

GENERAL REQUIREMENTS FOR TERRESTRIAL BIOLOGICAL SURVEYS

FOR ENVIRONMENTAL IMPACT ASSESSMENT
IN WESTERN AUSTRALIA

Preliminary

Position Statement No. 3

May 2000



Environmental Protection Authority

GENERAL REQUIREMENTS FOR TERRESTRIAL BIOLOGICAL SURVEYS

**FOR ENVIRONMENTAL IMPACT ASSESSMENT
IN WESTERN AUSTRALIA**

Preliminary

Position Statement No. 3

May 2000

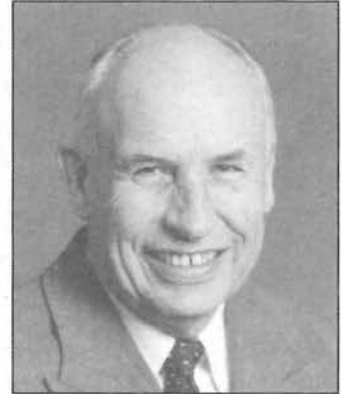


Environmental Protection Authority

ISBN 0 7309 8192 4

FOREWORD

The Environmental Protection Authority (EPA) has decided to prepare and publish a series of Position Statements which set out its views on some matters of environmental importance. The statements provide an avenue for the Authority to inform the public about environmental values and visions for the future. They also provide a basis for the development of the associated series of statements entitled "Guidance for the Assessment of Environmental Factors".



This Position Statement is about General Requirements for Terrestrial Biological Surveys for Environmental Impact Assessment (EIA) in Western Australia.

Terrestrial biological surveys are an essential component of EIA.

The application of a set of survey standards which are consistent with Commonwealth requirements and which address National and International expectations, will improve the ability of the EPA to assess the impacts of developments and projects on the environment of Western Australia. This will enable the Authority to provide adequate public and independent advice to the Minister for the Environment as required by the *Environmental Protection Act 1986* (WA).

This Position Statement outlines the general principles to be adopted by the EPA in developing these requirements for terrestrial biological surveys, and discusses the need for standard protocols for the purpose of environmental impact assessments. The EPA recognises that the level of detail required for surveys will be influenced by the nature and scale of the impact and/or proposal being assessed, and the sensitivity of the receiving environment. As the quality of biological surveys and our knowledge base of ecosystems have changed rapidly in the last few decades, the Authority seeks to utilise the best information and data available. This statement also includes a selected bibliography for further reading, in the context of International and National approaches to biodiversity.

The objective of the Position Paper is to encourage proponents and their consultants to focus their attention on the issues of significance in regard to biodiversity, and to undertake terrestrial biological surveys so as to assist the EPA in its assessment of impacts, in relation to government commitments and community expectations. The Position Paper also aims to provide a basis for a Preliminary Guidance Statement, to follow this position statement, which will provide details on the standard protocols for each level of survey.

I commend this Position Statement to you for reading.

This Position Statement has been termed Preliminary in that the EPA would welcome submissions which will assist the Authority in correcting any errors of fact or omissions of importance. Such comments should be made to the Chairman, Environmental Protection Authority, Floor 8, 141 St Georges Terrace, Perth 6000 WA by 31 August 2000.

Bernard Bowen

Bernard Bowen

Chairman
Environmental Protection Authority

CONTENTS

FOREWORD	iii
1. INTRODUCTION	1
2. THE NEED FOR STANDARD REQUIREMENTS	3
2.1 International and National Agreements	3
2.2 Environment Protection and Biodiversity Conservation Act 1999	4
3. WHY THERE IS A NEED TO IMPROVE AND UPGRADE STANDARDS IN WESTERN AUSTRALIA?	5
4. DEFINITIONS AND PRINCIPLES	7
4.1 Intrinsic Values	7
4.2 Ecosystem Values	8
4.3 EPA Guidance Statement	9
5. PRINCIPLES TO BE ADOPTED BY THE EPA FOR ASSESSMENT OF IMPACTS ON BIODIVERSITY	11
5.1 Interim Biogeographic Regionalisation of Australia (IBRA)	11
5.2 The Precautionary Principle	11
6. EPA POSITION	13
7. REFERENCES	14
APPENDIX 1 - Definition of Biodiversity	15
APPENDIX 2 - International and National Agreements	18
Figure 1. Interim Biogeographic Regionalisation of Australia.	11
Table 1. Likely levels of biological surveys in relation to scale and nature of impact and the sensitivity of the receiving environment.	12

1. INTRODUCTION

In view of the international significance of Western Australia's flora and fauna, the Environmental Protection Authority (EPA) regards biological diversity as a key environmental factor and has an objective to ensure that biodiversity is protected¹.

The EPA is concerned that, at times, insufficient attention is given to the relevant detail of biological surveys for the purposes of environmental impact assessment, in relation to the scale and the nature of the impact, and the sensitivity of the receiving environment. This may mean that the information supplied is inadequate to allow the EPA to undertake a comprehensive assessment, resulting in potential delays in the progress of an assessment while additional or appropriate information is collected. The EPA recognises that the absence of acceptable standard protocols may also result in inconsistency of effort and value of data collected.

In addition, there is a need to improve existing terrestrial biological survey standards in Western Australia because of international commitments made by Australia towards protecting biodiversity. Western Australia was the first State to become a signatory to *The National Strategy for the Conservation of Australia's Biological Diversity* (Commonwealth of Australia, 1996).

Through this Position Statement, the EPA is also foreshadowing the introduction of the new Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the proposed bilateral agreement on environmental assessments between the State and the Commonwealth.

This Position Statement discusses:

- the need for standard requirements;
- why there is a need to improve and upgrade standards in Western Australia;
- the definitions and principles that will be adopted by the EPA within the proposed EPA Preliminary Guidance Statement 51 *Standard Protocols for Terrestrial Biological Surveys for Environmental Impact Assessment in Western Australia* (not yet released);

¹ Section 15 of the *Environmental Protection Act 1986* (WA) states that the objective of the EPA is:

"to use its best endeavours –
to protect the environment;
and to
prevent, control and abate pollution"

Section 16 of the *Environmental Protection Act 1986* (WA) states that the functions of the EPA are-

- (k) to publish for the benefit of planners, builders, engineers, or other persons, guidelines to assist them in undertaking their activities in such a manner as to minimise the effect on the environment of those activities, or the results thereof;..
- (o) to specify standards and criteria, and the methods of sampling and testing to be used for any purpose; and
- (p) to promote , encourage, an coordinate or carry out planning and projects in environmental management..."

- the need for both a consolidated database and for data to be collected by the proponents or their consultants in a format to allow ease of assessment at the local, regional and national levels, and to facilitate transfer into State biological databases; and
- the principles which the EPA will use when assessing proposals which may impact on biodiversity values, including:
 - the use of Interim Biogeographic Regionalisation of Australia (IBRA)² at the regional scale, to guide assessment of variable levels of impact in different areas of the State; and
 - the use of the precautionary principle.

The outcomes sought by this position statement are intended to:

- promote and encourage all proponents and their consultants to develop and implement best practice in terrestrial biological surveys and to focus their attention on the issues of significance for terrestrial biological surveys; and
- enable greater certainty for proponents in the EIA process by defining the principles the EPA will adopt when assessing impacts on biodiversity.

² Interim Biogeographic Regionalisation of Australia (IBRA) From: *The National Strategy on the Conservation of Australia's Biodiversity* (Commonwealth of Australia, 1996)

2. THE NEED FOR STANDARD REQUIREMENTS

2.1 International and National Agreements

Over the last two decades, there has been growing global community expectation of the use of best practice for environmental matters. This growth in community expectation is reflected in the development of legislation and agreements at the International level, to which Australia has become a signatory and which have become translated into National and State strategies, agreements and legislation. These include over 300 Acts and Ordinances that impact on the environmental matters in Australia (Hughes, 1999).

Some of the most significant acts, agreements and legislation are outlined in Appendix 2, and include:

- The *Wildlife Conservation Act 1950 (WA)*, which is currently being reviewed
- 1971 – *The Convention on Wetlands of International Importance (Ramsar Convention)*
- 1972 – *Convention Concerning the Protection of the World Cultural and Natural Heritage*
- 1974 – the 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 (Japan-Australia Migratory Bird Agreement – JAMBA)*
- 1975 – *Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)*
- 1985 – the *Conservation and Land Management Act 1985 (WA)*, which is currently being reviewed
- 1986 – the Agreement between the Government of Australia and the Government of the People's Republic of China for the *Protection of Migratory Birds and their Environment (China-Australia Migratory Bird Agreement – CAMBA)*
- 1990 – Special Premiers' Conference identified the need for an agreement on the environment
- 1991 – the Australia and New Zealand Environment Conservation Council (ANZECC) recognised the need for a *National Approach on EIA*
- 1992 – the United Nations *Convention on Biological Diversity* commitment to conserve genetic, species and ecosystem biodiversity ratified by Australia in 1993
- 1992 – the *National Strategy for Ecologically Sustainable Development (Commonwealth of Australia, 1992)*
- 1992 – The Australian *Intergovernmental Agreement on the Environment*, (Council of Australian Governments, 1992). This agreement identifies conservation of biodiversity as an essential principle of environmental protection (Schedule 6), and the development of standard EIA procedure principles (Schedule 3) (see Appendix 2)
- May 1995 – clearing controls through the *Soil and Land Conservation Act 1945 (WA)*
- 1996 – *Guidelines and Criteria for Determining the Need for and Level of EIA in Australia (ANZECC, 1996)*
- 1996 – Western Australia becomes the first signatory to *The National Strategy for the Conservation of Australia's Biodiversity (Commonwealth of Australia, 1996)*, which

explicitly takes account of the provisions of the United Nations *Convention on Biological Diversity*

- 1997 – *Basis for a National Agreement on Environmental Impact Assessment* (ANZECC, 1997)

2.2 Environment Protection and Biodiversity Conservation Act 1999

The development of the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* is a direct response by the Commonwealth to meeting international responsibilities for the protection of the environment, and places a greater emphasis on the environmental impact assessment process to meet national agreements and standards.

Under the amended Commonwealth legislation, the following will apply:

any action which "will have or is likely to have a significant effect on certain aspects of the environment" will require approval from the Commonwealth Minister for the Environment (s. 523).

"action" is defined as:

- a) a project;
- b) a development;
- c) an undertaking;
- d) an activity or series of activities; or
- e) an alteration of any of the things mentioned in paragraph (a), (b), (c) or (d).

Relevant triggers (relating to terrestrial biodiversity) for referral to the Commonwealth (ie. "certain aspects of the environment") include:

World Heritage areas;

- wetlands of international importance (eg: RAMSAR wetlands);
- listed threatened species and ecological communities;
- listed migratory birds (JAMBA, CAMBA Agreements); and
- additional matters as prescribed.

Penalties, including fines and/or imprisonment, may be imposed under the criminal code if:

- a) the person takes an action; and
- b) the action results in, or will result in, or is likely to have, a significant impact on any of the above.

Subsection 4B(3) of the *Crimes Act 1914 (Cth)* lets a court fine a body corporate up to five times the maximum amount the court could fine a person under this subsection.

It is intended that the standard requirements for terrestrial biological surveys adopted by the EPA (WA) are compatible with that required by Commonwealth assessment. This will contribute to Commonwealth accreditation of the WA EPA assessment of impacts, which will allow proponents to avoid duplication of assessment.

3. WHY THERE IS A NEED TO IMPROVE AND UPGRADE STANDARDS IN WESTERN AUSTRALIA?

In recent years, it has become apparent to those operating in the environmental industry that the global community recognises the high values of biological diversity in Australia. In considering the “footprint” or impacts that any future proposals may have, the EPA recognises that the proponents, and their consultants, play a major role in defining these biodiversity values.

The EPA acknowledges that Western Australia has many positive strengths which contribute to the protection of biodiversity. These include:

- the *Environmental Protection Act 1986 (WA)* that provides for an open and public process for assessment of the environmental impact of proposals;
- recent amendments to key legislation, government positions and/or land conservation practices which will work towards better protection of biological values (eg. the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)*; the *Soil and Land Conservation Amendment Act 1999 (WA)*; EPA Preliminary Position Statement No 2 *Environmental Protection of Native Vegetation in Western Australia* (EPA, 1999); and more stringent requirements for biodiversity information to be supplied during Notice of Intention to Clear assessment under the *Soil and Land Conservation Act 1945 (WA)*);
- the presence of a few key people with a high level of professional and technical expertise;
- an increasing level of community awareness and expectations;
- good library resources;
- high opportunities for developing a comprehensive database integrated with GIS;
- comprehensive information collected to high standards in some areas; and
- relatively low population.

However, the EPA also notes difficulties experienced when undertaking assessments where an understanding of the impacts of a proposal on the biodiversity values of an area is an important factor.

These concerns predominantly relate to a lack of appropriate, targeted information that allows the EPA to clearly assess the impacts of a proposal on the local and regional significance of biodiversity values of a site.

Key issues contributing to this difficulty are considered by the EPA to include:

- a lack of appropriate scale baseline information, for most areas of the State, to allow proper assessment in a regional context;
- a limited number of young graduate botanists and zoologists developing their skills and expertise;
- a lack of resources available from proponents for appropriate surveys;

- replication of previous databases (which may be acceptable in some instances) but without understanding how this data may be relevant in the context required for the current assessment;
- site-specific data being collected but not interpreted/analysed for biodiversity value (a site-only survey without being placed in a regional context is meaningless);
- a lack of standards/definitions for regional/local/intrinsic values;
- a lack of reference to current literature (both published and unpublished);
- a lack of a consolidated database;
- a lack of adequate accuracy of species identification (supported by herbarium specimens where appropriate);
- wrong time of survey, particularly in proposals where full flora information is important (high probability of significant species, eg. proposals in remote areas with limited or no previous collections; locations of high endemism; locations where rare and priority species are highly likely to be found; edges of bioregions and/or other transitions zones). Botanists need to rationalise what percentage of information is lost by not undertaking surveys during flowering times, versus what is really needed for assessment. This also applies to seasonal conditions at time of fauna survey;
- a lack of information on the condition of the vegetation and use of common standards for assessment;
- a lack of information on the rehabilitation potential and the effort required (where relevant);
- the EPA and DEP have historically accepted substandard work, therefore there has been no incentive to improve quality of surveys; and
- inconsistency in advice from departments and within departments - also changing advice mid-way.

Most of these issues can be addressed through the development of standard requirements for biological surveys, and through the development of a consolidated database where information on the biodiversity values of the state is increased incrementally and readily available for future requirements.

4. DEFINITIONS AND PRINCIPLES

Best practice assessment now requires that biodiversity be considered to have two key aspects, namely:

*its intrinsic value at the individual species, species assemblage and genetic levels; and
it's functional value at the ecosystem level.*

Biological surveys need to provide sufficient information to address both intrinsic and functional values. Appendix 1 provides further discussion on the definition of Biodiversity.

4.1 Intrinsic Values

Genetic level

Due to a lack of research regarding the genetic range of native species, there has been, and will continue to be, difficulty in addressing protection of biodiversity specifically at the genetic level.

Species level

EIA in WA has historically mainly considered flora at the species and species assemblage levels, while fauna has mainly been considered only at the species level, often based on expected occurrence or limited survey, or at best, in relation to habitat and range.

For example, assessments presented to the EPA typically include flora or fauna inventory lists (sometimes without relevant interpretation) with an emphasis on the presence or absence of rare, threatened and priority species (as determined by CALM databases).

It is important to clarify that the intrinsic value of "species" relates not just to rarity or how threatened an individual is. Given the incomplete state of knowledge of the State's flora and fauna and their distributions, many undescribed, rare or poorly collected species exist that are not formally recognised as rare or priority species under the *Wildlife Conservation Act 1950* (WA).

Even though a species may occur in large numbers, it may be a major component for the sustainability of the system (eg: biomass or distribution may be important). Importantly, species information must also be considered in the context of its geographical range. In the absence of genetic information, conservation of examples over the full geographic range will ensure that the genotypic and phenotypic range of the species is best conserved.

It is also important to consider the concept of species as it relates to diversity (or species richness). Furthermore, in areas considered to be high biodiversity "hotspots", endemism may be focused and changes in species may occur over relatively short distances.

Species Assemblages

There is a requirement for consideration of units of species assemblages that should be related to environmental parameters and diversity in the biophysical environment.

The EPA notes that the classification of vegetation communities for EIA purposes is mostly an arbitrary description of the structure and dominant species observed. Quite often the number of units described is generally related to the scale of the project (typically 5-10 vegetation associations are described whether the project site is 1 hectare or 100 hectares).

These descriptions, while useful for habitat definition, are difficult to compare with regional vegetation units.

More recently, the concept of ecological communities has been introduced to recognise the significance of recognisable assemblages of biota.

The Western Australian Department of Conservation and Land Management (CALM) has adopted the following definition for an ecological community:

“a naturally occurring biological assemblage that occurs in a particular type of habitat”

habitat is defined as:

“the abiotic features of the place in which an assemblage of organisms live” (adapted from Odum, 1971)

The *Environmental Protection Biodiversity Conservation Act 1999 (Cth)* defines ecological community as:

“an assemblage of native species that:

- a) inhabits a particular area in nature; and*
- b) meets particular criteria (if any) specified in regulations (if any) made for the purpose of this definition”*

4.2 Ecosystem Values

“Ecosystem” values have traditionally been attributed to large-scale species assemblages with an assumption that functional relationships and ecosystem processes are expressed through the variety of assemblages, their relationship with the landscape, and with each other.

For example, at the ecosystem level, an arbitrary percentage retention of a Beard vegetation unit or Hedde vegetation complexes (Hedde *et al.*, 1980) (mapped at 1:250,000 scale) is often argued to be adequate for protection of biodiversity, with little regard for spatial distribution, size or condition of those conserved fragments. The conservation of fragments does not necessarily protect the functionality of ecosystems.

Little or no criteria for minimum habitat requirements are generally supplied for the assessments of impacts on fauna. This is so even though considerable information may be available at the species level on the size of home ranges, minimum viable populations sizes/habitat area; corridor requirements etc. Impacts of proposals on system dynamics such as plant/animal interactions are almost never considered.

In the absence of clear understanding of relationships between species and their ecosystems and underlying environments, the assessment of impacts becomes open to interpretation (ergo the precautionary principle). As part of the precautionary principle, and in the absence of the feasibility of being able to conserve a “catchment” as an ideal representative unit of a system, the EPA will give increasing consideration to protection of catena sequences (‘connected series’) in the landscape, as a unit representing a range of habitats and processes, as a means of protecting biodiversity.

4.3 EPA Guidance Statement

The EPA intends to provide guidance on this issue via Preliminary Guidance Statement 51 *Standard Protocols for Terrestrial Biological Surveys for Environmental Impact Assessment in Western Australia*.

The Guidance Statement is intended to:

- clarify the EPA objectives in regard to biodiversity, for the purposes of EIA and reporting under Part IV of the *Environmental Protection Act 1986 (WA)*;
- provide an easy-to-use decision-making tree on the level of biological survey required, recognising that the significance of the impact will vary according to the scale and nature of the impact, and its location within the State. To this end, the EPA has adopted the biogeographic regions as per the Interim Biogeographic Regionalisation of Australia (IBRA) as the largest unit for decision making (see Section 5.1);
- provide a checklist of the factors that will be required to be reported on, once the potential significance of the impact has been determined;
- provide a reference inventory to ensure desktop information is derived from standard sources;
- provide additional references and data sources (including web sites, institutions, etc) which may provide additional information outside minimum requirements;
- define the preferred methodology for field surveys, including timing and frequency;
- describe the format for data collection to allow ease of assessment at the local, regional and national levels, and establish protocols to facilitate transfer of quality information into public biological databases;
- set expectations for the reporting of all biological survey data;
- identify the need for a limitations section to be included in each biological survey report; and
- identify the EPA as one of the intended users of the report.

5. PRINCIPLES TO BE ADOPTED BY THE EPA FOR ASSESSMENT OF IMPACTS ON BIODIVERSITY

The EPA considers that one of the key principles in the protection of biodiversity is to avoid impact where this is achievable. The EPA requires proponents to demonstrate in assessment that all reasonable measures have been taken to avoid impact. Where some impact on biodiversity cannot be avoided, it is for the proponent to demonstrate that the impact will not result in an unacceptable loss. This will require information to relate the loss to a regional context, and to consider the cumulative impacts of threatening processes.

In addition to demonstrating that any loss in biodiversity resulting from the development proposal will be acceptable, the biological survey will also contribute to the bank of data available for the particular region, to aid the overall biodiversity understanding and assessment for the region.

5.1 Interim Biogeographic Regionalisation of Australia (IBRA)

The EPA will use the IBRA as the largest unit for decision making, resulting in 26 Bioregions of the State (Figure 1) with different threatening processes and level of sensitivity to impact.

An illustration of the likely requirements of biological surveys in relation to the significance of the impact (as a function of the scale and nature of the impact and sensitivity of the receiving environment), is provided in Table 1.

The Bioregions have been grouped in Table 1 according to the existing degree of regional modification/loss of biodiversity (threat) and sensitivity to further loss, and are proposed as a general guide. However, it is very important to note that there may be areas of greater sensitivity within each bioregion that will require special consideration (eg. wetlands, threatened ecological communities, heritage, geomorphological values, etc).

5.2 The Precautionary Principle

Where a project or an action is likely to affect biodiversity, the information gathered for EIA via desktop studies and biological surveys should be undertaken to acceptable protocols. The EPA expects these protocols to be compatible with the level of detail required to meet both National and International standards (see Section 2). It is recognised however, that the scope of the survey depends on the scale and nature of the impact or proposal, and the sensitivity of the receiving environment. Nevertheless, the EPA requires that the quality of information and scope of the survey meets the standard requirements determined by the EPA.



Figure 1. Interim Biogeographic Regionalisation of Australia.

Table 1. Likely levels of biological surveys in relation to scale and nature of impact and the sensitivity of the receiving environment.

Sensitivity of Environment (see Section 5.1)	Scale and Nature of Impact		
	High	Moderate	Low
WAGEMS ¹	3	3	2
GCYPCMNHJ ² DNCOV ³	3	2 or 3	1
GGGLCT ⁴	3	2	1

¹ Warren, Avon Wheatbelt, Geraldton Sandplains, Esperance Plains, Mallee, Swan (Largely Cleared)

² Gascoyne, Carnarvon, Yalgoo, Pilbara, Coolgardie, Murchison, Nullarbor, Hampton, Jarrah Forest

³ Dampierland, Northern Kimberley, Central Ranges, Ord-Bonaparte, Victorian-Bonaparte

⁴ Great Sandy Desert, Gibson Desert, Great-Victoria Desert, Little Sandy Desert, Central Desert, Tanami.

Note: For explanation of the numbers in Table 1, see Levels of Biological Surveys box below.

Levels of Biological Surveys:

- 1 **Desktop Study** – literature review: search of all current and relevant literature sources and databases
- 2 Desktop Study; plus
Reconnaissance Survey – site visit by qualified personnel to:
 - a) verify desktop survey
 - b) delineate key values present in the area and potential sensitivity to impact
 - c) undertake broad-scale mapping based on selected sites rather than regular gridding
- 3 Desktop Study; plus
Reconnaissance Survey; plus
Comprehensive flora and fauna survey

6. EPA POSITION

1. The Environmental Protection Authority (EPA) adopts the definition of Biodiversity and the principles as defined in *The National Strategy for the Conservation of Australia's Biological Diversity* (Commonwealth of Australia, 1996) and will have regard for these in undertaking its role.
2. The EPA requires proponents to demonstrate in assessments that all reasonable measures have been undertaken to avoid the loss of biodiversity.
3. The EPA aims to ensure that the information gathered for environmental impact assessment in Western Australia meets State, National, and International Standards and Agreements in regard to biodiversity conservation.
4. The EPA requires that the quality of information and scope of the field surveys meets the standards, requirements and protocols determined by the EPA.
5. In the absence of information that could provide the EPA with certainty that biodiversity will be protected, the EPA will adopt the precautionary principle.

7. REFERENCES

- Australia and New Zealand Environment Conservation Council (1996) *Guidelines and Criteria for Determining the Need for and Level of EIA in Australia*, ANZECC: Canberra, ACT.
- Australia and New Zealand Environment Conservation Council (1997) *Basis for a National Agreement on Environmental Impact Assessment*, ANZECC: Canberra, ACT.
- Commonwealth of Australia (1992) *National Strategy for Ecologically Sustainable Development*, AGPS: Canberra, ACT.
- Commonwealth of Australia (1996) *The National Strategy for the Conservation of Australia's Biological Diversity*, AGPS: Canberra, ACT.
- Council of Australian Governments (1992) *Intergovernmental Agreement on the Environment*, AGPS: Canberra, ACT.
- Environmental Protection Authority (1999) *Environmental Protection of Native Vegetation in Western Australia – Preliminary Position Statement No 2*, Environmental Protection Authority: Perth, WA.
- Hedde, E.M., Loneragan, O.W., and Havel, J.J. (1980) *Vegetation Complexes of the Darling System, Western Australia*. IN: *Atlas of Natural Resources, Darling System, Western Australia. Explanatory Text*. Department of Conservation and Land Management, Western Australia, Perth. Pp 37-72.
- Hughes, L. (1999) *Environmental Impact Assessment in the Environment Protection and Biodiversity Conservation Act 1999 (Cth)*. *Environment and Planning Law Journal* 16 (5) – 441 – 467.
- Odum, E.P. (1971) *Fundamentals of Ecology*, 3rd Edition, Saunders, Philadelphia.

APPENDIX 1

Definition of Biodiversity

The EPA adopts and commits to implement the following principles as defined in *The National Strategy for the Conservation of Australia's Biological Diversity* (Commonwealth of Australia, 1996):

1. Biological diversity is best-conserved in-situ.
2. Although all levels of government have clear responsibility, the cooperation of conservation groups, resource users, indigenous peoples, and the community in general is critical in the conservation of biological diversity.
3. It is vital to anticipate, prevent and attack at source the causes of significant reduction or loss of biological diversity.
4. Processes for and decisions about the allocation and use of Australia's resources should be efficient, equitable and transparent.
5. Lack of full knowledge should not be an excuse for postponing the action to conserve biological diversity.
6. The conservation of Australia's biological diversity is affected by international activities and requires actions extending beyond Australia's national jurisdiction.
7. Australians operating beyond our national jurisdiction should respect the principles of conservation and ecologically sustainable use of biological diversity and act in accordance with any relevant national or international laws.
8. Central to the conservation of Australia's biological diversity is the establishment of a comprehensive and adequate system of ecologically viable protected areas integrated with the sympathetic management of all other areas, including agricultural and other resource production systems.
9. The close, traditional association of Australia's indigenous peoples with components of biological diversity should be recognised, as should the desirability of sharing equitably benefits arising from the innovative use of traditional knowledge of biological diversity."

Definition of Biodiversity

The EPA accepts the following definition of biological diversity:

It is the variety and variability of all life forms, all plants, animals and micro-organisms, the genes they contain and the ecosystems they form.

The National Strategy for the Conservation of Australia's Biological Diversity defines three levels of Biodiversity – genetic, species and ecosystem.

Genetic Diversity

Variation of genes/genetic information contained in all individual plants, animals and micro-organisms both within and between populations of organisms that comprise individual species as well as between species. It represents the heritable variation within and between populations of organisms. There are so many genes and different possible combinations of

genes that for most types of organisms every individual, population and species is genetically distinct.

Species Diversity

The variety of individual species within a region. While such diversity can be measured in many ways, the number of species in a region (species richness) is most often used, but a more precise measurement taxonomic diversity also considers the relationship of species to each other. The more different a species is from other species the greater its contribution to any overall measure of biological diversity. The ecological importance of a species can have a direct effect on community structure and thus on overall biodiversity. The variety of species increases with genetic change and evolutionary processes.

Ecosystem Diversity

Ecosystems are the critical biological/ecological operating units in nature. Ecosystem diversity is the diversity of all-living organisms and non-living components within a given area and their relationships. Ecosystems include abiotic components, being partly determined by soil parent material and climate. Ecological system diversity is the variety of habitats, biotic communities and ecological processes in a given area. Ecological processes are the interactions, changes or evolutionary development processes of the ecosystem over time.

Ecosystem diversity is harder to measure than species or genetic diversity because the boundaries of communities (ie. variety of unique assemblages of plants and animals and ecosystems) are elusive. As long as a consistent set of criteria is used to define communities and ecosystems, their number and distribution can be measured. Even using a relatively simplified measure, any given area contributes to biodiversity in at least two different ways; through its richness in numbers of species and through the endemism (geographical uniqueness) of these species. The relative importance of these two factors changes at different geographical scales.

Local Ecosystem/Regional Ecosystem Diversity

Individual species and plant communities exist as elements of local ecosystems, linked by processes such as succession and predation. Regional ecosystem diversity is the pattern of local ecosystems across the landscape. Also known as landscape diversity or large ecosystem diversity.

Ecological integrity is maintained when the productivity, stability and resilience of the ecosystem are collectively maintained.

Other expressions of biodiversity

Other expressions of biodiversity can be important. These include the relative abundance of species, the age structure of populations, the pattern of communities in a region, changes in community composition and structure over time, and ecological processes such as predation, parasitism and mutualism. It is often important to examine **diversity in ecosystem structure and function** as well as **compositional diversity** of genes, species and ecosystems.

- Diversity of higher taxonomic groups - at the level of fundamental types of body plans or phyla, marine animals display much greater diversity than terrestrial animals. Most diversity on land comes from the phylum Arthropoda

-
- Species function based on behaviour/role eg. different feeding habits, reproductive behaviour, biochemical diversity. More important than the conservation of individual species is not to lose any broad functional category of species.
 - In natural systems diversity varies. Many communities with relatively few species, such as estuaries and mangrove forests, are highly productive and have an abundance of life but not a great variety.

Biodiversity has two key aspects:

- its functional value at the ecosystem level; and
- it's intrinsic value at the individual species, species assemblages and genetic levels.

The functional value is derived from the parts played by the species assemblages in supporting ecosystem processes and is expressed through the kinds of plant and animal assemblages occurring in various parts of the landscape. In addressing this, matters requiring consideration include:

- soils;
- landscape;
- species richness;
- species composition;
- differences in species composition pre and post disturbance; and
- the ecosystem processes, linkages and how they are supported.

The intrinsic values relate to the actual species and species associations.

Two species assemblages may have different *intrinsic* values but may still have the same *functional* value in terms of the part they play in maintaining ecosystem ecological processes.

APPENDIX 2

International and National Agreements

Summary of Key Acts, Agreements And Legislation Related To Protection of Biodiversity:

1971 - Ramsar Convention

On 2 February 1971, the *Convention on Wetlands of International Importance Especially as Waterfowl Habitat* (held at Ramsar, Iran) defined some broad aims to halt the worldwide loss of wetlands and to conserve, through wise use and management, those that remain. These wetlands include shallow, open waters such as lakes, rivers and coastal fringes, and any land, which is regularly or intermittently saturated by water such as marshes, swamps and floodplains. Presently there are approximately eighty countries which are Contracting Parties to the Ramsar Convention, covering some 75 % of the world's lands.

1972 - World Heritage

The *Convention Concerning the Protection of the World Cultural and Natural Heritage*, held in Paris, defines the kind of natural and cultural sites which can be considered for inscription on the World Heritage List, and sets out the duties of the State Parties in identifying potential sites and their role in protecting and preserving them. By signing the Convention, each country pledges to conserve not only the World Heritage sites situated on its territory, but also to protect its national heritage.

1975 - CITES

On 1 July 1975, the *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES) entered into force. With a current membership of 146 countries, these countries act by banning commercial international trade in an agreed list of endangered species and by regulating and monitoring trade in others that might become endangered. CITES provides an official list of endangered, vulnerable or presumed extinct species that is regularly updated.

1990 - Special Premiers' Conference

In 1990, the Special Premiers' Conference identified the need for an agreement on the environment.

1991 - National Approach on EIA

In 1991, the Australia and New Zealand Environment Conservation Council (ANZECC) recognised the need for a *National Approach on EIA*.

1992 - Intergovernmental Agreement on the Environment

On 1 May 1992, the *Intergovernmental Agreement on the Environment* was signed by all State and Territory governments and the Commonwealth. Complementary legislation was passed in all jurisdictions. This led to the development of EIA procedure principles, detailed in Schedule 3:

1. The parties agree that it is desirable to establish certainty about the application, procedures and function of the environmental impact assessment process, to improve the consistency of the approach applied by all levels of Government, to avoid duplication of process where more than one Government or level of Government is involved and interested in the subject matter of an assessment and to avoid delays in the process.
2. The parties agree that impact assessment in relation to a project, program or policy should include, where appropriate, assessment of environmental, cultural, economic, social and health factors.
3. The parties agree that all levels of Government will ensure that their environmental impact assessment processes are based on the following:
 - (i) the environmental impact assessment process will be applied to proposals from both the public and private sectors;
 - (ii) assessing authorities will provide information to give clear guidance on the types of proposals likely to attract environmental impact assessment and on the level of assessment required;
 - (iii) assessing authorities will provide all participants in the process with guidance on the criteria for environmental acceptability of potential impacts including the concept of ecologically sustainable development, maintenance of human health, relevant local and national standards and guidelines, protocols, codes of practice and regulations;
 - (iv) assessing authorities will provide proposal specific guidelines or a procedure for their generation focussed on key issues and incorporating public concern together with a clear outline of the process;
 - (v) following the establishment of specific assessment guidelines, any amendments to those guidelines will be based only on significant issues that have arisen following the adoption of those guidelines;
 - (vi) time schedules for all stages of the assessment process will be set early on a proposal specific basis, in consultations between the assessing authorities and the proponent;
 - (vii) levels of assessment will be appropriate to the degree of environmental significance and potential public interest;
 - (viii) proponents will take responsibility for preparing the case required for assessment of a proposal and for elaborating environmental issues which must be taken into account in decisions, and for protection of the environment;
 - (ix) there will be full public disclosure of all information related to a proposal and its environmental impacts, except where there are legitimate reasons for confidentiality including national security interests;
 - (x) opportunities will be provided for appropriate and adequate public consultation on environmental aspects of proposals before the assessment process is complete;

- (xi) mechanisms will be developed to seek to resolve conflicts and disputes over issues which arise for consideration during the course of the assessment process; and
- (xii) the environmental impact assessment process will provide a basis for setting environmental conditions, and establishing environmental monitoring and management programs (including arrangements for review) and developing industry guidelines for application in specific cases.

Schedule 6 of the *Intergovernmental Agreement on the Environment* identifies conservation of biodiversity as an essential principle of environmental protection. There are clear indications that the Commonwealth's international responsibilities will be pursued through forums in which the states and territories are heavily represented.

1992 - Convention on Biological Diversity

On 5 June 1992, Australia signed the United Nations *Convention on Biological Diversity* at the United Nations Conference on Environment and Development at Rio de Janeiro. Australia ratified this signing in 1993 and is committed to conserve genetic, species and ecosystem biodiversity. It is committed to:

- regulate or manage biological resources (including genetic resources and populations) important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use;
- control or eradicate those alien species which threaten ecosystems, habitats or species;
- develop necessary legislation and/or other regulatory provisions for the protection of not only threatened species, but also threatened populations;
- identify types of activities likely to have significant adverse impacts on the conservation of biodiversity, monitor the effects of these activities and regulate or manage them; and
- adopt economically and socially sound measures that act as incentives for the conservation of biodiversity.

The *Convention on Biological Diversity* requires that contracting states should:

“Establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity.”

“Promote environmentally sound and sustainable development in areas adjacent to protected areas with a view to furthering protection of these areas.”

1979 - Conservation of Migratory Species

The *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn, 1979) including JAMBA and CAMBA.

Many migratory birds make return flights from the northern to the southern hemispheres each year. Conservation of these migratory birds requires international action because the birds depend on protection and appropriate habitat management in a number of countries.

Over the past two decades there has been increasing recognition of the need for international co-operation for the conservation of migratory species and for the protection of specific habitats. Governments have begun to develop formal agreements, of which

Australia has two on migratory birds one each with the Governments of Japan and the People's Republic of China.

The 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* is more commonly called the Japan – Australia Migratory Bird Agreement (JAMBA) and was signed on 6 February 1974.

The Agreement between the Government of Australia and the Government of the People's Republic of China for *Protection of Migratory Birds and Birds in Danger of Extinction and their Environment* is more commonly called the China-Australia Migratory Bird Agreement (CAMBA) and was signed on 20 October 1986.

Legislation (WA)

The *Wildlife Conservation Act 1950 (WA)* and the *Conservation and Land Management Act 1985 (WA)* provide the guidelines and legislation to protect the State's flora and fauna. In May 1995, clearing controls administered through the *Soil and Land Conservation Act 1945 (WA)* was extended to provide greater protection for vegetation, including the consideration of nature conservation values in assessing clearance notifications.

Policy (WA)

Perth's Bushplan

Identification of bushland on the Swan Coastal Plain, which is of regional significance for conservation - Perth Metropolitan Area portion of Perth's Bushplan.

EPA Conservation Through Reserves - System Areas

In the late 1970s a system of conservation through reserves was set up and the State was divided into 12 regions or "systems".

For example System 6 (the Darling System), just over 1% of the State's area, contains 80% of the population. It extends from the Moore River in the north to the Blackwood River in the south and as far inland as Toodyay. The System 6 report, released in 1983, contained conservation recommendations for 209 specific areas, 108 of these in the Perth metropolitan area. The Government accepted the general principles and recommendations of the report and asked that they be implemented as far as possible.

CALM has undertaken comprehensive biological surveys of plants and animals in the sandy desert region, Kimberley rainforests, Nullarbor, Eastern Goldfields and Swan Coastal Plain through its biogeography research program.

CALM considers that the existing system of national parks and nature reserves is not adequate to ensure the long-term conservation of terrestrial ecosystems. Maintenance of natural areas on private land, vacant Crown land and other vested land such as road reserves is crucial.

1992 - National Strategy for the Conservation of Australia's Biological Diversity

The National Strategy for the Conservation of Australia's Biological Diversity was developed in 1992. It explicitly takes account of the provisions of the Convention on Biological Diversity. It is mainly organised around two spatial scales: continental and bioregional. Activity at the local scale has been subordinated and integrated into the bioregional planning framework.

Overall responsibility for implementation is assigned to ANZECC, which is to consult with other relevant ministerial councils. It is to monitor the outcomes of the strategy, report to heads government on its implementation and provide five-yearly reviews of its progress. Western Australia is a signatory to *The National Strategy for the Conservation of Australia's Biological Diversity*.

1992 - National Strategy for Ecologically Sustainable Development

The National Strategy for the Conservation of Australia's Biological Diversity has in important respects close links with Australia's *National Strategy for Ecologically Sustainable Development*, also of 1992.

As such, the Ecological Sustainable Development (ESD) commitment represents one of the greatest challenges facing Australia's governments, industry, business and community in the coming years. While there is no universally accepted definition of ESD, in 1990 the Commonwealth Government suggested the following definition for ESD in Australia:

"using, conserving and enhancing the community's resources so that ecological processes, on which life depend, are maintained, and the total quality of life, now and in the future, can be increased."

In other words, ESD is development, which aims to meet the needs of Australians today, while conserving our ecosystems for the benefit of future generations.

ANZECC - Various policies

In 1996, Australia and New Zealand Environment Conservation Council (ANZECC) *Guidelines and Criteria for Determining the Need for and Level of EIA in Australia*.

In 1997, the Australia and New Zealand Environment Conservation Council (ANZECC) *National Agreement on Environmental Impact Assessment*.