclusion on the Register of the National Estate; scale = 1:250 000;

4. Maps showing detailed location of boundaries of Indicative Areas; scale = 1:50 000;

5. Guidelines for the protection of National Estate values for areas both within and outside the conservation reserve system based on an assessment of the sensitivity and resilience of those values to particular land use management strategies;

6. Identification of further research needs for improved identification of areas of national estate significance.

1.8 Time requirements

The time required for a National Estate study will depend to a large extent on the availability and form of primary data for the region to be assessed. Collection of new data and data capture onto computer databases is both time consuming and expensive. Substantial delays may be experienced due to the need to create a large composite spatial database from many small datasets and, particularly, to problems due to incomplete or incompatible data sets.

2. World Heritage

2.1 Statutory obligations

Commonwealth obligations in relation to the identification and protection of World Heritage values are covered under the World Heritage Convention. Australia has an international obligation under the World Heritage Convention to ensure the identification, protection and conservation of its natural and cultural heritage. Under the terms of the Convention, there has been established a World Heritage List of property having outstanding universal value which forms part of the cultural and natural heritage of signatory countries.

The *World Heritage Properties Conservation Act 1983* seeks to regulate activities that would adversely affect World Heritage values, thus authorising the Commonwealth to prevent the damage or destruction of a property by regulation through the prohibition of prescribed acts.

Article 2 of the World Heritage Convention defines 'natural heritage' as:

(a) natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view;

(b) geological and physiographic formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation;

(c) natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation or natural beauty.

World heritage properties must be outstanding in a global context. Such properties must also satisfy a number of integrity conditions which ensure the continued viability of their outstanding values. In other words the adequate protection and conservation (refer to: (vi) Conditions of integrity for natural heritage properties) is essential in meeting our international obligations.

2.2 Data collection

National Estate assessment is able to provide sufficient information for the first stage identification of possible World Heritage sites. Areas with values that can be used to determine World Heritage status will be readily identified. The Australian Heritage Commission's assessment of value against their criteria also assists in determining those areas likely to have significant World Heritage value.

The second stage, which can only start after National Estate assessment is complete, involves reviewing areas of high National Estate values against the World Heritage criteria and integrity conditions. This stage would involve assessment by the World Heritage Unit of the Department of the Environment, Sport and Territories and may also involve referral to experts and professional organisations.

2.3 Assessment

Objectives

To identify the World Heritage significance of the region by rating it against specified criteria and conditions of integrity for World Heritage listing.

Criteria

World Heritage and National Estate use discrete but in some cases similar sets of criteria. A World Heritage property must meet one or more of 4 natural criteria or one or more of 6 cultural criteria and also fulfil certain conditions of integrity.
Criteria for the determination of World Heritage status:

Natural criteria

Sites nominated should:

(a)(i) be outstanding examples representing the major stages of the Earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features; or

(ii) be outstanding examples representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals; or

(iii) contains superlative natural phenomena, or areas of exceptional natural beauty and aesthetic importance; or

(iv) contains the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

and also fulfil the following conditions of integrity:

(b)(i) The sites described in (i) above should contain all or most of the key interrelated and interdependent elements in their natural relationships; for example, an 'ice age' area would be expected to include the snow field, the glacier itself and samples of cutting patterns, deposition and colonisation (eg, striations, moraines, pioneer stages of plant succession, etc); in the case of volcanoes, the magnetic series should be complete and all or most of the varieties of effusive rocks and types of eruptions be represented.

(ii) The sites described in (ii) above should have sufficient size and contain the necessary elements to demonstrate the key aspects of processes that are essential for the long-term conservation of the ecosystems and the biological diversity they contain; for example, an area of tropical rain forest should include a certain amount of variation in elevation above sea-level, changes in topography and soil types, river systems and naturally regenerating patches; similarly, a coral reef should include, for example, seagrass, mangrove or other adjacent ecosystems that regulate nutrient and sediment inputs into the reef

(iii) The sites described in (iii) should be of outstanding aesthetic value and include areas that are essential for maintaining the beauty of the site; for example, a site whose scenic values depend on a waterfall should include adjacent catchment and downstream areas that are integrally linked to the maintenance of the aesthetic qualities of the site.

(iv) The sites described in (a) (iv) should contain habitats for maintaining the most diverse fauna and flora characteristic of the biographic province under consideration for example, a tropical savannah should include a complete assemblage of coevolved herbivores and plants; an island ecosystem should include habitats for maintaining endemic biota; a site containing wide-ranging species should be large enough to include the most critical habitats to ensure the survival of viable populations of those species; for an area containing migratory species, seasonal breeding and nesting sites, and migratory routes, wherever they are located, should be adequately protected; international conventions, eg, Convention of Wetlands of International Importance

Especially as Waterfowl Habitat (Ramsar Convention), for ensuring the protection of habitats of migratory species of waterfowl, and other multi- and bilateral agreements could provide this assurance.

(v) The sites described in (a) should have a management plan. When a site does not have a management plan at the time when it is nominated for the consideration of the World Heritage Committee, the State Party concerned should indicate then such a plan will become available and how it proposes to mobilise the resources required for the preparation and implementation of the plan. The State Party should also provide other document(s) (eg, operational plans) which will guide the management of the site until such time when a management plan is finalised.

(vi) A site described in paragraph (a) should have adequate long-term legislative, regulatory or institutional protection. The boundaries of that site should reflect the spatial requirements of habitats, species, processes or phenomena that provide the basis for its nomination for inscription on the World Heritage List. The boundaries should include sufficient areas immediately adjacent to the area of outstanding universal value in order to protect the sites heritage values from direct effects of human encroachment and impacts of resource use outside the nominated area. The boundaries of the nominated site may coincide with one or more existing or proposed protected areas, such as national parks or biosphere reserves. While an existing or proposed protected area may contain several management zones, only some of those zones may satisfy criteria described in paragraph (a); other zones, although they may not meet the criteria in paragraph (a), may be essential for the management to ensure the integrity of the nominated site: for example, in the case of a biosphere reserve, only the core zone may meet the criteria, and the conditions of integrity, although other zones, ie, buffer and transitional zones, would be important for the conservation of the biosphere reserve in its totality.

(vii) Sites described in (a) should be the most important sites for the conservation of biological diversity. Biological diversity, according to the new global Convention on Biological Diversity, means the variability among living organisms in terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part, and includes diversity within species, between species and of ecosystems. Only those sites which are the most biologically diverse are likely to meet criterion (iv) of paragraph (a).

Cultural criteria

Sites nominated should:

(a)(i) represent a unique artistic achievement, a masterpiece of the creative genius; or

(ii) have exerted great influence, over a span of time or within a cultural area of the world, on developments in architecture, monumental arts or town-planning and landscape design; or

(iii) bear a unique or at least exceptional testimony to a civilisation or cultural tradition which has disappeared; or

(iv) be an outstanding example of a type of building or architectural ensemble or landscape which illustrates (a) significant stage(s) in human history; or

(v) be an outstanding example of a traditional human settlement or land-use which is representative of a culture (or cultures), especially when it has become vulnerable under the impact of irreversible change; or

(vi) be directly and tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic or literary works of outstanding universal significance (the Committee considers that this criterion should justify inclusion in the List only in exceptional circumstances or in conjunction with other criteria);

and

(b)(i) meet the test of authenticity in design, materials, workmanship or setting and in the case of cultural landscapes their distinctive character and components (the Committee stressed that reconstruction is only acceptable if it is carried out on the basis of complete and detailed documentation on the original and to no extent on conjecture).

(ii) have adequate legal and/or traditional protection and management mechanisms to ensure the conservation of the nominated cultural property or cultural landscapes. The existence of protective legislation at the national , provincial or municipal level is therefore essential and must be stated clearly on the nomination form. Assurances of the effective implementation of these laws and/or management mechanisms are also expected. Furthermore, in order to preserve the integrity of cultural sites, particularly those open to large numbers of visitors, the State Party concerned should be able to provide evidence of suitable administrative arrangements to cover the management of the property, its conservation and its accessibility to the public.

2.4 Assessment process

In general, the process involves an evaluation of biophysical and cultural attributes for the region against the above criteria. World Heritage properties must be outstanding in a global context and they must be assured of adequate protection for the continued viability of these outstanding values.

- consider the area against the Indicative List and consult with State/Territory Governments.
- analyse data on World Heritage values against the criteria laid down for natural nominations.
- analyse data on World Heritage values against the criteria laid down for cultural nominations.
- undertake any additional data collection required to establish international significance of the area
    - assistance may be sought from AHC, CSIRO, ATSIC, universities, State Government authorities, overseas experts.
- prepare report on possible World Heritage significance of the area to be taken into account in the regional assessment process.
- prepare Management Plan consistent with the National World Heritage Management System specified in the Prime Minister's Statement on the Environment of 21 December 1992.

2.5 Required outcomes

Report on the World Heritage values/significance (rated against the criteria and conditions of integrity) of the region including recommendations on action for the protection and conservation of these values.

2.6 Time estimates

World Heritage assessment should be completed within 2 to 4 months of the completion of National Estate assessment, although this may depend upon the need for, and the availability of, expert advice.

3. Endangered species

3.1 Relevant statutory obligations

The *Endangered Species Protection Act 1992* aims to promote the recovery of species and ecological communities that are endangered or vulnerable and to prevent other species from becoming endangered.

The Act provides for a scientifically-based listing process which identifies nationally endangered and vulnerable species and endangered ecological communities and key threatening processes of national importance. The Act includes 299 endangered species, 726 vulnerable species, no endangered ecological communities and five key threatening processes (foxes, feral cats, feral goats, rabbits and the dieback disease, *Phytophthora*).

The Act emphasises the use of Recovery Plans to assist in the recovery of endangered species and ecological communities and the use of Threat Abatement Plans for reducing the impact of key threatening processes. The Commonwealth may provide assistance to the States for the preparation of plans for listed species or communities and for the implementation of approved plans. Plans prepared by State agencies can be accredited. Commonwealth agencies must not take any action that contravenes an approved Recovery Plan or Threat Abatement Plan.

Complementary changes to the *Environment Protection (Impact of Proposals) Act 1974* (the EP(IP) Act) clarify the circumstances in which endangered species considerations trigger environmental assessment under the EP(IP) Act, namely a development that could threaten with extinction a species or community listed under the *Endangered Species Protection Act 1992* or significantly impede its recovery would be regarded as 'environmentally significant'. A development or action that is expressly permitted under a Recovery Plan or a Threat Abatement Plan would not be considered 'environmentally significant'.

3.2 Objectives of an endangered species assessment

- Identify occurrence of endangered and vulnerable species of flora and fauna and endangered and ecological communities in the region of interest;
- Assess the conservation status of endangered and vulnerable species under present tenures and management practices;
- Identify and assess impacts of present and proposed resource uses;
- Prepare Recovery Plans for endangered and vulnerable species and endangered ecological communities as necessary;
- Identify and assess impacts of key threatening processes with respect to present and proposed resource use
- Provide advice to the Minister concerning the above.

3.3 Methodology for endangered species assessment

1. Meet with State agencies to agree on species and communities to be covered, the availability of survey data and recovery management information, the standards for recording any new survey information;
2. Obtain existing data on the distribution and occurrence of endangered and vulnerable species of flora and fauna and endangered ecological communities in the region (much of this data will be collected and collated by the AHC);

3. Identify priority species and ecological communities which need recovery plans prepared and the availability of expertise/information to prepare the plans. State agencies and ANCA to agree on arrangements and allocation of resources for writing and implementing recovery plans;

4. Identify data gaps and areas requiring further investigation. The use of predictive models for habitat and species' distribution may be important in this regard;

5. Arrange for collection of additional data as required. This is important so as to minimise the likelihood of additional occurrences of endangered and vulnerable species being discovered after the regional assessment;

6. Analyse the data to determine the distribution of endangered and vulnerable species and endangered ecological communities across different tenures;

7. Incorporate relevant results of AHC data collection and analysis into recovery plans;

8. Assess the extent to which the conservation needs of endangered and vulnerable species and endangered ecological communities and the requirements of recovery plans are met by existing tenure arrangements and land management practices;

9. Assess the likely impact of proposed resource uses on endangered and vulnerable species and endangered ecological communities, in particular the implementation of recovery plans;

10. Assess the impact of existing tenure arrangements and land management practises, and proposed resource uses, on key threatening processes and the implementation of Threat Abatement Plans.

11. Identify options for promoting the recovery of endangered and vulnerable species and endangered ecological communities and for preventing further species from becoming endangered in light of present and proposed resource uses;

12. Prepare a report summarising options and including recommendations on continued Commonwealth participation in recovery action, monitoring and in the adjustment of management arrangements to take account of significant new information.

3.4 Criteria for determining priorities for recovery action

Criteria used in determining priorities for recovery action include:

- the degree of threat to the survival in nature of the species or ecological community;
- the potential for the species or community to recover;
- the genetic distinctiveness of the species or community;
- the importance of the species or community to the ecosystem;
- any other value to humanity of the species or community; and
- the efficient and effective use of the resources allocated to the conservation of species and ecological communities.

Threat categories include:

- high degree of threat requiring recovery action immediately to prevent extinction;
- medium threat requiring recovery action within five years;
- lower threat for which action is required within five to ten years.

Within each threat category, species are further categorised as high or low priority according to:

- recovery potential;
- genetic distinctiveness;
- benefit to the ecosystem of the recovery action;

- economic or cultural importance to society.

3.5 Data required for endangered species assessment

A. Data collected by the AHC

1. vegetation types
2. species occurrences
3. habitat attributes
4. disturbance

B. Information from other analyses

1. National Estate assessment
   - areas listed under National Estate Criteria A and B;
   - current management strategies for these areas;
   - impacts of planned resource uses;
   - strategies for mitigation of impacts.

2. Existing Recovery Plans for endangered and vulnerable species and endangered ecological communities, and Threat Abatement Plans for key threatening processes.

C. Additional data and information required but not available from the AHC National Estate study

1. Recovery Plans for endangered and vulnerable species and endangered ecological communities, and Threat Abatement Plans for key threatening processes.

3.6 Outputs from an endangered species study

1. A list of endangered and vulnerable species and endangered ecological communities for the region.

2. A report assessing:

- likely impact of resource use on endangered and vulnerable species and endangered ecological communities;
- options for promoting the recovery of endangered and vulnerable species and endangered ecological communities and for preventing further species from becoming endangered in light of present and proposed resource uses; and
- continued Commonwealth participation in recovery action, monitoring and in the incorporation of any significant new information in management.

3. Recovery Plans for endangered and vulnerable species and endangered ecological communities, and Threat Abatement Plans for key threatening processes, as appropriate.

3.7 Time requirements

Time requirements for an endangered species assessment will depend both on the number of endangered and vulnerable species and how well their representative populations are known, and on the number of endangered ecological communities. Factors affecting time requirements will include the availability of existing information, the need for additional information concerning population dynamics, the number and complexity of recovery plans that must be developed, and the level of resources and expertise contributed by the States towards the preparation of recovery plans. Time requirements for an endangered species assessment therefore may vary widely between different regions.

4. Biological diversity

4.1 Statutory and other obligations

Convention on Biological Diversity

The Convention on Biological Diversity was opened for signature at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992. Australia signed the Convention on 5 June 1992 and ratified it on 18 June 1993. The necessary 30 countries have now ratified the Convention and it came into force on 29 December 1993.

Briefly the Convention:

- has as its primary aims the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilisation of genetic resources;
- addresses the full range of biological diversity at genetic, species and ecosystem levels in all environments around the globe;
- emphasises in-situ conservation measures, with ex-situ conservation complementing these;
- requires the development of national strategies, plans or programs for the implementation of its measures.

The Convention contains a wide range of provisions which will need to be considered in a detailed and comprehensive manner during the regional assessment process, particularly those relating to:

- identification and monitoring (Article 7)
- in-situ conservation (Article 8)
- ex-situ conservation (Article 9)
- sustainable use of components of biological diversity (Article 10)
- incentive measures (Article 11)
- impact assessment and minimisation of adverse impacts (Article 14).

National Parks and Wildlife Conservation Act 1975

The Act provides for the establishment of national parks and reserves and the protection and conservation of wildlife. The Act has been used to protect, conserve, manage and control wildlife, and to conduct surveys, research and collect statistics of animals and plants throughout Australia. The Act has also been used to establish parks and reserves in Territories and Commonwealth waters.

Other relevant international agreements, national strategies and programs, and legislation are addressed in other sections to this paper.

4.2 Objectives of a biodiversity assessment

- identify components of biological diversity important for its conservation and sustainable use;

- monitor, through sampling and other techniques, the components of biological diversity identified above, paying particular attention to those requiring urgent conservation measures and those which offer the greatest potential for sustainable use;

- identify processes and categories of activities which have or are likely to have significant adverse impacts on the conservation and sustainable use of biological diversity; monitor their effects through sampling and other techniques and regulate or manage the processes and categories of activities;

- develop guidelines for the selection, establishment and management of protected areas or areas where special measures need to be taken to conserve biological diversity and establish protected areas where required;

- promote environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of these areas;

- promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings;

- regulate or manage biological resources important for the conservation of biological diversity with a view to ensuring their conservation and sustainable use;

- promote the encouragement and protection of the customary use of biological resources in accordance with traditional cultural practices, (consistent with conservation or sustainable use requirements), and promote the protection of traditional knowledge and intellectual property rights;

- adopt measures relating to the use of biological resources to avoid or minimise adverse impacts on biological diversity.

4.3 Criteria for determining importance for biological diversity conservation

The Convention on Biological Diversity identifies the following as indicative of components of biological diversity important for its conservation and sustainable use and should be subject to monitoring and management as described above.

Ecosystems and Habitats:

- containing high diversity;
- containing large numbers of endemic or threatened species;
- containing wilderness;
- required by migratory species;
- of social, economic or cultural importance;
- which are representative;
- unique or associated with key evolutionary or other biological processes;
- of scientific importance
  For example
  - *areas important for monitoring biological diversity;*
  - *areas important as reference or bench mark sites;*
  - *areas important as research sites, particularly for understanding mechanisms of biological diversity loss and resilience, and methods for improving management;*
  - *keystone species*
  - *ecosystems and species demonstrating unique characteristics or adaptations.*

Species and Communities which are:

- threatened
- wild relatives of domesticated or cultivated species;
- of medicinal, agricultural or other economic value;
- of social, scientific or cultural importance;

- important for research into the conservation and sustainable use of biological diversity such as indicator species.

Described Genomes and Genes

- of social, scientific or economic importance

While assessment using some of these criteria poses technical problems, the criteria are included to indicate the scope of relevant obligations under the Convention. In the case of some criteria, data collection would be more a matter of collating available material rather than conducting comprehensive field investigations.

4.4 Methodology for biodiversity assessment

The details of biological diversity assessment methodology including specific attributes for inventory are set out in the attached paper, *Proposed Guidelines for Biological Diversity Assessment*.

Outlined below are the key steps in the assessment process.

1. compile available data on fauna, flora and disturbance history, and other knowledge relevant to biological diversity criteria, including traditional knowledge;

2. develop physical environmental databases at an appropriate scale for stratifying the region for ecosystem surveys and predictive modelling for species surveys;

3. identify gaps in knowledge, including the target species, ecosystem and disturbance history data and design surveys to fill gaps;

4. undertake necessary species, ecosystem and disturbance history surveys;

5. undertake ecosystem analyses, interpolate the distribution of ecosystems across the region using modelling techniques and implement validation surveys;

6. undertake a conservation options analysis and viability analysis to identify a range of options for spatial configuration of management zones;

7. undertake a socio-economic impact/cost-benefit analysis to determine the optimal configuration of management zones that maximises biodiversity conservation potential and minimises social and economic impacts;

8. develop management guidelines for each management zone, including identification of further inventory and research needs and design of a monitoring program;

9. review current management guidelines and administrative structures both for conservation and ecologically sustainable use of biological diversity and modify where necessary to ensure they are consistent with the management guidelines for management zones arising from analyses;

10. implement the regional management plan.

4.5 Outputs from a biological diversity study

1. management guidelines for all identified management zones in the region that are consistent with ESD principles;

2. listing of conservation values from a national and regional perspective;

3. listing of major conservation threats and measures to ameliorate the threats;

4. recommendations regarding likely impacts/cumulative impacts on regional biodiversity;

5. maps of areas requiring protection, possibly outlining zones with different management requirements, including rehabilitation, and those requiring urgent conservation activities;

6. map of areas requiring further inventory or research;

7. management guidelines for major ecosystems/communities;

8. monitoring guidelines and indicators;

9. adequacy of assessment indicators.

4.6 Time requirements

The time required for an assessment of biological diversity will depend on a range of factors including time required for a National Estate assessment, the size of the region, the need for additional analyses, the availability of information for additional analyses etc and may vary widely between different areas. It is estimated that a minimum time of 18 months to two years will be required.

5. Aboriginal and Torres Strait Islander native title, and heritage and cultural values

5.1 Statutory obligations

The Commonwealth *Native Title Act 1993* provides for the recognition and protection of native title rights and interests, provides mechanisms for dealing with matters concerning native title, and allows for the validation of past actions.

The Act constrains the Commonwealth, State and Territory Governments from making any decision or taking any action which would affect native title rights and interests.

The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* does not carry any obligations for assessment and reporting of impacts or values in a planning context, but may be activated by Aboriginal or Torres Strait Islander communities in response to a perceived threat.

The Act may be activated by an applicant when it is believed that a state or territory is unwilling or unable to offer adequate protection to a place or object of significance. The Act provides for the Commonwealth Minister for Aboriginal and Torres Strait Islander Affairs to make either emergency or permanent declarations to protect particular values.

In considering whether to provide permanent protection, the minister must consider a report addressing matters prescribed under s.10(4) of the Act, including the significance of the place/objects, the nature of any threat, potential impacts on the interests of others of any declaration, and the degree of protection actually offered under state or territory legislation.

5.2 Objectives of an assessment of Aboriginal and Torres Strait Islander native title, and heritage and cultural values

Assessment objectives include:

- the preservation of native title rights and interests;
- the protection and appropriate management of objects, sites, areas and environmental features of cultural significance to Aboriginal and Torres Strait Islander people, consistent with the Act;
- the establishment of consultative and cooperative arrangements involving Aboriginal and Torres Strait Islander communities in the assessment of values, development of management recommendations and ongoing management of identified values;
- the collection, use and protection of traditional Aboriginal and Torres Strait Islander knowledge;
- the implementation of forest management arrangements consistent with the protection of Aboriginal and Torres Strait Islander cultural values, native title rights and interests, and community development aspirations.

5.3 Broad methodology for assessment

It is envisaged that assessment will ideally cover:

- consultation with local and regional communities prior to the assessments in relation to assessment objectives and procedures, the handling of new sites which may be discovered during the assessment, and the protection of traditional knowledge;
- identification of objects, sites, areas and environmental features of cultural significance to Aboriginal and Torres Strait Islander people;

- identification of threatening processes and activities;

- consultation with Aboriginal and Torres Strait Islander communities in the development of objectives and recommendations for the management of identified threats and values (including the involvement of Aboriginal and Torres Strait Islander people in ongoing management and traditional use arrangements, where consistent with government conservation objectives and Aboriginal and Torres Strait Islander community development goals);

- identification of impacts on values of existing and proposed management arrangements, including impacts of protection of identified values on the proprietary or pecuniary interests of non-Aboriginals;

- assessment of the adequacy of available State or Territory laws and management controls in achieving the protection of identified values and the implementation of management recommendations;

- ongoing consultation with Aboriginal and Torres Strait Islander communities at the local and regional levels during the assessment process in relation to known and new site protection, and any other issues related to the assessments.

Special arrangements will need to be adopted to ensure that the traditional knowledge and intellectual property of indigenous people is protected, for both cultural and commercial reasons. These arrangements will need to apply to traditional knowledge which may be collected and recorded under each of the analyses conducted in the assessment process, including the assessment of National Estate values and biological diversity values.

5.4 Links to other obligations and assessments

Investigations into Aboriginal and Torres Strait Islander issues will be coordinated with related assessment requirements arising from the *Australian Heritage Commission Act 1975* and the *Environmental Protection (Impact of Proposals) Act 1974* (EP(IP) Act). The National Estate assessment conducted by the Australian Heritage Commission (AHC) would provide information on the protection of known sites and serve as a basis for wider assessment. The assessment of environmental impacts in accordance with the EP(IP) Act will be required to address environmental issues relevant to Aboriginal and Torres Strait Islander communities.

Consistent with the Convention on Biological Diversity, the assessment of biological diversity values will involve an examination of the significance of biological resources to indigenous people, and the role of indigenous people and traditional technologies, in maintaining these values. The role of indigenous people in managing and conserving forest resources is recognised internationally in Agenda 21 and the Statement of Forest Principles signed at Rio de Janeiro in 1992, and regionally in the Apia Convention (refer Section 8).

5.5 Consultation requirements

National Estate assessment processes undertaken by the AHC will embrace procedures related to the discovery of new Aboriginal sites and consultation with Aboriginal and Torres Strait Islander communities. Consultations with Aboriginal and Torres Strait Islander communities will also be required in accordance with the EP(IP) Act.

It should be noted that the Register of the National Estate is, as the name suggests, a listing of places of *national* significance. As such, it cannot be expected to represent all places of concern to local Aboriginal communities, and is not a management tool for local purposes. In addition, local communities may, for a number of reasons, prefer not to have places in their areas of concern included in a national listing.

The involvement of both ATSIC and local and regional Aboriginal and Torres Strait Islander communities will be important to ensure that the assessment process takes account of the traditional and contemporary concerns of Aboriginal and Torres Strait Islander people. The regional forest agreement consultation process would involve consultations before assessment begins, during the course of the assessment, and should provide for consultation into the future. A coordinated and specialised consultation program involving the Commonwealth and State Governments will be necessary to avoid duplication in addressing Aboriginal and Torres Strait Islander interests in the assessment process.

5.6 Outputs

Assessment outputs may include a regional heritage and cultural values management strategy containing a list of identified objects, sites, areas and environmental features of significance to Aboriginal and Torres Strait Islander people, an assessment of threats and impacts, guidelines for the protection and management of identified objects, sites etc, and recommendations on the ongoing involvement of Aboriginal and Torres Strait Islander people in impact assessment and management relating to heritage and cultural values.

5.7 Time requirements

Time requirements for each assessment are expected to vary widely based on consultative arrangements, available information, relevance of data collected in other assessments, density and complexity of forest values and other factors. In many areas, the active participation of Aboriginal and Torres Strait Islander people could be of considerable assistance in the assessment and planning process.

Any such strategy must be regarded as an evolving management tool to which further rights, interests, objects, sites, areas and environmental features may be added in the future. The strategy must therefore be flexible, and should not be expected to contain an exhaustive or limiting list of concerns.

6. Impact assessment

6.1 Statutory obligations

The object of the *Environment Protection (Impact of Proposals) Act 1974* (the EP(IP) Act) is to ensure, to the greatest extent that is practicable, that matters affecting the environment to a significant extent are fully examined and taken into account in and in relation to actions, proposals and decisions taken by or on behalf of the Commonwealth Government, including:

(a) the formulation of proposals;
(b) the carrying out of works and other projects;
(c) the negotiation, operation and enforcement of agreements and arrangements (including agreements and arrangements with the States and authorities of the States);
(d) the making of, or the participation in the making of, decisions and recommendations;
(e) the incurring of expenditure, by, or on behalf of, the Commonwealth Government and authorities of Australia, either alone or in association with any other government, authority, body or person.

The EP(IP) Act defines environment as including 'all aspects of the surroundings of human beings whether affecting human beings as individuals or in social groupings'. This broad definition of 'environment' encompasses the environment and heritage values which will need to be met under a comprehensive regional assessment process, including National Estate, World Heritage, endangered species and Aboriginal values. It also encompasses values which may not be covered by other Commonwealth responsibilities.

The Minister for the Environment Sport and Territories administers the EP (IP) Act. The Act places a duty on all Commonwealth Ministers to ensure that the Environment Minister's advice and recommendations provided pursuant to the Act are taken into account in the administration of their portfolios.

6.2 Administrative Procedures

The Administrative Procedures of the EP(IP) Act provide the Minister with discretion to determine that:

- neither a Public Environment Report (PER) nor Environmental Impact Statement (EIS) is required because, for example:
  - clear evidence is provided that environmental matters have already been taken into account; or
  - the Minister is satisfied that the preparation or obtaining of a PER or EIS is contrary to the public interest;
- a PER be prepared;
- an EIS be prepared;

The Act also provides that the Minister may direct that a public inquiry be conducted with respect to any or all of environmental aspects of the proposed action.

The Administrative Procedures allow that, where the Minister determines that the preparation of an EIS or PER is not required, the Minister may, nevertheless, make comments, suggestions or recommendations to the Action Minister concerning the proposal, including recommendations concerning the conditions to which the proposed action should be subject.

The Administrative Procedures set down matters that the Environment Minister, or the Department on behalf of the Minister, shall take into account in determining the level of assessment required.

The Administrative Procedures also require, in regard to the preparation of an EIS, that documentation should:

a) state the objectives of the proposed action;
b) analyse the need for the proposed action;
c) indicate the consequences of not taking the proposed action;
d) contain a description of the proposed action;
e) include information and technical data adequate to permit a careful assessment of the impact on the environment of the proposed action;
f) examine any feasible and prudent alternatives to the proposed action;
g) describe the environment that is likely to be affected by the proposed action and by any feasible and prudent alternative to the proposed action;
h) assess the potential impact on the environment of the proposed action and of any feasible and prudent alternative to the proposed action, including, in particular, the primary, secondary, short-term, long-term, adverse and beneficial effects on the environment of the proposed action and of any feasible and prudent alternative to the proposed action;
i) outline the reasons for the choice of the proposed action;
j) describe and assess the effectiveness of any safeguards or standards for the protection of the environment intended to be adopted or applied in respect of the proposed action, including the means of implementing and the monitoring arrangements to be adopted in respect of such safeguards or standards; and
k) cite any sources of information relied upon in, and outline any consultations during, the preparation of the environmental impact statement.

These two elements of the Administrative Procedures provide a guide to the scope of matters that should be addressed by the forest assessments to ensure that they comply with impact assessment requirements. Matters which should be addressed in a regional assessment of forest resources might be summarised as follows:

- effects on natural environment
- resource availability
- forest practices
- economic effects
- social effects
- cultural effects
- other legislative requirements.

6.5 Methodology for integrating environmental impact assessment with regional forest assessment

A decision by the Commonwealth to engage in a regional forest agreement process would provide the trigger for environmental impact assessment under the EI(IP) Act. Although the exact nature of the environmental impact assessment might vary according to the circumstances of each agreement process, in general the procedure described below would satisfy the requirements of the Administrative Procedures consistent with the intent of the regional forest agreement process.

1) The Administrative Procedures of the Act would be activated by the designation of a proponent at the beginning of each regional forest agreement process, bringing the process and its outcomes within the operation of the Act.

2) Consistent with the transparent nature of environmental impact assessment and to ensure that all of the principal issues of interest to the key public stakeholders were addressed, a document setting out the scope of the assessments would be released for a limited public review and the scope of the assessments adjusted to take account of submissions received.

3) The assessments and preparation of a draft regional forest agreement would then proceed. Advice would be taken from environmental impact assessment authorities from time to time to clarify assessment issues that might arise and on the preparation of documents for subsequent public review.

4) The draft agreement together with a document explaining how it was arrived at would be released for public review. The availability of the documents would be widely advertised in the Australian Government Gazette and the press in accordance with normal environmental impact assessment practice.

5) The Environment Protection Agency would prepare its report to the Environment Minister on the assessment process and the draft agreement taking into account the content of public submissions received.

6) The Environment Minister would consider the draft agreement together with the Environment Protection Agency's report and public review outcomes and provide advice to the Minister who was to conclude the agreement with the state (the action Minister), including any comments, suggestions and recommendations for changes to the draft agreement that the Environment Minister considered necessary for the protection of the environment.

7) Finally, the draft agreement would be amended by the action Minister to take into account the Environment Minister's advice before being submitted to the Government and taken into final negotiations with the state government.

This environmental impact assessment process would, of course, need to be coordinated with state requirements in accordance with the principles of the Intergovernmental Agreement on the Environment and the draft agreement on cooperation on environmental impact assessment between the Commonwealth and the states and territories.

6.6 Timing of an integrated environmental impact assessment - regional forest agreement process

Timing of the integrated process is very hard to gauge as it would depend on the nature, extent and complexity of each regional forest agreement process as well as cooperative arrangements established with each individual state. Within the framework described above, notional estimates of the time required for environmental impact assessment components are provided below.

1)	designation of a proponent	con-current with other activity
2)(a)	preparation of a document setting out the scope of the assessments	--
2(b)	public review of the scoping document	1 month
2)(c)	finalisation of the scope of the assessments	--
3)	conduct of the assessments and preparation of the draft agreement and documents for public review	--
4)	public review of the draft agreement	3 months
5)	preparation of the Environment Protection Agency's report to the Minister	2 months

6)	consideration of the agreement by the Environment Minister and the preparation of advice to the action Minister	1 month
7)	amendment of the draft agreement negotiation of the final agreement	--

7. Relevant national strategies and Commonwealth initiatives

The Commonwealth and State/Territory Governments have negotiated, or are in the process of developing, a number of National Strategies and other initiatives on resource use and environment and heritage conservation relevant to the regional assessment process. These strategies and initiatives are identified as being of interest to the Commonwealth, but many are in fact joint responsibilities shared by the States and Territories.

Agreed and proposed national strategies and agreements, and Commonwealth initiatives include:

The InterGovernmental Agreement on the Environment ;
The National Forest Policy Statement ;
The National Grasslands Strategy;
The National Rangelands Strategy;
The National Conservation Strategy for Australia ;
The National Coastal Strategy, and related Commonwealth Coastal Policy;
The National Strategy for the Conservation of Biological Diversity;
The Australian National Strategy for the Conservation of Australian Species and Ecological Communities Threatened with Extinction;
The National Greenhouse Response Strategy
The National Strategy on Ecologically Sustainable Development ;
The National Decade of Landcare Plan;
The National Marine Conservation Strategy;
The National World Heritage Management System; and,
The National Reserve System.

Many of the strategies address Australia's response to international conventions or Commonwealth legislation and have been addressed in Section 8.

Key among these strategies and initiatives which are especially relevant for the regional forest agreement process are the Intergovernmental Agreement on the Environment, the National Forest Policy Statement and the National Reserve System initiative.

7.1 InterGovernmental Agreement on the Environment (IGAE)

The IGAE establishes the framework for cooperation between the Commonwealth and the States on environment and conservation management. In addition to providing a framework for the cooperative development of a regional forest agreement, the IGAE has a number of specific goals which should be addressed as part of the regional forest agreement process. Of particular significance for the conservation objectives of regional assessment is Schedule 9 of the IGAE on Nature Conservation.

7.2 National Forest Policy Statement (NFPS)

The NFPS, in addition to establishing the authority and framework for the regional forest agreement process, sets out a number of goals for the management and protection of Australia's forests which should be addressed during an assessment.

7.2.1 Objectives for regional assessment

The two principal objectives of the NFPS to be addressed are the commitment to the ecologically sustainable management of native forests and the commitment to protect nature conservation, wilderness and heritage values of forests.

The NFPS acknowledges that the protection of the full range of forest ecosystems and other environmental values is fundamental to ecologically sustainable forest management; and, that this entails the maintenance of the ecological processes that sustain forest ecosystems, the conservation of the biological diversity associated with forests (particularly endangered and vulnerable species and communities), and the protection of water quality and associated aquatic habitats.

Governments, in the NFPS, agreed to manage forests for the conservation of all species of Australia's indigenous forest fauna and flora throughout those species' range, and to manage public native forests for the protection of a number of other conservation values, such as wilderness and heritage values, cultural significance (including significance to Aboriginal people), and landscape and aesthetic attributes. The stated objective is to ensure the retention of the full suite of forest values over time.

Nature conservation objectives are to be pursued through reserve systems, complementary management of public native forest outside reserves and thirdly the promotion of sympathetic management of private native forests. Governments have agreed that an effective corridor system linking reserves and areas with relatively large altitudinal and other geographical variation should be included to take into account possible climate change effects.

1. Reserve systems

The primary method for the protection of nature conservation, wilderness and heritage is to be the reserve system. Governments have agreed that there should be comprehensive, adequate and representative network of dedicated and secure reserves to protect nature conservation (including old-growth forest) and wilderness. The reserve systems are also to ensure that unique features and heritage values of conservation significance are protected.

Nature conservation reserves are defined in the NFPS as areas of publicly owned land, including forested land, managed primarily for nature conservation and providing multiple benefits, such as recreation and water catchment but excluding wood production. The NFPS defines the terms comprehensive, adequate and representative as:-

comprehensive

- includes the full range of forest communities recognised by an agreed national scientific classification at appropriate hierarchical levels;

adequate

- the maintenance of the ecological viability and integrity of populations, species and communities; and

representative

- those sample areas of the forest that are selected for inclusion in reserves should reasonably reflect the biotic diversity of the communities.

While it was agreed that the terms comprehensive, adequate and representative should also apply to reserves for wilderness, the definition of how these terms would be applied is to be further developed through the implementation of the NFPS. Governments have agreed that management plans should be developed for the reserves to guide the management of reserves in order to achieve adequate protection of nature conservation and heritage values; and that the development of these management plans will incorporate community consultation.

The NFPS contains a specific strategy and timeframe for the development of reserve systems for old-growth and wilderness. Subject to agreement on criteria, Governments have agreed to establish comprehensive, adequate and representative reserve systems to protect old growth forest and wilderness values on public land by the end of 1995. The inclusion of any private land in the reserve system is to be completed, to the extent feasible, by 1998. Any regional forest agreement will require that the reserve systems for all nature conservation, wilderness and heritage values are put in place.

The terms old-growth forest and wilderness were also defined in the NFPS. The terms both required that the areas be substantially free of unnatural disturbance, or are capable of restoration to a substantially unmodified state.

Meeting these obligations through the regional forest agreement process will mean undertaking old-growth surveys using agreed methodology and wilderness assessments using, for example, the National Wilderness Inventory. Once agreed, Governments will also apply the criteria for the development of reserve systems drafted by the ANZECC/MCFFA Technical Working Group on Reserve Criteria established under the NFPS.

2. Ecologically sustainable forest management

The NFPS and ESD Strategies commit Governments to the ecologically sustainable management of forests.

The NFPS states that the regional agreement resulting from the assessment will cover guidelines for all aspects of the ecologically sustainable management of the forests in question, and cover for example management for sustainable yield, the application and reporting of codes of practice and the protection of rare and endangered species and National Estate values. The guidelines may also specify the levels and types of disturbance acceptable for a particular forest so as to not adversely affect National Estate and other conservation values of that forest.

As part of the ecologically sustainable management of forests Governments have agreed to the continued development of integrated planning process, through codes of practice and environmental prescriptions, and through management plans. The management plans are to provide a set of operational requirements for wood harvesting and other commercial and non-commercial uses of forest. These management plans are to include specifications for the management of important biological, cultural, archaeological, geological, recreational and landscape values, and are to take into account the precautionary principle.

Governments have agreed that all commercial and high impact non-commercial operations on public and private land will be covered by legally enforceable codes of practice, and that there is effective auditing of compliance with these codes of practice. The codes of practice adopted by States should reflect 'best available practices', be based on the Australian Forestry Council's set of national principles, be updated with new research, and be monitored for their effectiveness against the set of national baseline environmental standards to be developed as part of the NFPS' implementation.

The objectives of the NFPS relating to ecologically sustainable forest management will need to be taken into account during environmental impact assessment and negotiation of the regional forest agreement.

7.3 National Reserves System initiative

The National Reserves System (NRS) initiative announced in the Prime Minister's December 1992 Statement on the Environment confirmed the Commonwealth Government's commitment to the development, in cooperation with the States and Territories, of a national comprehensive system of parks and reserves. The Government's policy was that all major ecosystems be surveyed and that a comprehensive, adequate and representative system of reserves be established progressively by the year 2000.

A total of $16.85m over four years beginning in 1992-93 was provided in the Statement for a range of portfolio programs to support implementation of the initiative. The bulk of the funding is administered by ANCA as the National Reserves System Cooperative Program (NRSCP). The Australian Heritage Commission manages the National Wilderness Inventory and the Wild Rivers Program. DEST is the lead agency within the Portfolio with respect to the NFPS and accordingly has responsibility for the old growth forests component.

The objectives being implemented through NRSCP 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 2000; and

3. to develop and apply, in association with the State and Territories, nationally consistent management principles for protected areas in accordance with internationally accepted classifications and standards.

The reserve system developed for a region should take into account both the NFPS and the NRS. The is a need to ensure that the protocols and procedures agreed to in the NFPS and the NRS are integrated and complementary. The NRS covers all terrestrial ecosystems other than forests. Species and ecosystems based conservation assessment approaches developed for forests will need to be examined for their relevance to non-forest ecosystems in the NRS and visa versa. Procedures and protocols will need to consider a wide range of issues including, both temporal and spatial scales, as well as the heterogeneity of map units, and the need for standards for environmental and habitat attributes.

8. Relevant international treaties, conventions, and agreements

8.1 Summary

The following list includes international conventions, treaties and other agreements which the Commonwealth may need to consider in undertaking regional assessments.

Multilateral conventions, treaties and agreements

- Convention on Wetlands of International Importance, Especially as Waterfowl Habitat, 1971, Ramsar
- Convention concerning the Protection of the World Cultural and Natural Heritage, 1972, Paris
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973, Washington
- Convention of Conservation of Migratory Species of Wild Animals, 1979, Bonn
- International Tropical Timber Agreement (ITTA) 1983
- Convention on Biological Diversity, 1992
- Climate Change Convention, 1992
- Statement of Forest Principles 1992
- Agenda 21 1992
- Rio de Janeiro Declaration on Environment and Development 1992
- Man and the Biosphere Programme

Regional agreements

- Convention on Conservation of Nature in the South Pacific, 1976, Apia.
- Convention for the Protection of the Natural Resources and the Environment of the South Pacific Region (SPREP), 1986, Noumea.

Bilateral agreements

- Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment, 1974 (JAMBA).
- Agreement between the Government of Australia and the Government of China for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment, 1986 (CAMBA).

8.2 Details of major International Conventions, Treaties and other Agreements which may be relevant to forested areas

Multilateral Conventions, Treaties and Agreements

- **Convention concerning the Protection of the World Cultural and Natural Heritage 1972 (World Heritage Convention)**
  - refer Section 2

- **Convention on Biological Diversity 1992**
  - refer Section 4

- **United Nations Framework Convention on Climate Change**

Commitments under this Convention appear to have only a limited relevance in relation to the proposed assessment process and will largely be covered under other initiatives (ie ESD, NFPS).

The Convention commits Parties to:

- Promote and cooperate in scientific, technological, technical, socio-economic and other research, systematic observation and development of data archives related to the climate system and intended to further the understanding and to reduce or eliminate the remaining uncertainties regarding the causes, effects, magnitude and timing of climate change and the economic and social consequences of various response strategies (Article 4.1.g);

- Promote sustainable management and promote and cooperate in the conservation and enhancement of sinks and reservoirs of greenhouse gases, including biomass, forests and oceans (Article 4.1.d);

- Take climate change considerations into account in relevant social, economic and environmental policies and actions (Article 4.1.f);

- Have a regard to and should promote sustainable development. Policies and measures to deal with climate change should be appropriate for the specific conditions of each party and should be integrated with national development programs (Article 3.4).

Specific actions in relation to this commitment may involve baseline information gathering and monitoring effects of climate change (species distribution, rates of deforestation/afforestation).

- **Convention on Wetlands of International Importance Especially as Waterfowl Habitat 1971 (Ramsar Convention)**

The Ramsar Convention seeks to:

- promote conservation of wetlands and waterfowl;
- to establish nature reserves on wetlands; to provide adequately for their protection and management; and
- to train personnel in the field of wetlands research and management.

A list of Wetlands of International Importance is maintained. The Convention, which came into force in Australia on 21 December 1975, has proved to be a useful tool for protecting listed sites. The Convention is implemented through State and Territory conservation legislation and is coordinated through the Australian and New Zealand Environment and Conservation Council (ANZECC) Wetlands network, convened by ANCA. Australia now has 40 Ramsar sites. The objectives to be met in relation to this international commitment would include identification of any wetlands of international importance and ensuring appropriate management/landuse recommendations in relation to those wetlands.

- **Statement of Forest Principles (1992)**

The Statement of Forest Principles, agreed at UNCED, is a non-legally binding document which represents a global consensus on forests, consisting of broad principles which acknowledge the importance of forests for the maintenance of ecological processes from local to global level and the need to ensure their careful management, conservation and sustainable development.

Recognition of the rights of indigenous peoples and their involvement, along with other groups, particularly women, in dealing with forest issues is advocated, as is the promotion of the non-wood values of forests and assistance to developing countries to achieve the goals outlined in the Statement.

Relevant principles expressed in the Statement include:

- the provision of timely, reliable and accurate information on forests and forest ecosystems is essential for public understanding and informed decision-making and should be ensured (Principle 2c);

- all aspects of environmental protection and social and economic development as they relate to forests and forest lands should be integrated and comprehensive (Principle 3c);

- decisions taken on the management, conservation and sustainable development of forest resources should benefit, to the extent practicable, from a regional assessment of economic and non-economic values of forest goods and services and of the environmental costs and benefits. The development and improvement of methodologies for such evaluations should be promoted (Principle 6c);

- national policies and/or legislation aimed at management, conservation and sustainable development of forests should include the protection of ecologically viable representative or unique examples of forests, including primary/old-growth forests, cultural, spiritual, historical, religious and other unique and valued forests of national importance (Principle 8f); and

- national policies should ensure that environmental impact assessments should be carried out where actions are likely to have significant adverse impacts on important forest resources, and where such actions are subject to a decision of a competent national authority (Principle 8h).

Objectives to be met through the regional assessment process in relation to this international commitment include:

(a) acquisition of sufficient data collection and data analysis to allow for the protection of representative or unique examples of forests
(b) integration of all aspects of environmental, social and economic data and analysis (comprehensive assessment of all economic and non-economic values)
(c) undertaking impact assessment on actions likely to have a significant adverse impact on forests

The regional assessment process incorporates these principles in that it is comprehensive, deals with impact assessment and will result in decisions on the protection of representative and/or unique forest environments.

- **Man and the Biosphere Programme**

Biosphere is an international designation made by the United Nations Educational, Scientific, and Cultural Organisation (UNESCO) on the basis of nominations submitted by the more than 110 countries participating in its Man and the Biosphere Programme (MAB). While no binding international obligation arises from an area being designated a biosphere reserve, such areas should nevertheless be protected. Biosphere reserve is a unique category of protected area - each biosphere reserve conserves examples of characteristic ecosystems of one of the worlds natural regions. Management plans are prepared specifying steps to be taken to develop and coordinate biosphere reserve functions, as set forth in the action Plan for Biosphere Reserves approved by the MAB International Coordinating Council in 1984. Australia has 12 Biosphere reserves.

Objectives for regional assessment include:

- identification of protected areas within the region that are, or nominated as Biosphere reserves;
- identification of suitable areas for nomination as or addition to Biosphere reserves; and
- consideration of management implications for any of the above areas in regional assessment recommendations.

- **Agenda 21**

As a signatory to the final act of the United Nations Conference on the Environment and Development (UNCED) in June 1992, Australia is committed to the implementation of Agenda 21 in accordance with our domestic economic interests and international priorities for sustainable development. There are several chapters of Agenda 21 which address the social and economic dimensions of environment and development. The regional assessment process is consistent with the objectives for national and regional assessment as expressed in these chapters.

Chapter 10, *Integrated Approach to the Planning and Management of Land Resources*, seeks to promote integrated planning and management through the development of supportive policies and instruments, strengthening planning and management systems, the use of appropriate tools, raising awareness, public participation, strengthening information systems and international cooperation.

Chapter 11, *Combating Deforestation*, specifies four principal program areas:

A. Sustaining the multiple roles and functions of all types of forests;

B. Enhancing the protection, sustainable management and conservation of all forests, and the greening of degraded areas, through forest rehabilitation, afforestation, reforestation and other rehabilitative means;

C. Promoting efficient utilisation and assessment to recover the full valuation of the goods and services provided by forests;

D. Establishing and/or strengthening capacities for the planning, assessment and systematic observations of forests and related programs, projects and activities, including commercial trade and processes.

In its report to the United Nations Commission on Sustainable Development in 1995, Australia will be required specifically to report on progress with the implementation of activities proposed in Agenda 21 concerning land, desertification, forests and biodiversity.

- **Convention on the Conservation of Migratory Species of Wild Animals 1979 (Bonn Convention)**

The Bonn Convention protects those species of wild animals that migrate across or outside of national boundaries. It provides a framework for enhancing the conservation status of rare and threatened migratory species. The Bonn Convention came into force for Australia 1 September 1991 and is coordinated through ANZECC Migratory Animals Network.

- **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) 1973 Washington**

This Convention regulates international trade in species threatened with extinction (ie some tropical timber species). It was signed by Australia in 1973 and ratified 1976. ANCA is the CITES Management Authority for Australia. CITES is implemented in Australia through the Wildlife Protection (Regulation of Exports and Imports) Act 1984, administered by ANCA.

Regional agreements

- **Convention on Conservation of Nature in the South Pacific 1976 (Apia Convention)**

On 27 March 1990 Australia ratified the Convention on Conservation of Nature in the South Pacific which came into force on 23 June 1990. Article 2 of the Convention provides that: "Each Contracting Party shall, to the extent that it is itself involved, encourage the creation of protected areas which together with existing protected areas will safeguard representative samples of the natural ecosystems occurring therein (particular attention being given to endangered species, as well as superlative scenery, striking geological formations, and regions and objects of aesthetic interest or historic, cultural or scientific value." This convention is implemented in Australia by ANCA.

- **Convention for the Protection of the Natural Resources and the Environment of the South Pacific Region (SPREP Convention), 1986, Noumea**

The SPREP Convention, as it is commonly called, provides a comprehensive, umbrella agreement for the protection, management and development of the marine and coastal environment of the South Pacific Region. It lists sources of pollution which require control and identifies environmental management issues requiring regional cooperation. The SPREP Convention was ratified by Australia 19 July 1989.

Bilateral agreements

- **Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment 1974 (JAMBA)**

JAMBA is a bilateral Agreement to reinforce the Ramsar Convention, as well as extending Australia's commitment to protect migratory birds other than waterfowl and birds in danger of extinction and their environment. The Japanese and Australian Governments meet periodically to review the Annex to the Agreement, which lists the migratory birds covered by the Agreement. The agreement has been ratified and entered into force on 30 April 1981. The Commonwealth, States and Territories have shared responsibility for fulfilling the obligations incurred under this Agreement. JAMBA is coordinated through the ANZECC Migratory Animals Network, convened by ANCA. Objectives include identification of habitats important for migratory birds listed under the Agreement; and provision of management/landuse recommendations on habitat areas.

- **Agreement between the Government of Australia and the Government of the Peoples Republic of China for the Protection Of Migratory Birds in Danger Of Extinction and their Environment (CAMBA)**

The objectives of this Agreement to be met through the regional assessment process that respond to this international commitment include:

- protection if migratory birds listed;
- identification of habitats important for migratory birds listed under the Agreement; and
- making management/landuse recommendations on habitat areas.

Attachment

PROPOSED GUIDELINES

FOR

BIOLOGICAL DIVERSITY ASSESSMENT

A component of the regional forest agreement process

PROPOSED GUIDELINES FOR BIOLOGICAL DIVERSITY ASSESSMENT

A component of the regional forest agreement process

CONTENTS

1. BACKGROUND

This guide aims to define a conceptual approach and methodologies for the assessment of forest biological diversity. Biodiversity assessment in this context forms part of a set of assessments constituting the comprehensive regional assessment (CRA) process, as described in the National Forest Policy Statement.

The CRA process underpins the development of regional agreements between the Commonwealth and particular state governments on appropriate forest management arrangements. These proposed guidelines should therefore be read in conjunction with the Commonwealth position paper on the regional forest agreement process, and in particular Section 2 of that paper.

The matters discussed in this guide derive authority from several sources:

a. The commitment to conserve biological diversity is principally derived from the Convention on Biological Diversity and the draft National Strategy for the Conservation of Australia's Biological Diversity. The Convention on Biological Diversity, ratified by Australia on 18 June 1993, deals at a global level with the full range of biological diversity conservation, its sustainable use, and the fair and equitable sharing of benefits arising from its use. The Convention came into force on 29 December 1993. The draft National Strategy signifies Australia's commitment to the Convention and will be a critical reference point in implementing the Convention;

b. The National Forest Policy Statement establishes the concept of CRA and lists the protection of biological diversity under the Convention on Biological Diversity as one of the Commonwealth obligations to be included in the assessment; and

c. The National Strategy for Ecologically Sustainable Development (ESD) identifies the protection of biological diversity and the maintenance of essential ecological processes and life-support systems as one of its three core objectives.

2. FRAMEWORK FOR BIODIVERSITY ASSESSMENT

The framework proposed here outlines a process for the biodiversity assessment component of CRA (Figure 1). It emphasises the links between broad policy goals, operational goals required for assessment purposes, and the constraints imposed on implementing comprehensive biodiversity assessment by limited funds, information, analytical methodologies and short time frames. Recognition of these constraints requires that, as far as possible, an iterative approach be taken, with the initial assessment providing the basis for defining management regimes and further information needs.

Guidelines for the review of management regimes could be developed during the planning phase for regional assessments. If an iterative process is not adopted, the reliability and consistency of CRA outcomes will vary substantially between regions, with the potential for poor outcomes in terms of inefficient resource allocation and a failure to achieve biodiversity goals.

The relationship between the time available for assessments, resources allocated and the quality and availability of existing data is likely to be complex and to vary between CRA regions. For this reason the approach taken has been to design a generic framework which identifies the critical elements for obtaining a consistent result between regions. The further elaboration of this approach is a high priority.

3. GOALS OF BIODIVERSITY ASSESSMENT

The fundamental goal of biodiversity conservation is to minimise loss of biodiversity by maintaining viable populations or meta-populations of species, the basic evolutionary units, and the ecological processes upon which they depend. This principle is the basis for targeting biodiversity assessment at the species population level, particularly for species which are sensitive to prevailing land use regimes.

Biodiversity conservation is concerned with the status of biodiversity across the whole landscape, whether public or private lands, and is not simply the development of a reserve network. A critical outcome of the assessment process is therefore the development of sound management guidelines for all lands. In these respects biodiversity assessment is different in significant ways to the commonly utilised approach to conservation evaluation of identifying the 'best bits' of the landscape for higher levels of protection and ignoring the remaining lands and water.

Biodiversity is considered at three levels in the Biodiversity Convention; genetic, species and ecosystem. Definitions and goals provided in these and other similar policy documents are generally not amenable to implementation in a consistent manner until converted into operational goals, which link the goal with the types of data available and appropriate analytical methodologies. The purpose of this section is to define operational goals for biodiversity conservation and identify priority biodiversity entities for assessment.

The three levels of biodiversity targeted in assessments contain significant redundancy. For example, by maintaining genetic variation within a species, assuming this is done in-situ, the goal of maintaining viable populations of that species is likely to be achieved. At the higher, ecosystem level, there is the potential for considerable redundancy as ecosystems are composed of assemblages of plant and animal species in different physical environments. Many of the species captured at the ecosystem level are likely to have been targeted through operational goals at lower levels. This redundancy has been considered when developing the operational goals, target groups and methodological approach outlined in this document.

The priorities for assessment identified in the following discussion may change as new methodologies and knowledge become available.

(a) Genetic and species diversity

GOAL - ***To maintain viable populations of each species in each biogeographic region****

Empirical data on genetic variation within and between species is sparse and generally restricted to a small number of species within the major taxonomic groups, primarily vertebrate animals and higher plants. The cost of analyses to allow genetic variation to be comprehensively included in evaluations is prohibitive. The strategy adopted for incorporating genetic diversity conservation into biodiversity assessment is to identify particular species groups which on the basis of current knowledge, and require targeted assessments to ensure their survival and the maintenance of genetic variation. As knowledge of intraspecific variation, and techniques for assessing this improve, it will be necessary to revise the strategies for ensuring preservation of genetic variation, and the goal itself.

It will be possible to systematically identify actively evolving groups and species including clines, species complexes, hybridisation zones and co-evolving taxa, and it will become more practical to recognise the importance of such variation to ecological and evolutionary processes, particularly in the light of anthropogenic climate change. Improved data will also allow the identification of important interspecific interactions, and their incorporation into assessments.

* The issue of viability for both species and ecosystems is discussed in Section 5 (c).

Species level assessments include a number of other broad categories which have been identified as having special identification or management needs (Appendix 1). The distribution of the majority of species and ecosystems will, however, be determined using a coarse filter approach (Noss 1987), where assemblages of animals and/or plants are the units for inventory. This approach is necessary given the limited resources and time available for assessment.

Species known, or suspected, to be at greater risk of extinction are a priority group for species level assessments and include the endangered, vulnerable and declining species categories. They are generally characterised by having low resilience to the environmental changes associated with current and/or projected major land use regimes. These species provide a logical basis for setting priorities for protection as greater effort is expended on species requiring higher levels of management to maintain viable populations.

A methodology for ranking species response to prevailing land use regimes is recommended for adoption within the biodiversity assessment component of CRA but requires refinement to allow the concept to be made operational. Initially this would necessarily involve intuitive judgements of 'experts' (eg Reid and Fleming 1992) but it should be feasible to build the concept into a rule based decision making process which provides a measure of consistency across regions. A more formal decision making process would require extensive data from monitoring programs to provide a quantitative basis for the ranking process.

Target groups also include categories related to genetic difference (eg phylogenetically distinct species), distributions (rare species) and importance for management or monitoring of biodiversity. These groups require specialised information to be collected to ensure they are adequately protected. The Biodiversity Convention also identifies species of economic or cultural importance as target groups for conservation. The maintenance of genetic diversity in local populations of plants and animals is a critical consideration particularly for species of importance for traditional use and those used for commercial purposes. (See Appendix 1 for definitions of all genetic/species categories). Where a known sub-species, hybrid zone or species complex occurs in a region, assessments should, where feasible, be conducted such that the conservation needs of these entities are included in assessments.

GENETIC AND SPECIES DIVERSITY TARGET GROUPS

- Threatened species (endangered and vulnerable)
- Declining species
- Rare species
- Species with disjunct distributions
- Migratory or mobile species
- Bioregional endemic species
- Phylogenetically distinct species
- Economic and culturally important species
- Functionally important species
- Indicator species

(b) Ecosystem diversity

GOAL - ***To maintain viable samples of each ecosystem in each biogeographic region***

The concept of ecosystem class (See Appendix 1 for definitions) is used to define areas which can be characterised in terms of three factors: biotic composition, physical environment and structural vegetation attributes. Priority in biodiversity assessment is given to the biotic composition factor. The ecosystem classes are used to define zones within which broadly similar management regimes and actions would be required to maintain the values of a particular class. Development of methodologies for selecting a representative sample or samples from an ecosystem class for higher levels of protection is required to ensure the variation in that class is maintained. This procedure should also partially satisfy the requirements for a comprehensive, adequate and representative (CAR) reserve system.

A number of ecosystem groups which are 'special' classes of ecosystem are identified for targeted assessment. These include threatened and declining ecosystems which require higher levels of protection and management, and rare ecosystems which are unlikely to be adequately identified using a coarse filter approach.

Non-vascular plants and invertebrates are considered primarily in ecosystem level assessments using rapid biodiversity assessment (RBA) techniques (Anon 1993). The exceptions are non-vascular plants and invertebrate species listed in the *Endangered Species Protection Act 1992* and species known or suspected to belong to any of the target species groups identified above. These species will be considered in species level assessments.

ECOSYSTEM DIVERSITY TARGET GROUPS

- Threatened ecosystems
- Declining ecosystems
- Rare ecosystems
- Representative ecosystems - identified by selecting viable samples from ecosystem classes
- Ecosystems important for research, monitoring and as benchmark sites (many of these will be identified during the assessment process).

4. INVENTORY COMPONENT OF BIODIVERSITY ASSESSMENT

(a) Evaluation of existing information

(i) General

The information evaluation phase of biodiversity assessment contains several components (Figure 2):

- the compilation and evaluation of the quality and coverage of available biological and disturbance data to identify major gaps in information;
- the development of physical environmental databases of appropriate scale; and
- the design of biological and disturbance surveys (See Sections 4(b) and (c)).

Much of these data will be gathered in association with Australian Heritage Commission (AHC) National Estate assessment requirements.

(ii) Data quality and coverage

The quality and comprehensiveness of available data will determine the adequacy of biodiversity assessments in CRA. Effort directed at the evaluation of existing data will provide a sound basis for implementing the biodiversity assessment component of a CRA and will help ensure criteria are applied in a consistent manner within and between regions. Biodiversity assessments in regions where data are sparse and of poor quality will require more conservative application of the precautionary principle than in areas where comprehensive databases are available.

Several aspects of data quality and comprehensiveness need evaluating in this process:

- coverage - are data available for the whole region for all attributes at an appropriate resolution?
- comprehensiveness of site data - what proportion of all species which occur at a site have been sampled?
- quality of data - what quality control checks have been carried out on the data?; is data presence only or does it make use of absences?; does the data comprise measurements for particular attributes or are data aggregated to broad classes? eg height or cover classes for vegetation survey.

The restricted time frames for CRA and limited resources will determine the extent to which further inventory is feasible, even in the situation where data are found to be inadequate for even preliminary assessment of values. Detailed evaluation of existing information will provide the opportunity for determining a series of options for the assessment process, priorities for inventory and a time frame for future data collection in areas where data are inadequate for decisions to be made.

(iii) Physical environmental data

The basic data set required for both species and ecosystem level analyses is physical environmental data which is utilised for the characterisation of the physical environment for fauna/flora assemblages and the modelling of species and assemblage (ecosystem) distributions.

Four key attributes have been selected for the development of physical environmental databases:

- terrain surfaces;
- climate surfaces;
- substrate (soil/surficial geology); and
- hydrology, especially near surface.

Of these, the soil/surficial geology data are generally of the poorest quality and resolution and it is recommended that geological maps at 1:250 000 scale be used for developing the substrate coverage. The resolution of climate surfaces and terrain surfaces is primarily dependent on the number and spatial distribution of sites in a region. Methodologies for developing these datasets are well developed, however the scale of data is generally coarser than required for many analyses.

Decisions concerning the appropriate resolution of physical environmental datasets will be required for specific regions and will made during the data evaluation phase. Hydrological data will only be used in assessments if available in existing data sets, the possible exception being data for wetland ecosystems in forested areas, which may be collected as part of the assessment process.

(b) Biodiversity inventory component

(i) An appropriate spatial framework for assessments

Biodiversity assessments for CRA should be carried out within a bioregional framework as the identification of conservation values for any area of land or water is dependent on the area's broader national and regional biogeographic context. CRA assessments may, however, be undertaken in administrative regions, the boundaries of which are unlikely to reflect those of natural regions for biota.

A number of potentially significant consequences for the reliability and efficiency of assessments could arise from this situation. For example, where a CRA region only comprises a portion of a biogeographic region the potential exists for a significant degree of replication of particular biodiversity entities through their identification in a series of independent assessments. Where the CRA region includes portions of more than one biogeographic region, bias in the identification of representative biodiversity entities could occur.

It is difficult to predict the actual consequences of these scenarios for efficient implementation of biodiversity assessments, however, in some instances, they may be significant, particularly where biogeographic region boundaries cross State and Territory borders. The likely results are inefficient allocation of land to different uses and inconsistent outcomes in CRAs between regions.

The development of an agreed set of biogeographic regions at an appropriate scale is a priority issue as it would allow the consideration of values within a biogeographic framework.

(ii) Scale for assessments

Scale is a critical factor for consideration in the CRA process as it will have a major influence on the comparability of CRA outcomes across Australia. For example the perceived heterogeneity within a region and number of 'discrete' ecosystems or communities will show a strong relationship with map scale when vegetation maps are used as the basis for selecting representative ecosystems. An appropriate scale could be determined on the basis of a formal or informal evaluation of the biological and/or environmental heterogeneity within and between regions.

A scale of 1:100 000 for outputs has been suggested for forest reserve assessments by the joint ANZECC-MCFFA working group on forest reserve criteria and is accepted as a generalised scale for biodiversity analyses. Sampling densities for inventory purposes will have to be determined for analyses at this scale. In fragmented forest areas and for particular ecosystems types (eg closed forests), a finer resolution may be required.

(iii) Surrogates of biodiversity

The definition of a biodiversity surrogate proposed here is:

> ***A measured or mapped unit which is assumed to be correlated with or able to predict the distribution of the biodiversity entity of interest.***

Surrogates of biodiversity are major components of current biodiversity assessments, primarily because of resource limitations on surveys.

The two major applications for surrogates in biodiversity assessment are:

- environmental classifications such as vegetation community maps and domain analyses which are used directly as surrogates to describe the patterns of distribution of biodiversity;

- predictive modelling techniques which utilise physical environmental data as a surrogate for particular species, assemblages or ecosystems to extrapolate their distribution across the landscape.

The ecosystem and higher level surrogates (environmental classifications) have been in use for many years, primarily in the context of conservation evaluations for nature conservation reserve selection. During the early to mid-1980's land systems were used extensively as general surrogates for the distribution of flora and fauna (Purdie 1986). By selecting representative samples of land systems, it was assumed that representative samples of flora and fauna would be captured in reserves. However, the assumptions underlying the link between land systems and flora/fauna distributions has not been systematically tested (Pressey in press).

With the development and improved availability of high speed computers, spatial modelling software and appropriate digital databases of physical environmental data, more formal uses of surrogates have been made possible (eg domain analyses Richards et al. 1990; Lewis et al. 1991). However, these methodologies have not been generally accepted by conservation biologists. Validation of modelling results against empirical biological data has been limited for both explicit and subjective ecosystem analysis methodologies (see Kirkpatrick and Brown 1992, Richards et al. 1990, Pressey in press).

Predictive modelling techniques for extrapolating species, assemblage or ecosystem distributions are in a period of rapid development following the early work of Austin et al. (1984) and development of the BIOCLIM system (Nix 1986). An overview of these studies has recently been made available by the Resource Assessment Commission (RAC 1993). The extent of validation of the different models is variable although some (eg BIOCLIM) have been used frequently in modelling exercises at a variety of scales (eg Nix 1986, Busby 1991).

For example, with the majority of species based predictive models there is considerable uncertainty as to how to interpret the predicted 'environmental envelope'; ie what is the probability of finding the species of interest at any site within the envelope. Validation of modelling techniques will require significant effort in the ground truthing of predictions. The incorporation of information on land use and disturbance histories into the models is likely to be necessary to improve the robustness of predictions (Kirkpatrick and Brown 1992) but these data are scarce and generally of coarse scale.

Given the current uncertainty surrounding the reliability of surrogate based approaches to biodiversity assessment, priority is being given to the use of primary biological data at species and assemblage level for assessment purposes. If, because of time constraints or other reasons, the high quality data sets necessary for species and ecosystem assessments cannot be obtained, consideration would need to be given to the use of surrogates. The ecosystem assessment process outlined here would need to be re-evaluated if environmental surrogates were used as the primary spatial units for analysis.

The outcomes of analyses using surrogates will be uncertain given the large number of assumptions inherent in their application and lack of empirical testing of these assumptions and should be viewed as preliminary. To ensure a scientific basis for the application of surrogates within the CRA process, the assumptions underlying analyses should be stated. These include whether the surrogate is assumed to represent all biodiversity entities or a particular sub-set of biodiversity. This approach will provide the opportunity to evaluate the efficiency of the assessment in the ongoing development of methodologies.

(iv) Steps in data evaluation, survey design and analysis

Genetic/species

The steps involved in determining priority areas for species protection and appropriate management regimes are outlined below;

Step 1 Compile lists of vertebrate animal, vascular plant species, lower plant and animal groups for each region and allocate species to the categories listed in Appendix 1. Invertebrates and non-vascular plants will primarily be considered through review of existing data and identification of priority sites.

Step 2 Evaluate the quality and coverage of both distributional and habitat data for each target species (eg number of records, specific surveys, quality of associated environmental data).

Step 3 For species where distributional data are poor, predictive modelling will be used to assist with survey design. This step will require the development of physical environmental databases at an appropriate scale (see ecosystem discussion below).

Step 4 Ground truthing to validate predictions.

Step 5 Integrate species data with disturbance data to develop habitat maps for selected key species.

Step 6 Compile distributional (point location) and habitat maps as GIS layers for each priority species or species group. See Section 4(c)(iii) for additional information on habitat assessment.

The choice of appropriate predictive models and environmental variables for modelling will be region and species specific and will be determined during the CRA implementation phase. Migratory species assessments will require seasonal surveys.

Ecosystem

A number of different approaches will be necessary for the ecosystem level assessments because of the variable scales required for analyses (eg high level of resolution for highly fragmented forest ecosystems) and ecosystem specific attributes required to characterise particular ecosystem types (eg stream and river systems).

However, the basic definition of an ecosystem outlined in Appendix 1 provides the basis for developing explicit analytical methodologies for each major ecosystem type. Appendix 2 contains additional points on data attributes, information needs and sampling design for species and ecosystem analyses.

The basic steps involved in ecosystem analysis are outlined below and will apply to all ecosystem types to some degree.

Step 1 Compilation of existing data, evaluation of its quality and coverage and identification of information gaps and determination of taxon groups to be sampled.

Step 2 Stratification of the region using physical environment data. A number of approaches are possible and details will be determined during the assessment (e.g. McKenzie et al 1989, Gillison 1984).

Step 3 Determination of sampling intensity and number of samples in each sub-region at the scale required for outputs.

Step 4 Surveys for selected taxon groups (eg vascular plants, RBA for lower plants and animals) using a nested design with all samples taken within a single 'site' where feasible (Allen 1989). If different sampling strategies are used for different taxa, a minimum data set of plant floristic/structural and physical environmental data should be specified.

Step 5 Classification of patches according to similarity in species composition to identify assemblages. This may be done for each major group separately or combined.

Step 6 Relate patterns of species composition to physical environmental attributes, both physical environmental and disturbance history, measured or estimated for the sites.

Step 7 Interpolate the distribution of assemblages across the landscape using modelling techniques (eg McKenzie et al. 1992, Moore et al.1990).

Step 8 Preparation of assemblage/ecosystem maps as GIS layers.

Step 9 Integration of ecosystem coverages with species and habitat coverages in the GIS for input to the conservation options analysis.

Both clustering and ordination approaches should be reviewed for application at Steps 5 and 7 (eg Belbin 1992, Faith and Walker 1993).

(c) Inventory of 'natural' and anthropogenic disturbance regimes

(i) General

Disturbance analyses have several uses in biodiversity assessment:

- exploratory analyses of the response of particular species or assemblages to specific disturbance regimes;
- incorporation of disturbance data into models for predicting the distribution of biodiversity entities;
- the development of guidelines for management of different management zones;
- the development of guidelines for the size of management zones and buffer areas.

Disturbance analysis is an area that is poorly developed in Australia in the context of broad, regional assessments. A simple model has been adopted within the Landscape Directorate, ANCA for development of formal disturbance analyses and is proposed for use in the biodiversity assessment component of the CRA process.

The model was developed to distinguish between what were considered to be overlapping and confusing definitions of threatening processes being utilised in some threatened species evaluations (eg Leigh and Briggs 1992). A primary objective of the model is to make explicit the distinction between a specific type of land use, the environmental changes which are associated with different land uses and the species/ecosystem response to these changes. For example, clearing of vegetation for cropping should be distinguished from clearing for pastoralism in biodiversity assessment.

(ii) 'Natural' and anthropogenic disturbances

The definitions of 'natural' and anthropogenic used here follow the IUCN terminology which recognises the importance of distinguishing varying degrees of human intervention. The term natural is used by the IUCN to distinguish areas that have not been affected by a greater level of disturbance since the industrial revolution of approximately 1750. In Australia, this translates to areas that have not been substantially disturbed by the European occupation of the continent.

The distinction between 'natural' and anthropogenic disturbances is frequently difficult to determine in practice, (eg 'natural' vs anthropogenically caused fires). However, there is value in defining them separately given the need to identify disturbances which may be controlled through appropriate management, and stochastic processes which will increase the uncertainty of outcomes associated with any prescribed management regimes.

- **'natural'** - where they occur independent of human influence, such as storm damage, or were part of pre-European human activities, such as some forms of the use of fire.

- **anthropogenic** - where they occur as a result of post 1788 European influence, such as timber harvesting or changes in fire management.

Disturbance has always been a major factor influencing forest ecosystems in Australia. The more common forms of natural disturbance affecting Australia's forests include:

- **Fire** which is unquestionably the most significant disturbance for much of Australia's eucalypt forest. It contributes to the distribution of many forest types as well as regulating the rates of many ecological processes including regeneration of fire dependent species. Fire is one of the most important factors controlling rainforest boundaries in Australia. Rainforest species are fire-sensitive and do not regenerate rapidly after burning. They tend to be replaced by eucalypt-dominated vegetation in areas subject to recurrent fire. By contrast, rainforest species regenerate more readily than eucalypts in undisturbed areas and, in the long-term absence of fire or other disturbance, will replace eucalypts as the dominant vegetation in areas where other physical variables do not preclude their growth. The use of fire by aborigines is believed to have been instrumental in creating and managing the forest ecosystems extant at the time of European settlement (RAC 1992);

- **Cyclone damage** in the tropics and storm damage elsewhere. Periodic disturbance resulting from cyclone damage is typical of many northern rainforest areas. It has an important influence on rainforest dynamics; where dominant trees are blown down gaps are created and in these gaps seedling regeneration may occur. Debris associated with cyclone damage may also facilitate the penetration of fire into rainforest communities (RAC 1992);

- **Flooding in many riverine environments** is critical to the germination and establishment of species such as River Red Gum. Flood damage creates gaps where regeneration occurs and fallen trees provide in-stream habitat for many species. Flooding is also important in the distribution of nutrients.

Human use of forests usually results in some form of disturbance or modification to forest ecosystems and processes. There are many human uses of forests and a correspondingly wide range of impacts resulting from them.

The impacts of these uses can vary in intensity from complete removal of the forest, removal of the overstorey and subsequent regeneration, as occurs after clear-felling and regeneration burning, to localised disturbance such as that associated with use of an area for recreational bushwalking. Even apparent minor effects can be cumulative and have a substantial impact over a long time (RAC 1992), arguing for the inclusion in analyses of what may currently be classified as minor disturbances.

(iii) Issues for data evaluation, survey design and analysis

The basic attributes required for disturbance analysis in biodiversity assessment are similar to those for old growth and wilderness inventory. The potential for developing an integrated, cost-efficient inventory utilising a single set of attributes should be considered in the implementation of the CRA process.

Many disturbances tend to be region specific, hence it is not feasible to identify detailed disturbance attributes except in the context of a particular regional assessment. However, there are some general types of disturbances and characteristics of disturbance events which can be identified as the basis for determining appropriate management regimes. A preliminary list of land uses and environmental changes for biodiversity assessment purposes is presented in Table 1 and key characteristics of disturbances which should be determined for analytical purposes are listed below:

- date of a specific disturbance;
- spatial scale (area affected);
- temporal scale (timing and duration of the stress);
- intensity (severity of the event);
- frequency (time interval between events).

Outline of steps for disturbance analysis

Step 1 Identification of major land uses, development of a preliminary list of key environmental changes and associated attributes, and development of provisional methodologies for disturbance/habitat condition assessments.

Step 2 Compilation and review of existing data, identification of information gaps and development of a preliminary land use/disturbance history database and GIS coverage(s). A scale of 1:100 000 is recommended for products but will be dependent on resource availability.

Step 3 Design of sampling program. This should be undertaken at two levels; detailed site data from a sub-set of the sites being sampled for species and assemblage analyses and a broad habitat condition assessment across a wider range of sites (eg Anderson 1993). This component could readily be implemented using community groups given appropriate training.

Step 4 Review and modification of land use/disturbance history database and GIS coverage(s) after analysis of site data.

Step 5 Integration of land use/disturbance history data with species and ecosystem data. Development of habitat maps for selected species and identification of assemblages associated with particular successional stages of vegetation or specific land uses.

5. CONSERVATION EVALUATION PHASE

(a) Background

The conservation evaluation phase is the process of evaluating the data against criteria to determine which areas satisfy particular criteria. Possible outcomes from the conservation evaluation phase are numerous and are listed in section 5 (e).

The Commonwealth has a wide range of responsibilities in relation to the CRA process, of which the most relevant to biodiversity assessment are listed below:

- identification of all places of national estate significance;
- identification of areas which meet criteria for World Heritage listing;
- identification of endangered species and their habitats;
- identification of wilderness values;
- identification of areas and species and genes of biological diversity significance;
- assessment of the adequacy of the current reserve system for maintaining conservation values of forested areas and identification of requirements for adequate protection of these;
- identification of old growth values.

The operational goals specified in Section 3 (a) and (b) of this document are the criteria proposed for biodiversity assessment purposes with the definitions of target categories listed in Appendix 1 being the individual elements which are assessed against the data.

There are two major components of the conservation evaluation phase for biodiversity assessment:

- **Conservation options analysis** - determination of the optimal spatial configuration of key sites to conserve the target biodiversity entities and identification of management zones. A range of optional configurations for non-critical sites will be defined.
- **Viability analysis** - determination of management guidelines for all management zones to ensure Biodiversity Convention obligations are met.

(b) Conservation options analysis

The priority in the conservation options analysis process is to firstly, determine protection and management requirements for all target biodiversity entities, except the representative ecosystem category, and then to consider other species and ecosystems in a second phase analysis. The primary aim of this process is to identify the spatial configuration of management zones necessary to ensure that biodiversity conservation goals are met. This may not involve all species being contained in high protection zones.

A concern with applying conservation options analyses in an unselective manner, for example by attempting to reserve all species, is that it could lead to inefficient allocation of scarce conservation resources. Many species may not require representation in a high protection zone because they are not negatively affected or may actually increase in abundance under prevailing land use regimes. These species should be excluded from the initial conservation options analysis to ensure that biodiversity entities which are undergoing significant declines under current land use regimes or have specialised management needs are given priority in the delineation of high protection zones.

The basic principles and concepts of conservation options analyses were developed for selecting representative reserve networks but can applied in the biodiversity assessment context. The concepts being utilised are: irreplaceability (Pressey et al. in press) and complementarity (Vane-Wright et al. 1991).

The concept of irreplaceability derives from the observation that 'in most regions there are many ways of combining sites into representative reserve networks' (Pressey et al. in press). The 'irreplaceability' of a site is defined as the percentage of these alternative networks in which it occurs. Application of the principle of irreplaceability ensures that sites containing rare 'features' (sensu Faith 1992) are automatically selected in the reserve selection process.

This concept has been adopted for application in the biodiversity assessment component of CRA, specifically for all targeted biodiversity entities except the representative ecosystem entity. Examples include areas containing threatened ecosystems, significant concentrations of threatened species, or key overwintering sites for migratory species. These areas should be excised and placed into high protection zones prior to implementing iterative conservation options analyses (Margules and Nicholls 1988).

The second key principle adopted from the reserve selection literature is the complementarity concept which argues that 'the importance or value of an area as a candidate for addition to a reserve system depends on the number of previously unrepresented features (biodiversity entities) that it can contribute to the system, not on its total feature richness' (Faith and Walker 1993). Complementarity has arisen partly from a recognition that application of the species diversity (richness) criterion for area selection in conservation evaluations results in larger areas being selected for reservation (Pressey and Nicholls 1989). Application of the complementarity criterion minimises the potential for 'features' to be missed from the system as it involves utilisation of data on the actual species that occur in an area.

The second phase of the analysis aims to ensure that representative samples of each ecosystem class are maintained as reference sites for that class. The key principle for application in this phase is that a representative sample of each assemblage/ecosystem will be obtained if the areas selected efficiently represent the environmental space occupied by the assemblage (see Belbin 1993; Belbin unpubl. manuscript for a methodology for sampling environmental space).

The delineated zones for target biodiversity entities will encompass areas containing representative samples of some ecosystem classes which may, depending on the required management regimes, be able to function as reference sites for that class. These sites may also satisfy the requirements of a CAR reserve system. Application of the complementarity principle within a conservation options analysis at this stage will allow determination of a range of area configurations able to contain the full range of biodiversity entities identified in the biodiversity assessment goals.

The affordability of the various options will need to be determined through a social and economic cost-benefit analysis. If areas are to be removed from a high protection category they should be non-critical areas, which will generally be those areas identified during the second phase of the analysis.

Thresholds for minimum numbers of populations or areas for target species or ecosystems respectively will need to be determined. Kirkpatrick and Brown (1992) defined thresholds for use in the Tasmanian context which should be reviewed for their suitability for application in the CRA process.

(c) Viability analysis

The question of adequacy (viability) of management zones for maintaining species populations and ecological processes is a controversial field in conservation biology.

There are two general approaches to the problem in the literature: the development of broad guidelines for reserve size and shape using principles from ecological theory and practice, particularly island biogeography (Shaefer 1990), and the use of population viability analysis (PVA) to determine minimum population sizes and hence the area required to maintain viable populations of selected species (Burgman et al. 1993; Lindenmayer et al. 1992).

For CRA assessments viability is being considered through three processes:

i PVA (risk assessment of extinction) for selected species;

ii development of guidelines for management zone - sizes, shape and connectivity using principles from ecological theory and practice; and

iii implementation of systematic monitoring programs for selected species and assemblages/ecosystems using the integrated monitoring program concept (Karr 1991).

(i) Population Viability Analysis (PVA)

Population viability analysis (PVA), in the CRA context, aims to define the risks of extinction for particular populations or meta-populations under specified management regimes. The methodology generally requires substantial population data to be applied efficiently. These data are rarely available and are unlikely to be obtained at an adequate level through the biodiversity assessment component of CRA. On-going research will be necessary to implement PVA in a realistic manner and the assessment will provide the basis for identifying the species to be recommended for PVA research in the implementation of the CRA report.

(iii) Guidelines for reserve design

Each region has its own unique combination of land use and disturbance history and therefore the spatial context for the protection of biodiversity also changes. For example, in regions where forest environments have been highly fragmented it will be necessary to intensively manage small, isolated remnants to maintain their values, and ecosystem rehabilitation or restoration may be needed. In these environments, corridors may need to be developed to maintain 'connectivity' at the landscape scale, provide the potential for dispersal and re-colonisation of patches by animal and plant species and thereby reduce the risk of extinction.

A number of general principles have been extracted from the literature for use as guidelines in the viability analysis component of biodiversity assessment but their implementation will have to be tailored to the specific region within which they are applied:

- priority in the declaration of high protection zones should be given to areas containing species or ecosystems known to be in the threatened or declining category;
- large areas are preferred to small areas, all other factors being equal;
- guidelines relating to size of areas should not be used to exclude small remnants of high conservation value from being given significant protection;
- high protection zones should be developed across the major environmental, particularly altitudinal, gradients if feasible, but only if these gradients incorporate key areas identified during the conservation options analysis;
- linear areas should be avoided where feasible except for riverine/stream systems and corridors identified as having significant biodiversity values;
- buffer zones should be incorporated into all high protection areas to minimise the abruptness of the transition from areas of high protection to more intensively used landscapes;

- catchment boundaries should be utilised where feasible, particularly for large protected areas;

- comprehensive management guidelines should be developed for all management zones;

- the area (size), frequency and intensity of disturbances, whether 'natural' or anthropogenic should be incorporated as factors in the design of management areas; and

- the design of the management zoning system should take into account trends in land use and environmental change as well as current and historical data.

(iii) Integrated monitoring programs

The development of high quality, spatially referenced land use/disturbance history data sets will allow for explicit analyses of species and ecosystem response to disturbance.
These analyses, conducted during the conservation evaluation phase, will provide the basis for developing management objectives and guidelines for management zones. The recommended approach for ensuring that these guidelines are effective in maintaining the viability of species populations and ecological processes is to develop an integrated monitoring program (Karr 1991) at the regional level as a key component of the CRA process.

The key aspect of integrated monitoring is the incorporation of information on the status of species and/or assemblages as well as physical environmental indicators of condition in the development of the program. The data being returned from these monitoring programs would be used in an adaptive management sense (Holling 1978) to review management objectives as required or at regular intervals.

The need to adopt an iterative approach to the issue of viability derives from the enormous uncertainty attached to any recommendations regarding the design of an integrated nature conservation network. This uncertainty will only be removed by measuring the response of target biodiversity entities to the management regimes determined as part of the CRA process.

The question of which species to select for monitoring is a difficult issue for which there are no clear answers. Priority is being given to species at higher risk of extinction (eg threatened species listed under the Commonwealth *Endangered Species Protection Act 1992*) and functionally important species (Soule 1987) with highest priority for species which occur in both categories (eg cassowary). The priority sites for ecosystem monitoring are the threatened and declining classes depending on the level of resources available for monitoring. Monitoring of the reference sites for ecosystem classes identified under the representativeness criterion will be necessary, however the frequency and intensity of monitoring may be lower.

The review of monitoring strategies developed for the Wet Tropics Management Agency (Anon 1993) is recommended for consideration in the implementation of monitoring programs within the CRA process.

(d) Risk and uncertainty analysis

The purpose of the risk and uncertainty analysis is to apply the precautionary principle, an integral component of the ESD process, within the context of biodiversity assessment. It states *'where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.'*

The conservation of biological diversity is a core objective of ecologically sustainable development and is also recognised as an important principle within the Intergovernmental Agreement on the Environment (IGAE).

The application of this principle for the biodiversity component of CRA will require the development of appropriate methodologies for:

- modelling the costs and benefits of different resource allocation options in situations where the risks are known; and
- dealing with uncertainty in biodiversity assessment.

The application of the precautionary principle in biodiversity assessment is concerned here with two scenarios. The first is concerned with the situation where there is a conflict between allocation of land to resource utilisation or conservation purposes, where the biodiversity and resource utilisation values of the area are defined. In this situation a methodology is required to make explicit the costs and benefits of different biodiversity conservation or resource use options to ensure adequate consideration of the issues. This component may simply require a review of available methodologies.

The second scenario is one in which data are inadequate to define biodiversity conservation needs but the assessment time-frame requires that decisions be made in the face of considerable uncertainty. The preferred option for biodiversity assessment is to defer the decision until the data gaps are filled and analyses have been undertaken, however this option may not be available. Explicit methodologies for coping with uncertainty are required to ensure more cautious decisions are made in areas where there is significant uncertainty as a result of incomplete knowledge. Methodologies in this area are poorly developed.

The development of an integrated approach to application of the precautionary principle which incorporates the assessment of risk and uncertainty will produce a formal basis for agreement between the Commonwealth and States regarding the allocation of land to different uses. This issue is beyond the scope of this paper to address in detail but requires specific projects to develop or refine methodologies. The outcomes of these projects should result in better decisions for CRA.

(e) Assessment of adequacy of existing management arrangements

The outcomes from the conservation evaluation analyses will be a series of options for implementing a regional biodiversity management plan. These options will each have to be assessed against existing management arrangements to determine the adequacy of existing management.

The relative merits of each biodiversity conservation option will have to be determined in terms of:

- the biodiversity costs of maintaining existing management regimes; and
- the economic and social costs for each option of implementing new management regimes to meet biodiversity needs.

(f) Products derived from the biodiversity assessment

The primary product arising from the biodiversity assessment component of the CRA process is a regional conservation action plan which incorporates the following elements:

- maps of all management zones with areas of high value defined;
- management guidelines for all management zones in the region that are consistent with ESD principles;
- a listing of conservation values from a national and regional perspective;
- a listing of major conservation threats and measures to ameliorate the threats;

- maps of areas requiring further inventory or research (gaps in information);
- monitoring guidelines including sampling frequencies, indicator species and/or assemblages and physical and chemical indicators of condition;
- maps of areas requiring rehabilitation or restoration and guidelines for the scale and objectives of the work required; and
- specified timeframes for review of management guidelines and monitoring program data.

6. BIODIVERSITY ASSESSMENT IN CONTEXT

(a) Biodiversity assessment and the CRA process

Biodiversity assessment is part of a decision making hierarchy. The results of the biodiversity assessment are to be integrated with those of other environmental and heritage assessments to produce a single CRA report. In turn, the CRA report is to be considered with social and economic assessment information in the development of a regional forest agreement between governments.

It is expected that a CRA would result in a single report which:

- identifies and assesses environmental heritage (including biodiversity) values for the region;
- defines government obligations to protect those values;
- assesses the adequacy of existing management arrangements, and proposes management options which will enable the obligations of governments to be met.

Management recommendations specified in the CRA report may include options for reserve identification, prescriptions for management plans developed to cover specific management zones, special practices in commercially-used forest areas, ongoing monitoring, and intergovernmental consultation and data access arrangements.

As part of the CRA process, biodiversity assessment is intended to contribute to a comprehensive identification of conservation values and a list of consistent regional forest management recommendations. To avoid duplication, and to produce a unified CRA report, biodiversity assessments will need to be undertaken in close conjunction with other environmental and heritage assessments of both governments.

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Table 1. Land use and environmental change attributes for biodiversity assessment*

The list of land uses and environmental changes outlined below is only intended to be indicative of those which may apply in any particular region. A review of these categories will be required during the evaluation phase of assessments to identify critical categories.

Land uses	**Attributes**
Forestry	clearfelling selective harvesting thinning salvage logging
Pastoral	stocking rates distribution and proportion of native, exotic or mixed pastures
Agriculture	crops horticulture
Mining	base metal sand coal/oil
Recreation	off-road vehicle horses camping bushwalking
Transportation	rail road water
Water resources development	storage flood control flow regulation
Infrastructure	all built structures not identified in the above categories
Environmental changes	
Biological	feral animals/weeds - distribution and density disease - Phytophthora insect outbreaks - distribution and severity vegetation fragmentation - floristic changes and condition indices
Physical	fire - deliberate/accidental/natural fire - change in intensity/frequency/seasonality flooding frequency - decrease/increase soil erosion - streambank/gullying/rill streams/rivers - change in sedimentation rates vegetation fragmentation -structural change
Chemical	pollution - herbicide/pesticide/ detergents/heavy metals salinity - dryland/freshwater intrusion

FIGURE 1 BIODIVERSITY ASSESSMENT FLOW CHART

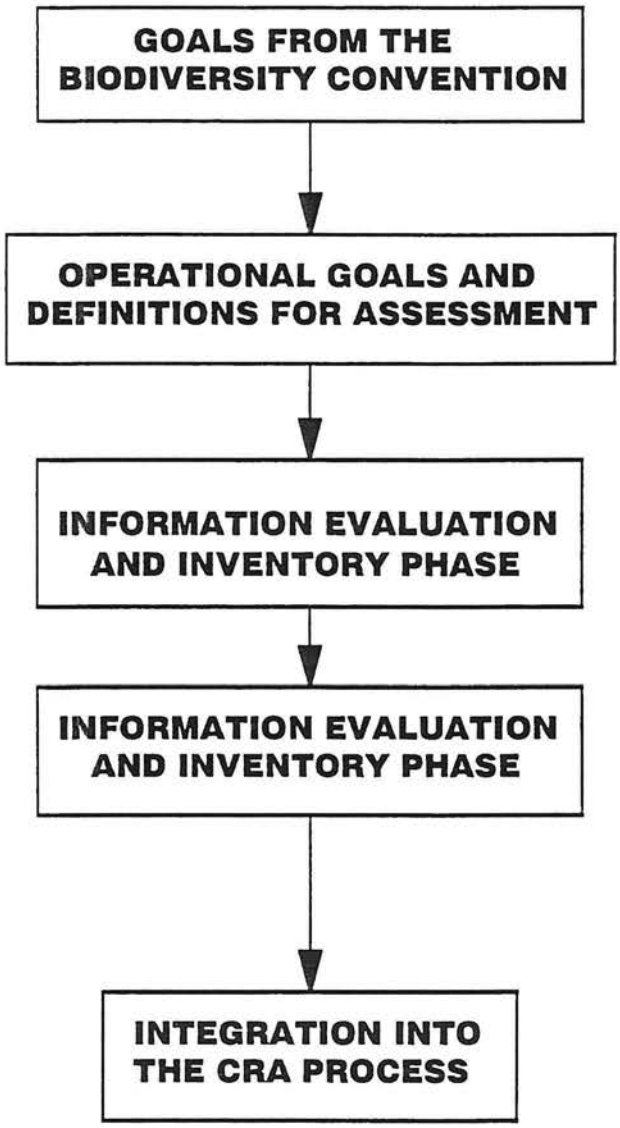
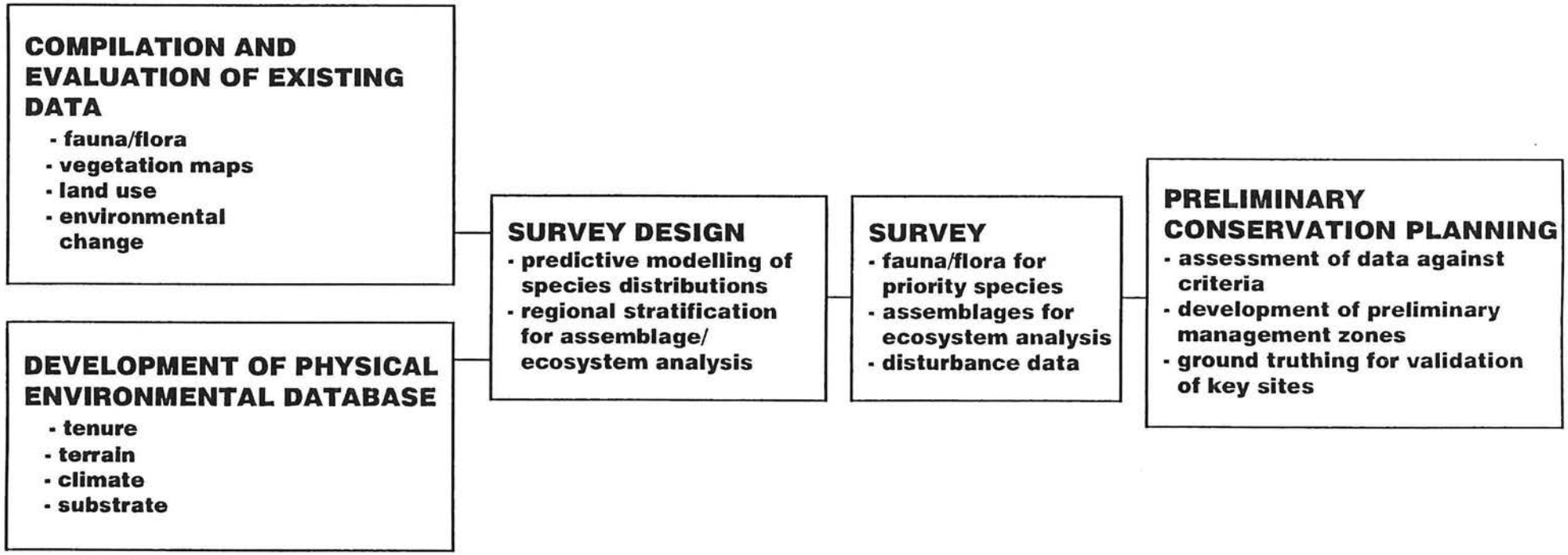


FIGURE 2 INVENTORY PHASE FLOWCHART



Appendix 1 Definitions for biodiversity assessment

1. SPECIES DEFINITIONS

(a) Species at greater risk of extinction

Endangered species

Taxon in danger of extinction unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate.

Priority is given to species which are endangered nationally as identified in the Commonwealth *Endangered Species Protection Act 1992.*

Vulnerable species

Taxon believed likely to move into the 'endangered' category within the next 25 years, unless the factors threatening its abundance, survival or evolutionary development cease to operate.

Priority is given to species which are vulnerable nationally as identified in the Commonwealth *Endangered Species Protection Act 1992.*

Declining species

Declining species are those species known to be adversely affected by prevailing land uses through either a significant decrease in abundance or a significant reduction in range at the regional level.

Nationally threatened species are specifically excluded from this category because they are considered independently. The declining species category includes species which are endangered or vulnerable at the regional level as well as species known to be declining at the regional level. The process of identifying declining species will, initially, be through expert judgement but, in the future, quantitative data should be obtained for this purpose. The reviews by Reid and Fleming (1992) for arid zone birds and the Office of the Commissioner for the Environment (Anon 1991) for Victorian fauna are good examples of the application of the concept.

(b) Species difficult to assess because of characteristics of their distribution or habitat requirements

Rare species

Species with small world populations that are not at present 'endangered' or 'vulnerable' but are at risk.

Rare taxa are characterised by three attributes; geographic range, habitat specificity and local population size. The framework developed by Rabinowitz (1981) is proposed for classifying species as rare and should be consulted for details of the classification process.

Migratory and mobile species

Species in which populations, or components of populations, regularly or irregularly occupy different areas of the landscape because of changes in resource/habitat availability.

The definition includes species typically referred to as nomadic and should be interpreted broadly from an ecological perspective.

Where the survival of a population or populations of a species is dependent on maintaining habitat (resource) patches which are variable in their availability through space or time then the species should be classified as migratory or mobile for the purposes of assessment.

(c) Species important for maintaining genetic (taxonomic) diversity

Phylogenetically distinct species

No single definition has been adopted for this category as the field is in a rapid stage of development and agreed definitions or methodologies have not yet emerged. The basic argument for utilising the phylogenetically distinct species concept is that 'the size of the potential genetic loss is related to the taxonomic hierarchy because....different positions in the hierarchy reflect greater or lesser degrees of genetic difference' (IUCN/UNEP/WWF 1980). Application of this concept in the identification of priority species for biodiversity assessment should assist in minimising loss of genetic diversity.

The concept has been applied formally through the use of taxonomic dispersion analyses (Williams et al 1991), cladistic analysis and classification trees (Faith 1992; Faith & Walker 1993) and intuitively through the concept of primitive species (eg *Quassia* sp, Simaroubaceae; Webb 1987). The different approaches outlined above will all be evaluated in the CRA process given appropriate data sets.

Bioregional endemic species

Species in which > 75% of the known range is contained within a single biogeographic region or which have a total range of 100 000 square km or less.

Particular attention will be given to species confined to the area of the CRA. The definition does not, and probably can't, have an explicit biological basis given the subjective aspects of defining bioregions, but is being adopted to facilitate a systematic approach to analyses for the CRA process.

Species with disjunct populations

Disjunct populations are those which have become physically separated over time due to the appearance of a break in a formerly continuous distribution, or through long distance dispersal over a barrier.

Disjunct populations are frequently morphologically or structurally distinct and have commonly diverged genetically from parent stocks.

(d) Species critical for management and monitoring of biodiversity

Functionally important species

A functionally important species is a species whose disappearance from a system results, either directly or indirectly, with the loss of several other species.

Operationally, this category will include species whose disappearance from a system is likely to result in the loss of other species based on current knowledge of the role of that species in ecosystem function. Specific categories include keystone species and mobile-link species. Examples include cassowaries, fruit pigeons, flying foxes and honey-eaters for their role in seed and pollen dispersal, top carnivores such as raptors for their possible role in modulating prey densities and competitive interactions between species, and dominant vegetation canopy species or species prominent in other layers. Agreed lists of species which fit these categories will need to be developed prior to implementation of the CRA process in each region.

Indicator species

An indicator species is a species whose population response is considered to more broadly reflect the response of a range of species populations to the environmental changes resulting from particular land uses or combinations of land uses in a defined area.

The indicator species concept has developed in response to the impossibility, both logistically and financially, of measuring population responses in all species which occur in an area. A successful example of the use of the concept is macro-invertebrates as ecosystem condition indicators in aquatic systems. The concept of indicators has also been applied at the assemblage level (Faith and Norris 1989).

(e) Economically and culturally important species

The Biodiversity Convention identifies species of economic or cultural importance as requiring special efforts to ensure the maintenance of genetic diversity for future use by society. The category includes wild relatives of domestic species, species of medicinal, agricultural or other economic value, and species of scientific and social importance. Cultural and social values are likely to vary from region to region possibly requiring public input or literature surveys to define target species.

A definition of economic and cultural importance which can be readily applied in assessments is not currently available. The focus for assessment in this paper is currently economically important species and species of cultural significance to indigenous Australians. It is recommended that the CSIRO Division of Plant Industries Economic Plants of Australia database (CSIRO 1993) be reviewed as the basis for developing criteria for incorporating the economic and cultural importance criteria into assessments.

2. ECOSYSTEM DEFINITIONS

An ecosystem class is defined as:

An assemblage of plants and/or animals that responds similarly to particular combination(s) of physical environmental variables

The definition incorporates several points. These are the requirement to:

- specify a scale for outputs (eg 1:100 000 for the CRA process).
- specify the specific combination of taxa and/or structural/morphological and/or physical environmental data to be used in the analysis and data attributes used to define the class.
- utilise an explicit, preferably hierarchical, numerical analysis in the classification of ecosystems from primary data.
- utilise an ecological difference level for assemblage/ecosystem classification purposes (eg Belbin 1992).

A number of different categories of ecosystem are defined for the CRA process to provide a basis for setting priorities for data collection and to ensure that the range of ecosystem types and associated ecological processes are considered.

The endangered, vulnerable and declining ecosystem categories require data in the following areas for the definition to be applied in an explicit manner. The definitions imply that the change in status of particular ecosystem types can occur through either a major disturbance such as clearing or simply a change in management which alters condition eg successional stage of the vegetation at the site.

The data requirements are:

- 'natural' area of the ecosystem;
- current area of the ecosystem;
- trends in land use influencing ecosystem status; and
- measures of ecosystem 'condition'.

Endangered ecosystem

An endangered ecosystem is an ecosystem in danger of extinction unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate.

Vulnerable ecosystem

A vulnerable ecosystem is an ecosystem believed likely to move into the 'endangered' category within the next 25 years, unless the factors threatening its abundance, survival or evolutionary development cease to operate.

Declining ecosystem

A declining ecosystem is an ecosystem known to be undergoing a significant decline in range or condition due to the effects of current or historical land uses.

Rare ecosystem

A rare ecosystem is one which is localised within a restricted geographic range or is thinly scattered over a more extensive range.

Examples include cave systems, assemblages of plants and/or animals on rare soil types and refugia which occur in areas such as mountain summits with 'rare' climates. Rare ecosystems may need to be assessed using agreed lists of categories and methodologies for identification.

Representative ecosystem

A representative ecosystem is one which samples the variation inherent within a particular class (see definition of class above).

The use of hierarchical, numerical analyses provides the basis for stratifying data sets at a range of resolutions (group sizes). The aim is to structure the analysis such that lower levels of a classification represent within class variation providing an explicit basis for selecting representative sub-sets of the data. The critical questions relate to how the different data types, biological composition, physical environmental and vegetation structure are included in the analysis and how many samples are selected from a class to adequately represent the variation. This issue will require more detailed consideration during the evaluation phase of a CRA.

Wetland ecosystem

Wetland ecosystems are areas of marsh, fen, peatland or water, either natural or artificial, permanent or temporary, with water that static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres.

The definition adopted here is taken from the Ramsar Convention and is the definition agreed to at the ANPWS/BRR sponsored national workshop in 1991. A wetland definition is necessary to allow the discrimination of aquatic environments from terrestrial in assessments. The majority of non-forest littoral ecosystems, except for mangrove ecosystems, are excluded from consideration in CRA assessments although they satisfy the above definition.

Appendix 2 Notes on information needs for biodiversity assessment

Data attributes

The issue of standardised data attributes for natural resource surveys has been considered in a number of recent workshops (Bolton 1992; Davey et al. 1993) and these documents should be referred to for details. Additional attributes may be required for particular species and regions but this should be assessed during the planning phase for a CRA. A number of basic principles/points are raised below for inclusion in survey design:

- primary data, measurements not aggregated data, should be collected at all sites;
- ERIN's core attributes for description of sites in terms of relevant physical and biological parameters should be adopted;
- the BRS habitat attributes (Davey et al. 1993) should utilised for habitat description purposes where appropriate;
- data on flowering and fruiting times of plant species should be recorded as standard information;
- site location accuracy should be appropriate to the scale of survey and be as accurate as possible;
- core attributes for wetland system surveys will need to be developed prior to implementing the CRA process.

Additional points on information needs and sampling design

Replicate samples are required from all strata.

The scale for outputs needs to be determined prior to designing the sampling program. A generalised scale of 1:100 000 has been selected for CRA outputs but finer resolutions will be required for areas such as highly fragmented landscapes.

Vegetation data should include all strata not simply canopy dominants. Samples should be taken during the peak growing period and over a range of periods if feasible to maximise species representation in the sample. Soil seed samples may be required to obtain information on ephemeral plant species.

Sampling density for different ecosystem types (eg woodlands, rainforests) should be proportional to species density (richness). This will ensure that the biota in particular classes will be adequately sampled.

Sampling techniques and site configuration will need to be tailored to the particular ecosystem class being sampled.

The evaluation of current data and design of sampling programs for the 'special' ecosystem categories will need to be done independently of the design for general fauna/flora survey design. Survey design for wetlands will need to consider the basic processes determining the distribution and characteristics of wetlands which are gravity driven and strongly related to local geomorphological processes. Sampling design for rare ecosystems will need to consider the fine scale at which the processes influencing their distribution are operating.

Fauna and flora data should be collected from the same 'sites'. Because the scale at which sampling is required may vary between taxa (eg arboreal mammal data may require larger plots than plant assemblage data) a hierarchical design is recommended with the possibility of multiple plots within 'sites'.