



Technical Guidance

Terrestrial Fauna Surveys



The content of this Guidance has not yet been updated to reflect the EPA's framework for environmental considerations in environmental impact assessment

Environmental Protection Authority
December 2016

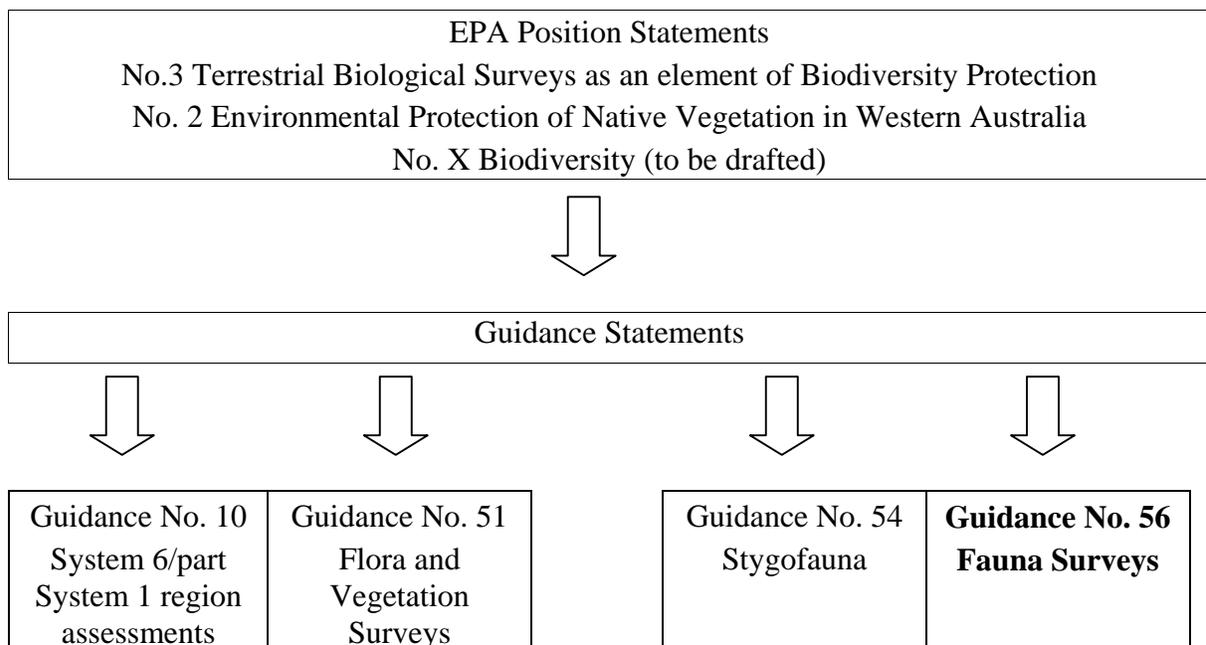
FOREWORD

The Environmental Protection Authority (EPA) is an independent statutory authority and is the key provider of independent environmental advice to Government.

The EPA's objectives are to protect the environment and to prevent, control and abate pollution and environmental harm. The EPA aims to achieve some of this through the development of environmental protection Guidance Statements for the environmental impact assessment (EIA) of proposals.

This document is one in a series being issued by the EPA to assist proponents, consultants and the public generally to gain additional information about the EPA's thinking in relation to aspects of the EIA process. The series provides the basis for the EPA's evaluation of, and advice on, development proposals subject to EIA. The Guidance Statements are intended to assist proponents in achieving an environmentally acceptable proposal. Consistent with the notion of continuous environmental improvement and adaptive environmental management, the EPA expects proponents to take all reasonable and practicable measures to protect the environment and to view the requirements of this Guidance as representing the minimum standards necessary to achieve an appropriate level of fauna survey for the assessment of environmental factors.

This Statement provides guidance on the standard of survey required to assist in collecting the appropriate data for decision-making associated with the protection of Western Australia's terrestrial faunal biodiversity and its habitat. The flowchart below shows the relationship between Position Statements and this and other Guidance Statements.



While the EPA has provided this guidance to encourage best practice in fauna and faunal assemblage survey and reporting, it is conscious that the process has also highlighted the need for complementary measures to promote such goals. In short, it is clear that the wider scientific community has a role to play in fostering skills and expertise. Firstly, the universities have a role to play in developing graduate skills in the areas of zoology, taxonomy, biogeography, ecology and statistics, which are amongst the basic prerequisites in this line of endeavour. It is evident that there has been a shift away from these areas as society places more emphasis on areas such as biotechnology. Secondly, practising zoologists and ecologists have a role to play, by mentoring recent graduates, and, perhaps most importantly, providing them with the opportunity to experience the breadth of the diversity at first hand. Thirdly, all practitioners have a role in developing a progressively improved synthesis of the fauna and zoogeography of the State. These matters are not specifically covered in this guidance.

While guidance is provided specifically in relation to the *Western Australian Environmental Protection Act, 1986*, proponents are reminded to ascertain any responsibilities they may have in regard to this issue under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*.

This Guidance Statement has the status of '**Final**' which means it has been reviewed by stakeholders and the public. The EPA has signed off the Guidance Statement and published it although it will be updated regularly.

I am pleased to release this document that now supersedes the draft version.

Walter Cox
CHAIRMAN
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June 2004

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Guidance Statement No. 56

Guidance Statement for Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia

Key Words: animal species assemblages, biodiversity, biological surveys, IBRA, terrestrial fauna, faunal assemblages, Priority fauna, short-range endemics, Specially Protected Fauna

1 INTRODUCTION

1.1 Purpose

The primary purpose of this Guidance Statement is to provide direction and information on general standards and protocols for terrestrial fauna surveys to environmental consultants and proponents engaged in EIA activities. The generic process for the writing of Guidance Statements is set out in Appendix 1.

This guidance should be used when preparing documentation for referral of proposals, planning schemes and their amendments to the EPA, as well as for formal assessment and audit.

This Guidance Statement:

- addresses the general standards and a common framework for terrestrial fauna and fauna assemblages for EIA in Western Australia, the quality and quantity of information derived from these surveys, and the consequent analysis, interpretation and reporting; and
- is primarily directed at the subset of biodiversity contained in all terrestrial faunal groups.

This guidance will assist in the interpretation and application of the general principles outlined in the EPA's Position Statement No. 3: *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (Environmental Protection Authority 2002). It should be read in conjunction with Guidance 51 when planning for biological surveys for EIA and when practical fauna and vegetation surveys should be coordinated.

This Guidance also aims to promote survey work of sufficient rigour to contribute to a more systematic inventory of the State's biota. A more uniform approach to biodiversity appraisal is intended to provide a progressively better collective inventory of biodiversity and ecosystems. Such an approach is compatible with a

consolidated, unified and readily accessible system of environmental information.

1.2 Policy context

1.2.1 State legislation

A range of legislation is relevant to biodiversity conservation in Western Australia. This includes the *Environmental Protection Act 1986* (EP Act), the *Conservation and Land Management Act 1984*, and, in particular, the *Wildlife Conservation Act 1950*.

The Government proposes to replace the *Wildlife Conservation Act 1950* with a new Biodiversity Conservation Act. The new Act will provide for the protection and restoration of biodiversity, and the sustainable use of native plants, animals and other organisms.

1.2.2 Requirements for assessments which are accredited under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

Under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) proposed actions which have the potential to have a significant impact on a matter of national environmental significance must be referred to the Commonwealth Minister for the Environment for a decision as to whether assessment is required under the provisions of that Act.

Provision has been made within the EPBC Act, for State authorities to be accredited to undertake environmental assessments, either jointly with or on behalf of the Commonwealth, so as to meet the requirements for assessment under that Act. The related requirements and arrangements for this are discussed in the EPBC Act itself and in the provisions of bilateral agreements being negotiated between State and Commonwealth governments. A bilateral agreement between Western Australia and the Commonwealth has been signed and came into effect on 20 October 2003, the date on which accommodating EP Act amendments were assented to in the Western Australian Parliament.

Assessments must adequately address the potential impacts on matters of national environmental significance in order to comply with the provisions of the EP Act and be accredited under the EPBC Act.

1.2.3 International and National policy context

A number of International policies and agreements are part of the framework for the protection of biodiversity:

- Wetlands of International Importance
 - 1971 – *The Convention on Wetlands of International Importance* (Ramsar Convention);
- Agreements covering migratory birds
 - 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 published as “Australian Treaty Series 1981 No. 6” by the Australian Government Publishing Service, Canberra, 1995);
 - 1979 – *Convention on the Conservation of Migratory Species of Wild Animals* (held in Bonn, Germany); and
 - 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 published as “Australian Treaty Series 1981 No. 22” by the Australian Government Publishing Service, Canberra, 1995).

The State has committed to an agreed framework, principles and objectives for the protection of biodiversity with the adoption of the *National Strategy for Ecologically Sustainable Development* (Commonwealth of Australia 1992) and the subsequent *National Strategy for the Conservation of Australia's Biological Diversity* (Commonwealth of Australia 1996). Western Australia was the first State to become a signatory to the latter, which followed from Australia's ratification of the United Nations Convention on Biological Diversity. In 2001 Western Australia endorsed the *National Objectives and Targets for Biodiversity Conservation 2001-2005* (Commonwealth of Australia 2001).

The EPA intends to ensure that, as far as possible, development proposals in Western Australia are consistent with, or do not conflict with, these principles, objectives and targets.

State of the Environment (SoE) reporting is now a legislative requirement at the Commonwealth level and has been adopted by Western Australia. SoE reporting aids environmental decision-making and enables assessment of progress towards ecological sustainability. It is important that environmental impact assessment reflects and reports on the ‘core’ environmental indicators developed for SoE reporting, some of which are biodiversity indicators (ANZECC 2000).

Accordingly, the EPA is seeking to improve the consistency and the standard of fauna surveys to ensure that decisions relating to protection of biodiversity are based on appropriate information that accords with agreements between the State and the Commonwealth.

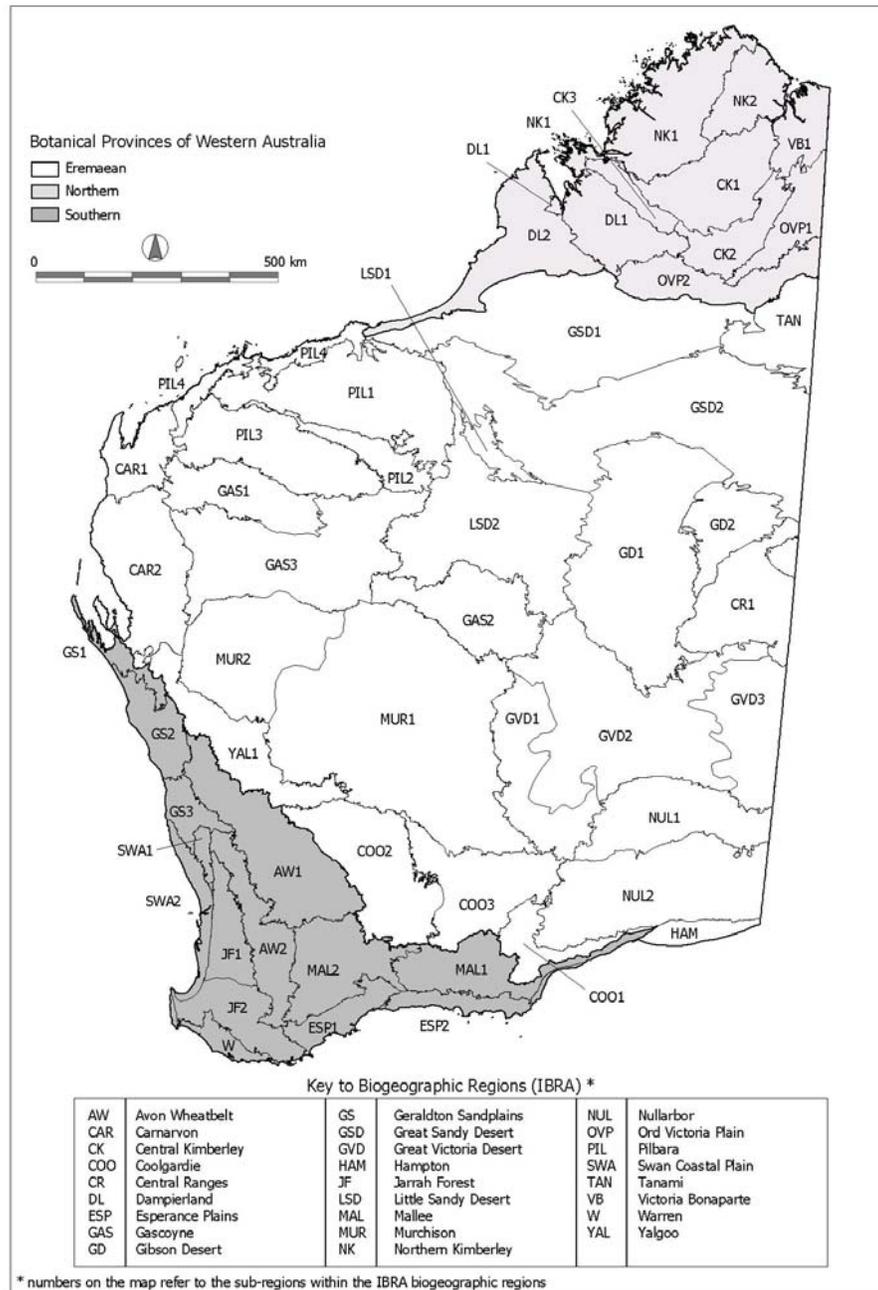


Figure 1: A Map of Western Australia showing the Botanical Provinces¹ (after Beard 1980), the IBRA bioregions (Environment Australia 2000) and the IBRA subregions (McKenzie et al. 2000).

¹ The Coolgardie and Yalgoo bioregions are here placed in the Eremaean Botanical Province (see Section 2.3 in Guidance 51). However, while their biotic composition is intermediate between the Eremaean and the South-West Provinces they are more closely allied with the South-West Province (GJ Keighery pers. comm. 2004).

1.2.4 Related policies of the Environmental Protection Authority

1.2.4.1 Position Statement No.3 on terrestrial biological surveys

In March 2002, the EPA published Position Statement No. 3 entitled *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (Environmental Protection Authority 2002). In that document the EPA discussed the range of International, National and State agreements and policies currently influencing the future protection of biodiversity in Western Australia and the need to review and improve the quality and quantity of information required for EIA.

Position Statement No. 3 indicated that the EPA adopted the definition of Biological Diversity and the Principles as defined in the *National Strategy for the Conservation of Australia's Biological Diversity* (Commonwealth of Australia 1996); that the quality of information and scope of field surveys should meet standards, requirements and protocols as determined and published by the EPA; and the Interim Biogeographic Regionalisation of Australia (IBRA) should be used as the largest unit for EIA decision-making in relation to the conservation of biodiversity. The IBRA has identified 26 bioregions in the State (Figure 1) that are affected by a range of different threatening processes and have varying levels of sensitivity to impact. Terrestrial biological surveys should provide sufficient information to address both biodiversity conservation and ecological function values within the context of proposals and the results of surveys should be publicly available.

Following a workshop in July 2000 on the draft Position Statement No. 3, the EPA decided that because of the diversity of ecosystems, separate guidance statements were warranted to address the range and complexity of issues pertaining to biological surveys.

Issues and survey types under consideration for incorporation in a series of guidance statements related to terrestrial biological surveys include:

- terrestrial fauna and faunal assemblage surveys (this Guidance);
- flora and vegetation surveys (Guidance 51);
- subterranean fauna in groundwater and caves (Guidance 54);
- karst environments;
- data acquisition and submission; and
- threatening processes.

Therefore this Guidance Statement forms part of a series in response to Position Statement No. 3, and is intended to be read in conjunction with that document and Guidance Statement No. 51 (Environmental Protection Authority 2004) as well as others that may be published in the series.

For projects located in the System 6 Region or the southern Swan Coastal Plain this Guidance Statement should also be read in conjunction with Guidance

Statement No. 10, *Guidance Statement for Level of assessment for proposals affecting natural areas within the System 6 region and Swan Coastal Plain portion of the System 1 region* (Environmental Protection Authority 2003a).

1.3 Limitations of this Guidance

This Guidance Statement is:

- confined to matters relating to terrestrial fauna and faunal assemblage surveys, and the treatment of associated data, and does not address more proposal-specific issues, which are the preserve of proposal-specific guidelines or approved scoping documents. Accordingly, it does not provide prescriptive guidelines for survey methodology. A useful reference for survey methodology is that adopted in South Australia to collect data for the Environmental Data Base of South Australia (Government of South Australia 2000);
- the contemporary view of the EPA until such time as this document is subject to review;
- not an instrument for predicting outcomes of deliberations by the EPA; and
- intended to apply to proposals yet to come before the EPA.

2 DIVERSITY OF THE FAUNA AND FAUNAL ASSEMBLAGES

2.1 The high diversity and endemism of the fauna

Australia's biota is recognised as one of the 12 most diverse in the world (Common and Norton 1992; Mummery and Hardy 1994). The faunal biota of Western Australia is diverse but incompletely documented (Hopper *et al.* 1996). The vertebrate groups are the best documented with an estimated 3,168 species (see Table 2 in Hopper *et al.* 1996). However, in some groups, especially fishes, frogs and reptiles, entirely new species are described almost every year (Aplin *et al.* 2001). The 1,900 species of fishes referred to by Hopper *et al.* (1996) has been increased to 3,127 species Hutchins (2001).

Figure 2 shows the increase in named species among the terrestrial vertebrate groups over time since the early exploration of Western Australia. This reflects the continuing growth of knowledge of the State's biodiversity as more areas are surveyed.

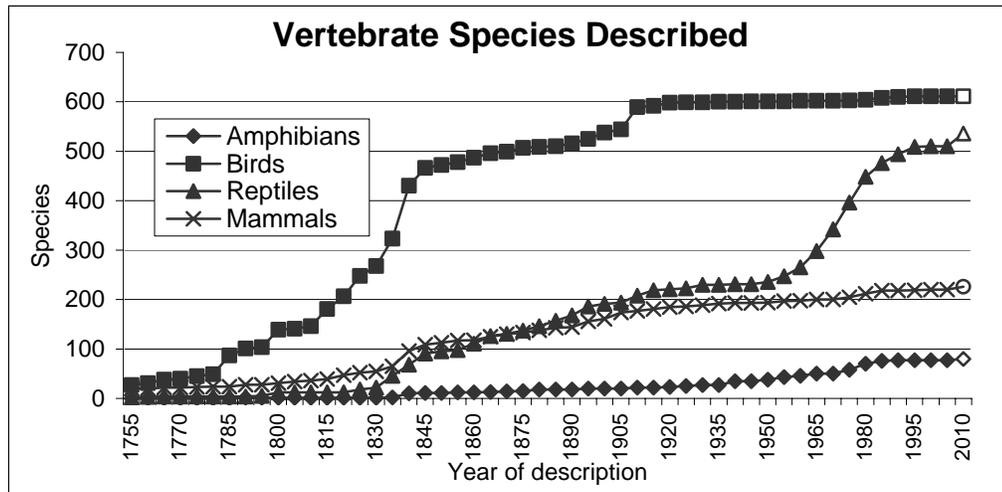


Figure 2: *Number of species of Western Australian vertebrates described over time and the potential numbers for 2010 based on known yet to be described taxa.*

Some faunal groups have a high level of endemism to Western Australia. For example, Horwitz (1994) commented on endemism patterns in the freshwater fauna and Hopper *et al.* (1996) noted that 49% of amphibians, 60% of reptiles, 18% of mammals but only 3% of birds were endemic to Western Australia. They estimated that 60% of the estimated 10,000 species of Chelicerata (spiders), 75% of the estimated 1,000 species of Myriapoda (millipedes and centipedes), and 55% of the estimated 30,000 species of Crustacea were endemic to Western Australia. However they were not able to estimate what percentage of the estimated 50,000 species of Insecta were endemic to Western Australia.

2.2 Short-range endemics

Comprehensive systematic reviews of different faunal groups often reveal the presence of short-range endemic species (Harvey 2002). Among the terrestrial fauna there are numerous regions that possess short-range endemics. Mountainous terrains and freshwater habitats often harbour short-range endemics, but the widespread aridification and forest contraction that has occurred since the Miocene has resulted in the fragmentation of populations and the evolution of many new species. Particular attention should be given to these types of species in environmental impact assessment because habitat loss and degradation will further decrease their prospects for long-term survival.

Harvey (2002) considered that although there were occasional short-range endemics among the vertebrates and insects, there were much higher numbers among the molluscs, earthworms, some spider groups (especially the mygalomorphs), millipedes, and some groups of crustaceans. Short-range endemics generally possessed similar ecological and life history characteristics,

especially poor powers of dispersal, confinement to discontinuous habitats, slow growth and low fecundity.

Some better known short-range endemic species have been listed as threatened or endangered under State or Commonwealth legislation but the majority have not. Often the lack of knowledge about these species precludes their consideration for listing as threatened or endangered. Listing under legislation should therefore not be the only conservation consideration in environmental impact assessment.

The State is committed to the principles and objectives for the protection of biodiversity as outlined in *The National Strategy for the Conservation of Australia's Biological Diversity* (Commonwealth of Australia 1996). The EPA expects that environmental impact assessment will consider impacts on conservation of short-range endemics in accordance with these principles and objectives.

3 THE GUIDANCE

3.1 EPA's objectives and their application to environmental impact assessment

3.1.1 The environmental objectives

This Guidance Statement provides information to proponents, consultants and the general public on the EPA's requirements for terrestrial fauna and faunal assemblage surveys and resulting survey reports. It details the minimum requirements for when a survey is required, what type and extent of survey is required and the minimum standard of interpretation of survey data which is required in the fauna and faunal assemblage survey report and related environmental assessment and evaluation (see definitions).

The objectives of this Guidance are to ensure that:

- there is clarity for proponents on the scale of fauna and faunal assemblage survey appropriate for different areas;
- the fauna and faunal assemblage survey, analysis, interpretation and reporting undertaken for EIA is of a suitable quality and of consistent methodology to enable the EPA to judge the impacts of proposals on fauna and faunal assemblages;
- the environment, in particular significant fauna and faunal assemblages, is identified and protected through best practice in the conduct and reporting of fauna and faunal assemblage surveys for EIA;
- Western Australia's knowledge base of fauna and faunal assemblages and biogeography are developed and enhanced over time at both the local and regional scale to the benefit of future decision making; and

- survey data are capable of underpinning long-term observation and measurement for later compliance and audit purposes (especially as this pertains to completion criteria for projects).

3.1.2 Environmental factors and EPA objectives for each factor

Section 44 of the EP Act requires the EPA to report to the Minister for the Environment on the environmental factors relevant to proposals and planning schemes that it formally assesses under Part IV of the Act. The environmental factors are described in the scoping document (for proposals under Section 38) or instructions (for Schemes and their amendments under Section 48A) for the required environmental review document. The EPA's objective for each environmental factor and the investigations that will be undertaken by the proponent (proposals) or is required of the responsible authority (schemes and their amendments) to evaluate whether these objectives can be achieved is also defined in the scoping document or instructions.

The initial identification of factors should be undertaken by the proponent during the preparation of referral and scoping documents (see Section 3.1.3).

3.1.3 Application of the guidance to environmental impact assessment

This Guidance will apply when preparing documentation for referral of proposals, planning schemes and their amendments to the EPA for formal assessment and audit where fauna and faunal assemblages are likely to be impacted as a result of implementation. Additional or special requirements for individual projects may be identified in the scoping document or instructions or in other advice provided via correspondence with the proponent or the responsible authority. Scoping documents or instructions should normally be consistent with this Guidance. However, in certain circumstances there may be a need to vary requirements to suit the particular case, and this would be set out in the scoping document or instructions.

3.2 Planning and design of fauna and faunal assemblage surveys

All proposals, planning schemes and their amendments where fauna and faunal assemblages will be impacted as a result of implementation of the proposal, scheme or amendment should report fully on natural values, potential impacts, cumulative impacts, and options to minimise impacts. Documentation should identify the degree to which the advice and approach provided in this Guidance Statement has been followed. Divergence from these standards should be highlighted in sections dedicated to limitations (see Section 3.3.1).

The EPA has provided below, guidance on what needs to be considered when surveys are being undertaken to provide information about fauna and faunal assemblages relevant to a proposal.

3.2.1 Approaches, resources and standards required

The State's fauna is highly diverse and only partially known, and appraisal of it is a highly technical and skilled process. Therefore it is expected that for fauna and faunal assemblage surveys:

- there will be adequate provision of resources for the survey and documentation of the fauna and faunal assemblages:
 - the intensity of sampling will reflect the likely faunal diversity due to the complexity of the vegetation and habitats of the proposal area;
 - adequate resources are directed to fauna sampling and identification, specimen processing and subsequent lodgement of specimens in the Western Australian Museum. This should include allowance for a possible species verification lag due to other commitments by taxonomists and the lack of availability of some taxonomic specialists; and
 - adequate resources are directed to data analysis and interpretation;
- there will be a high degree of rigour in reporting not only to describe current fauna and faunal assemblages but also to facilitate subsequent EPA assessment and auditing; and
- there will be a requirement for standardisation of techniques and terminology. It is important that survey methods are given minimum standards so that future work on the fauna and faunal assemblages is comparable.

3.2.2 Stage of proposal when surveys should be commissioned

For any proposal, the timing of fieldwork is critical to the whole process of survey and reporting on fauna and faunal assemblages. It is the first part of a process, and the natural fluctuation in rainfall may delay fieldwork. For example, heavy rainfall may cause delays with trapping and consultants need to comply with animal welfare requirements. A significant lead-time is required as it may be necessary to undertake surveys at various times of the year depending on the nature of the assemblages and species in the subject area. Survey over multiple years may be required where a single year's data is not adequate to determine the faunal assemblage (see How 1998, How *et al.* 1991) or to address the environmental factors.

There may also be a lag time due to appropriate faunistic expertise being unavailable. Proponents should make allowance for this lag when project planning, as it is a consequence of best practice. Consequently the EPA urges proponents to commission fauna and faunal assemblage surveys as early as practicable in the planning/site selection phase of a development or scheme to avoid potential for delays in project approvals.

For environmental monitoring and management, it is essential that fauna and faunal assemblage surveys have been conducted before the project area is cleared or otherwise modified.

3.2.3 Who should lead and undertake fauna and faunal assemblage surveys

Fauna and faunal assemblage surveys should be coordinated and led by fauna specialists who have had:

- a) training, experience and mentoring in the area of fauna identification/fauna and faunal assemblage surveys and/or specific training in elements of survey or sampling theory and Australian fauna identification and zoogeography; and
- b) would normally have had a wide exposure to WA's fauna and faunal assemblages, preferably with knowledge and experience in the region being surveyed.

It is recognized that the survey team will often include assessors who are less experienced. However, these team members should be supervised at all times by experienced and suitably qualified supervisors. The latter will enable the skill development of all zoologists involved in the work, which will assist in the development of professional skills within the wider industry. The universities also have a key role in developing graduate skills; in recent years there has been a tendency to shift away from the classical aspects of taxonomy and statistics, even though these are critical to fauna surveys.

Fauna and faunal assemblage survey reports should acknowledge all persons involved in the survey and their role in the survey. This includes acknowledging all specialists involved with specimen identification or species verification. The report should state who was responsible for its compilation.

These are specialist scientific and technical reports that should appropriately acknowledge authorship and contributions. The EPA sees this as part of the process of properly valuing this work and promoting good standards.

3.2.4 When fauna and faunal assemblage surveys should be conducted

The EPA expects that the design of fauna and faunal assemblage surveys, including sampling methods, duration and timing, will be appropriate to the faunal group being sampled and will use methods appropriate to the region of the State. In many cases the timing of a fauna and faunal assemblage survey will be critical in terms of the results of the survey providing adequate information and certainty levels with respect to whether the EPA's relevant environmental factors can be met. It is therefore essential that the timing of fauna and faunal assemblage surveys be such that the survey objective/s can be met.

The appropriate timing of fauna and faunal assemblage surveys will therefore need to be considered early in the planning phase of a development proposal or scheme. Environmental and planning consultants, staff of government authorities and the

EPA all have a role in bringing these requirements to the attention of development proponents as early as possible in the planning process for proposed developments or schemes (or their amendment).

In general fauna and faunal assemblage surveys conducted for baseline information (i.e. the first detailed survey of the area prior to development) should be multiple surveys conducted in each season appropriate to the bioregion and the faunal group. The most important seasonal activity times for many faunal groups are related to rainfall and temperature. Thus, a survey in the season that follows the season of maximum rainfall is generally the most productive and important survey time. However, in some cases there may also be a need to time surveys according to the seasonal activity patterns of particularly important species (such as Specially Protected Fauna or Priority species) or particular assemblages (e.g. molluscs or amphibians). In the case of surveys conducted for formal EPA assessments, the EPA's proposal-specific guidelines may specify these species and/or assemblages. In other cases (such as where the survey is carried out prior to referral of a proposal) advice on which are likely to be important species or assemblages may be sought from the Department of Environment (DoE) and (particularly with respect to proposals in current or proposed conservation reserves) the Department of Conservation and Land Management (CALM).

3.2.5 Determining the extent and level of survey required

The scale and nature of impact and the sensitivity of the receiving environment will govern the indicative levels of faunal survey expected by the EPA. These were outlined in EPA's Position Statement No. 3 (Environmental Protection Authority 2002) and are presented in Appendix 2.

Aspects of the environmental factors and objectives and the scope of the required survey may be set out by the EPA in proposal-specific Guidelines (in the case of environmental assessments by the EPA). In this case, the specific direction provided in the EIA Scoping Document or Instructions will take precedence within the context of the approach and expectations set out in this document. However in the absence of specific direction in these documents, the scope will be determined by the objectives of the survey consistent with expectations established in this Guidance Statement. Resource considerations are also relevant, provided that the survey will provide sufficient information for the EPA to determine whether or not the objectives for specified relevant environmental factors can be met.

3.2.6 Determining survey sampling design and intensity

Factors likely to influence sampling design include :

- bioregion – level of existing survey/knowledge of the region and associated ability to predict accurately;
- landform special characteristics/specific fauna/specific context of the landform characteristics and their distribution and rarity in the region;

- lifeforms, life cycles, types of assemblages and seasonality (e.g. migration) of species likely to be present;
- level of existing knowledge and results of previous regional sampling (e.g. species accumulation curves, species/area curves);
- number of different habitats or degree of similarity between habitats within a survey area;
- climatic constraints, e.g. temperature or rainfall that preclude certain sampling methods;
- sensitivity of the environment to the proposed activities;
- size, shape and location of the proposed activities; and
- scale and impact of the proposal.

During the planning stage before fauna and faunal assemblage surveys are conducted, the EPA expects that proponents will consider the methods, including any constraints, of other surveys in the region. Useful references in this context include Biological Surveys Committee of WA (1984), Burbidge *et al.* (2000a), How *et al.* (1984, 1991) and papers in Burbidge *et al.* (2000b). A useful manual for vertebrate survey methodology is that used in South Australia to collect data for the Environmental Data Base of South Australia (Government of South Australia 2000). The sampling design should be adequately explained and justified in the survey report.

The duration and spatial scale of fauna sampling are pivotal in environmental impact assessment and the methodology design and intensity of the survey needs careful consideration and will vary regionally and take into account local conditions. For example, studies (e.g. How 1998, How *et al.* 1991, Rolfe and McKenzie 2000) have shown that extensive sampling effort is required in both a temporal and spatial scale before the composition of a herpetofaunal assemblage (including its rarer species) can be adequately determined. At Bold Park on the Swan Coastal Plain, How (1998) showed that 80% of the reptile assemblage was recorded only after 40 days of systematic trapping, but in specific habitats the mean effort expended to record 80% of the assemblage was over 75 days. In the east Pilbara, a study by How *et al.* (1991), which extended over 58 days of pitfall trapping over nine trapping periods over three years over eight discrete habitats, revealed that 25 trapping days elapsed before 80% of the pitfall trapped assemblage was recorded. However, the assemblage revealed by pitfall trapping represented only 58% of the 67 reptile species recorded by all means during the survey.

Survey methodology, duration and timing will vary according to the faunal group being surveyed. For example, the timing of molluscan surveys is crucial. An apparent paucity of molluscs may be due to the relative humidity or time of day, rainfall and temperature on the day of the survey, over the preceding weeks or even in the previous year when conditions were not advantageous for breeding and survival of the young. For mollusc surveys for example, surveyors need to be skilled in assessing habitat diversity as it pertains to snails, and in using the

various techniques (dismantling rock piles, excavating burrows, sieving for micro-molluscs, etc.) that are appropriate for searching for snails (live or dead, active or aestivating).

The relative efficacy of sampling methods for terrestrial vertebrates has been analysed (e.g. How *et al.* 1984, 1991 and Rolfe and McKenzie 2000) for different parts of Western Australia. The EPA expects that analysis of faunal assemblage data will take cognisance of sampling bias in favour of some groups while under sampling others.

3.3 Presentation and reporting

3.3.1 Identifying the limitations of the survey

It is essential that every fauna and faunal assemblage survey report contains a section describing the methods used and the limitations of these methods. This is particularly important as it will enable assessment officers to determine whether the survey is adequate to address particular issues. The survey techniques for each of the faunal groups sampled should be detailed including person/hours and number of traps/area.

Detailing survey limitations are important as they fulfil three functions:

- they are a discipline that requires the author of the fauna and faunal assemblage survey report to consider any factors which may have limited or compromised the results, or omissions from the survey, and any issues which could not be addressed within the survey scope;
- in the spirit of transparency they clearly signpost such compromising factors in a way that should indicate the capacity of the survey and the report to address issues; and
- they may act as insurance to the practitioner against being perceived by others to have made false claims.

Limitations may cover constraints such as:

- competency/experience of the consultant carrying out the survey;
- scope (what faunal groups were sampled and were some sampling methods not able to be employed because of constraints such as weather conditions, e.g. pitfall trapping in waterlogged soils or inability to use pitfall traps because of rocky terrain or impenetrable subsoil);
- proportion of fauna identified, recorded and/or collected ;
- sources of information e.g. previously available information (whether historic or recent) as distinct from new data;
- the proportion of the task achieved and further work which might be needed;
- timing/weather/season/cycle;
- disturbances (e.g. fire, flood, accidental human intervention etc.) which affected results of survey;

- intensity (in retrospect, was the intensity adequate);
- completeness (e.g. was relevant area fully surveyed);
- resources (e.g. degree of expertise available in animal identification to taxon level);
- remoteness and/or access problems; and
- availability of contextual (e.g. biogeographic) information on the region.

3.3.2 Requirements for data presentation

As far as possible, data collected for fauna and faunal assemblage surveys being conducted for EIA or for other consideration by the EPA should be gathered and presented in quantitative form. Results presented within fauna and faunal assemblage survey reports can be used to interpret data or make qualitative observations, but the information to support the key results should be presented in a form that would allow an appropriately qualified third party to evaluate.

Nomenclature

The EPA is seeking to ensure comparability between different EIA reports, both in project methodologies and especially in the nomenclature of species involved. Agencies with the primary responsibility for compiling the State's species listing are the Western Australian Museum in the case of the fauna and the Herbarium (CALM) in the case of the flora. EIA reports will be expected to use current listings from these agencies.

In the case of vertebrate species the acceptable nomenclature will be that determined by the Western Australian Museum as provided in the original or current (including electronic) versions of *Checklist of the vertebrates of Western Australia*. EIA reports will quote the appropriate authorities for the nomenclature used for each vertebrate group, e.g. Hutchins (2001) for fish, Aplin and Smith (2001) for amphibians and reptiles, Johnstone (2001) for birds, and How *et al.* (2001) for mammals. For non-vertebrate groups for which there are no current comprehensive species listings it is expected that EIA reports will use the most recently available names and the appropriate departments in the Museum should be consulted for advice.

3.3.3 Preparation of fauna and faunal assemblage survey reports

Generally the person/s involved in the planning and implementation of the relevant fauna and faunal assemblage survey should be responsible for preparing these reports. In some cases there may be a need for quality endorsement by more experienced persons. However these persons should also be qualified to undertake surveys as set out in Section 3.2.3.

3.3.4 Setting the context for survey design and reporting

The key policy reference dealing with the environmental significance of impacts on fauna and faunal assemblages in Western Australia is Position Statement No. 3 (Environmental Protection Authority 2002). Position Statement No. 3 outlines the policy context for the protection of biodiversity throughout Western Australia, and in particular regions. In Position Statement No. 3 the EPA sets out key elements that are relevant to its consideration of proposals which impact on biodiversity. These elements provide the general framework for the objectives and design of fauna and faunal assemblage surveys because, in order to properly assess the environmental significance (and acceptability) of proposals, the EPA needs to be able to answer specific questions based on the elements identified. These questions also relate to any specific objectives that the EPA has identified as being relevant to a particular project, via the process of providing proposal-specific assessment guidelines, and to the requirements of the Commonwealth for matters of national environmental significance.

As Western Australia is a very large State with considerable local and regional environmental variation, the nature, scope and intensity of the fauna and faunal assemblage survey required may vary according to the region, in response to regional characteristics such as spatial heterogeneity and geographic distribution. These requirements need to be considered on a region-specific basis and are described in Appendix 2.

Aspects of ‘context ‘ will generally include, but not be limited to:

- objective of the survey (foreshadowing the contribution of the work);
- review of background (literature search, metadata search including appropriate search of specimen databases, e.g. W.A. Museum *Faunabase*);
- characteristics of the fauna of the site at the international, national, State, regional, local level as appropriate;
- appraisal of current knowledge base/framework;
- what specific areas of information will be investigated (e.g. regional and local biogeographical significance, biodiversity, species richness, conservation status, threatening processes); and
- review of other environmental work carried out in the area and relevant to the proposal.

3.3.5 Format of survey reports and data

The findings of the fauna and faunal assemblage survey should be submitted in two ways:

1) As a stand-alone report, which may also appear whole as an appendix of an environmental review document:

- To the EPA

In both hard copy (including any original habitat or other maps) and electronic form (with mapped data in a digital format). (Note: the EPA intends to develop guidance in the near future on the requirements for submission of data from biological surveys.)

- To the public

Available in hard copy from the proponent at a cost no greater than that of the main environmental review document; and

- 2) As an overview within the environmental review document

The environmental review document should include, within its text, a clear overview of the findings on the biodiversity and conservation values of the fauna and associated impacts. It is imperative that the overview accurately and directly represents the discussion, conclusions, recommendations, summary and limitations of the base survey report. The conclusions, summary and limitations of the base survey report should also be evident in the summary and conclusions of the environmental review document. The authors of the fauna survey report should be responsible for preparing the conclusion, summary and limitations, or at least vet these sections, and should sign the reports to indicate their agreement with the material presented.

3.3.6 Public availability of fauna survey reports submitted for EIA

The EP Act stipulates that the EPA [Section 39(1)(a)(b) and 39(5)] and proponents [Section 40 (2)(a)(4)(a)(b)] make information publicly available as part of the environmental review process.

The EPA considers that:

- the public availability of information on biodiversity is fundamental to the environmental review process and good decision-making;
- all survey work on fauna and faunal assemblages should contribute to the sum total of knowledge for the State; and
- any disclaimer within an environmental review or survey document must recognise that the work is primarily for the purposes of environmental impact assessment under the EP Act, is consequently publicly available, and is subject to the limitations outlined in the methods of the survey document.

The EP Act provides for particular and limited protections on confidential information [Section 39(2)(3)(a)(b)(4) and Section 120]. The *Freedom of Information Act 1992* also applies.

3.3.7 Use of terminology

Terminology should be clear and standardised, preferably using those terms listed in Section 6 of this Guidance.

3.3.8 Acknowledgement of contributors and attribution of all sources of data

Scientific and technical documents should appropriately acknowledge all contributions and authorship (this includes Environmental Review documents). This is important to the process of properly valuing all work and promoting basic standards.

Fauna and faunal assemblage survey reports should list the names of all persons involved in both the survey and the preparation of the report and briefly state their role. Acknowledgements should also extend to any other contributors including external expertise sought.

Other sources of data should be fully attributed and referenced to the original source. This includes metadata (including GIS), maps, figures and tables copied or adapted from other sources.

3.3.9 Record keeping for the purpose of audit

The EPA's requirement for information provided in fauna and faunal assemblage surveys is for the source data from surveys to be readily available for a reasonable period (7 years) following the survey so that:

- subsequent supplementary or time-sequence surveys can be adequately designed;
- survey limitations are transparent to data users; and
- the surveys themselves are verifiable and auditable by a third party.

Accordingly, the base data collected in surveys (including details of sample dates, precise location, habitat details, etc.) should be retained in the form originally collected for a minimum of 7 years after the survey was completed.

The EPA advises that from time to time there will be random and opportunistic audits of fauna and faunal assemblage surveys (and/or related reports). In some cases (usually for major projects in sensitive areas) fauna and faunal assemblage survey reports (and related data) may be subject to peer review by an independent faunal survey practitioner.

As outlined in Position Statement No. 3, the EPA expects that information obtained as part of environmental impact assessment should be made permanently available to the public. To achieve this, the EPA intends to encourage the coordinated development of a statewide database for EIA-related biological surveys in consultation with environmental practitioners and Western Australian natural resource management agencies and authorities. To achieve this end, it is desirable that an electronic version of the fauna data is provided to the EPA, so that it can be used to consolidate knowledge of the State's biota and progressively add to the knowledge base of the biodiversity of Western Australia and provide an improved basis for future decision-making.

The EPA proposes to work with survey practitioners and officers of the Western Australian Museum and CALM to develop an appropriate set of protocols for the presentation, storage, acknowledgement and accessibility of faunal information.

3.4 The role of the surveyor in increasing biodiversity knowledge

As a result of the limited amount of detailed fauna and faunal assemblage survey data available for most regions of Western Australia, much of the fauna survey work conducted is of an exploratory nature and there is significant potential for new discoveries or findings. This may significantly challenge or revise conventional understanding of the distribution or abundance of fauna and faunal assemblages.

This leads to a need for persons engaged in fauna and faunal assemblage surveys to act as scientific advocates and bring to the scientific, government, and public arenas, new information gathered in the course of the survey. This contributes to an increase in collective knowledge and ensures that decisions on biodiversity protection are based on the best available information.

For example, the EPA would expect that animal specimens collected and not readily identifiable as common, would be vouchered to the Western Australian Museum and that specimens which reflect taxonomic anomalies or which are found to occur beyond the previously known range of a taxon would be highlighted in the fauna and faunal assemblage survey report and brought to the attention of relevant authorities (e.g. Western Australian Museum, CALM, the EPA etc.).

Additionally, fauna and faunal assemblage survey reports should identify whether any animal taxa or assemblages present are restricted or whether the survey area is an outlier or known extremity of the range of those taxa/assemblages.

3.5 Auditing or peer reviewing surveys

The EPA does not have the resources to undertake systematic review of all fauna and faunal assemblage surveys or reports. To ensure that the methods and standards applied in surveys are of a standard that is adequate to ensure quality environmental assessment by the EPA, a proportion of projects may be selected at random for the audit process. In such cases, selected parts of the survey and the related report (i.e. a sample of the work) may be audited.

Peer review may be warranted for some EIA surveys, particularly where the EPA or the practitioner conducting the main fauna and faunal assemblage survey considers that the survey is in an area or bioregion which is poorly known or in which a limited range of specialists may be qualified or experienced. Such review must be undertaken by experienced and suitably qualified professionals (Section 3.2.3). Unless there are matters in dispute, the peer review would normally be conducted at the expense of the proponent. The EPA will normally seek to inform the proponent

of the likely requirement for a peer review in the project-specific guidelines or approved scoping documents.

Core elements of the peer review process in science are that:

- a) the choice of reviewer/s is made by a body independent of the author and the report commissioners (in this case, the EPA is the independent body);
- b) the reviewers are qualified and experienced professionals, with levels of relevant experience and expertise at least equivalent to those of the people they are reviewing;
- c) the reviewers are clear as to the scope and the limitations of the review (general limitations are considered);
- d) the reviewers can remain anonymous; and
- e) there is an opportunity to re-submit work after revision.

4 APPLICATION

4.1 Area

This Guidance Statement applies throughout the State of Western Australia and will apply to all new proposals, planning schemes and amendments to schemes.

Position Statement No. 3 indicates that the EPA intends to use IBRA as the largest unit for decision-making in relation to maintenance of biodiversity. Proponents will, as a minimum, be required to demonstrate that their proposal can meet objectives which are framed in the context of conservation within the applicable bioregion/s. In some areas, such as the Swan Coastal Plain, the developing framework of biogeographical knowledge and policy may provide a more detailed context (EPA Guidance Statement No. 10 and Government of Western Australia 2000a and b).

4.2 Duration and Review

The duration of this Guidance Statement is for five years, unless circumstances require it to be reviewed earlier.

5 RESPONSIBILITIES

5.1 Environmental Protection Authority responsibilities

The EPA will apply this Guidance Statement when assessing any proposals, planning schemes or amendments where fauna and/or faunal assemblages are identified as relevant factors prior to, or during, the assessment.

5.2 Department of Environment responsibilities

The DoE, through the EPA Service Unit (EPASU), will assist the EPA in applying this Guidance Statement in environmental impact assessment and in conducting its functions under Part IV of the EP Act.

The DoE, through the EPASU, will provide more specific advice to proponents and environmental consultants, as required, in relation to detailed interpretation of aspects of this Guidance or in relation to specific assessments, within available resources.

5.3 Proponent responsibilities

Assessment is likely to be assisted if proponents demonstrate to the EPA that the requirements of this Guidance Statement are incorporated into proposals.

As outlined in Section 3.3.5, the EPA expects that proponents will ensure that the findings of the original survey report/s appear in an unaltered form in the main text of any review document, and that a copy of the whole survey report will appear as an appendix of the review document.

5.4 Environmental practitioner (including fauna consultant) responsibilities

The EPA expects that the design of fauna and faunal assemblage surveys will take account of current fauna protection legislation and that survey practitioners will have appropriate CALM administered licences and will comply with current animal ethics requirements.

Environmental practitioners are expected to exercise due professional diligence in the conduct of fauna and faunal assemblage surveys and the authorship of fauna and faunal assemblage survey reports. Environmental review documents and fauna and faunal assemblage survey reports should contain an acknowledgment that the EPA's EIA process is one of the specific purposes for which the document or report has been prepared and that the document is suitable for this purpose. Documents and/or reports that do not do so will not be accepted by the EPA for the purposes of EIA.

It is essential that the standards for survey outlined here are met or exceeded. The EPA urges practitioners to ensure that they fully understand the inherent context and level of meaning of terms before they apply them. Particular use should be made of definitions in this Guidance.

A full and frank statement of impacts is expected at all levels of survey and environmental assessment documentation.

6 DEFINITIONS AND ACRONYMS

6.1 Definitions

Biological diversity/biodiversity – is the variety of all life forms - the different plants, animals and micro-organisms, the genes they contain, and the ecosystems of which they form a part. It is not static, but constantly changing; it is increased by genetic change and evolutionary processes and reduced by processes such as habitat degradation, population decline, and extinction (Commonwealth of Australia 1996).

Biodiversity has two key aspects:

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

Two different 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 processes.

○ **Genetic diversity** – is the variety of genetic information contained in all of the individual plants, animals and micro-organisms that inhabit the earth (Commonwealth of Australia 1996). Genetic Diversity represents the heritable variation within and between populations of organisms. In any given area it is the variety of genetic material contained in all organisms.

Genetic diversity occurs within and between the populations of organisms that comprise individual species as well as among species (Commonwealth of Australia 1996).

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

However for many species some information is available on the phenotypic expression of genetic variation through the recognition of different taxa at the sub-species or variety level. These may be significant in terms of exhibiting varying distribution and levels of rarity. The protection of species throughout their range and on the variety of sites may therefore serve as a surrogate for protection of genetic diversity in the absence of specific information. This issue needs to be considered in the design/collection and interpretation of data obtained in fauna and faunal assemblage surveys.

○ **Species diversity** – this can be considered as the variety of individual species within a given area, such as a region. While such diversity can be

measured in many ways, the number of species (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.

Species diversity is conceptually different from genetic diversity because:

- in general, the recognition of species is based on physical features (a taxonomic approach of recognising, describing, naming and classifying); and
- a species is a concept, rather than a clear unit in nature. This can mean that the amount of genetic variation within one species may be markedly different from another species. To accommodate such inconsistencies, sub-divisions such as sub-species and hybrids may be recognised.

EIA in WA to date has typically considered fauna at the species and species assemblage levels. For example, environmental assessment work presented to the EPA typically includes fauna inventory lists with an emphasis on the presence or absence of rare, Threatened and Priority species (as determined by CALM databases or other relevant data sources).

Threatened and Priority fauna are only one subset of species diversity. The scope of formal listings is limited by the extent and intensity of sampling in any area, by how well a surveyor recognises all different organisms in an area, by whether all known occurrences are registered, and by the current progress in naming species groups. Since these processes are ongoing, it is clear that survey for environmental impact assessment has a role in extending knowledge. Consequently, consultants are encouraged to check specimens that have no known match, or appear anomalous, and which may be new.

- **Ecosystem diversity** – in any given area, the variety of habitats, biotic communities and ecological processes (Commonwealth of Australia 1996).

Ecosystems are the basic functional ecological units. They comprise the diversity of all-living organisms and non-living components and their relationships within a given area. They can be defined at almost any nominated scale. Ecosystems include abiotic components, which include physical factors such as radiation, gases, the water cycle, geology, land and soil forming processes, and climate.

Ecological processes are the interactions, and changes or development processes, of the ecosystem over time.

Ecosystem diversity is harder to measure than species or genetic diversity because the boundaries of ecosystems (or component habitats and communities) are a matter of definition within a matrix. Provided a consistent set of criteria is used to define ecosystems, their number and distribution can be measured. It is therefore essential

that scale/s and the basis for differentiation are defined and understood in any treatment of ecosystem diversity.

○ **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 (Environmental Protection Authority 2002).

Environmental assessment and evaluation document (sometimes referred to as an **environmental review document**) – An environmental assessment and evaluation document is the information presented in an environmental assessment or review document submitted to the EPA. Environmental assessment or review documents may include:

- a referral document (prior to the EPA determining the level of environmental assessment required for a proposal);
- an environmental review document (as required by the EPA for formal assessments of some proposals and schemes, under Part IV of the Environmental Protection Act); or
- a post-approval report (i.e. prepared subsequent to environmental approval being granted) such as reports on fauna and faunal assemblage surveys conducted to fulfil proponent commitments or environmental conditions.

The information provided in an environmental assessment and evaluation may (where relevant) make reference to one or more fauna and faunal assemblage survey reports (as well as information relevant to other impacts of the proposal). It may also include an evaluation of the impacts of a proposal, drawing information from the fauna and faunal assemblage survey (and other) report/s that should always be made available to the DoE and the EPA either separately or as an appendix to the environmental review document.

Faunal assemblage - A collection of animal species inhabiting a particular area.

Fauna and faunal assemblage survey - For the purposes of EIA or environmental management, a fauna and faunal assemblage survey is the primary office and field based investigation (including a review of established literature) of the characteristics of the faunal biodiversity of a proposal or scheme area or any other area relevant to the consideration or assessment of a proposal or scheme by the EPA or the management of a proposal or scheme.

Fauna and faunal assemblage survey report - A fauna and faunal assemblage survey report describes the objectives, methods, data results, analysis and conclusions of a fauna and faunal assemblage survey. The primary author/s of this document should be the person/s conducting the fauna and faunal assemblage

survey. This report should be separate from an environmental assessment and evaluation report (described above).

Habitat - The natural environment of an organism or a community, including all biotic and abiotic elements; a suitable place for it to live (after Gilpin 1996; Jones *et al.* 1990; Lewis 1977; Onions 1978; Commonwealth of Australia 1996). The term 'habitat' has been applied at a range of scales in general use (as have community and vegetation). Vegetation can become a reasonable surrogate for outlining habitat when its main components, structure and the associated landform are also described.

Natural Areas - naturally vegetated area or non-vegetated areas such as water bodies (generally rivers, lakes and estuaries), bare ground (generally sand or mud) and rock outcrops (Environmental Protection Authority 2003b).

Priority Fauna - Conservation significant animal species listed by CALM's Threatened Species Consultative Committee but which are not currently listed under Section 14 (2) (ba) of the Wildlife Conservation Act 1950 as Specially Protected Fauna.

Proposal area - Any area or portion of the environment including aquatic areas and affected portions of the atmosphere potentially impacted upon by a proposal or scheme area being considered by the EPA.

Short-range endemics - A species with a naturally small distribution covering less than 10,000 km², although the actual area of occupancy may be far less (Harvey 2002).

Significant fauna - Species may be significant for a range of reasons other than those protected by international agreement or treaty, Specially Protected or Priority Fauna. Significant fauna may include short-range endemic species, species that have declining populations or declining distributions, species at the extremes of their range, or isolated outlying populations, or species which may be undescribed.

Significant fauna assemblage – Relatively intact examples of naturally occurring fauna assemblages or large populations representing a significant proportion of the local to regional total population of a species. [Note: significant fauna values are distinct from values for significant fauna species].

Species - A group of biological entities that interbreed to produce fertile offspring or possess common characteristics derived from a common gene pool. (*EPBC Act*).

Specially Protected Fauna - Animal species listed under Section 14 (2) (ba) of the Wildlife Conservation Act 1950. The latest listing is Wildlife Conservation (Specially Protected Fauna) Notice 2002 (Government of Western Australia

2002).

System 6 areas - Those specific localities as listed in The Darling System - System 6 Part II Recommendations for Specific Localities Report 13 Conservation Reserves for Western Australia as recommended by the Environmental Protection Authority (Department of Conservation and Environment 1983).

Taxa (singular **Taxon**) - A taxonomic group. Depending on context this may be a subspecies, species, genus or higher taxonomic grouping.

Terrestrial fauna - Animal species living in or on land. For the purpose of this Guidance Statement freshwater vertebrates including fish and amphibians and aerial species are included. (Note: marine and subterranean fauna (troglodytic and stygofauna, see Section 1.2.4.2) are not included in this Guidance Statement.)

Vegetation (compare with flora; and see significant vegetation) - The various combinations that all populations of all vascular plant species form within a given area, and the nature and extent of each combination (after Mueller-Dombois and Ellenberg 1974; Collocott and Dobson 1975; Lewis 1977; Onions 1978; Delbridge 1987). Note that this is a biodiversity approach, and that other approaches may be based on structure or appearance - approaches that describe lesser subsets of plant diversity. The term vegetation has been applied at a range of scales in general use (as have community and habitat). The joint influence of different approaches and levels that can be applied to vegetation has led to a range of terms which describe vegetation, with resulting confusion.

6.2 Acronyms

ANZECC	Australian New Zealand Environment and Conservation Council
CALM	Department of Conservation and Land Management
CAMBA	China-Australia Migratory Bird Agreement (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)
DoE	Department of Environment (formerly Department of Environmental Protection)
EIA	Environmental Impact Assessment
EPA	Environmental Protection Authority
EP Act	<i>Environmental Protection Act 1986</i>
EPA SU	Environmental Protection Authority Service Unit
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
GIS	Geographic Information System
IBRA	Interim Biogeographic Regionalisation of Australia

JAMBA	Japan-Australia Migratory Bird Agreement (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)
SoE	State of the Environment

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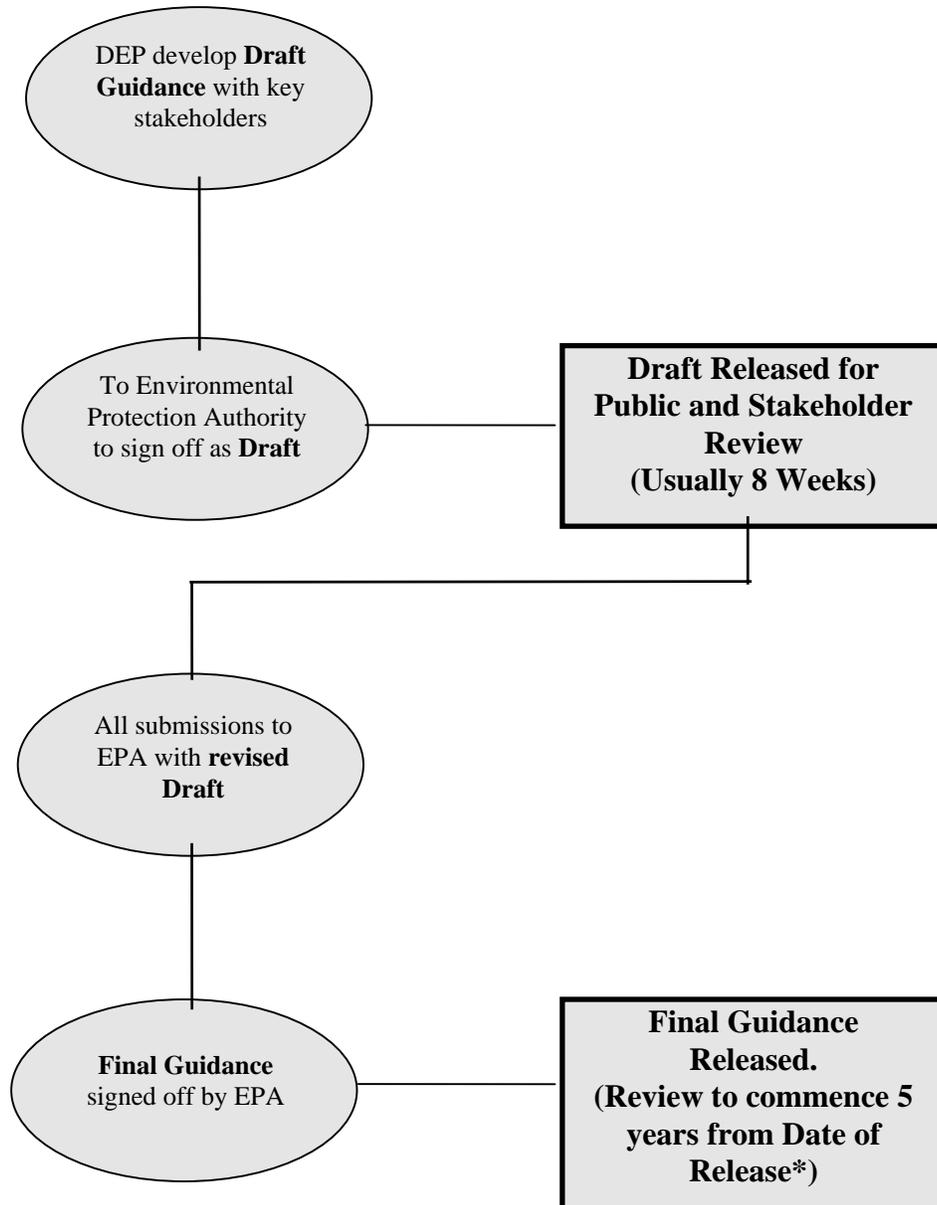
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Appendix 1

GENERIC FLOW DIAGRAM FOR THE GUIDANCE STATEMENT PROCESS



* Guidance may be reviewed earlier if circumstances require it.

Appendix 2

GUIDE TO LEVELS OF TERRESTRIAL FAUNA AND FAUNA ASSEMBLAGE SURVEY

Table 1: Levels of Terrestrial Fauna and Faunal Assemblage survey
(adapted from EPA Position Statement No. 3)

Survey levels differ in the capacity of the survey work to provide detail of the conservation and functional values of the target area and its immediate context.	
Level 1 Surveys	<p>Background research or ‘desktop’ study The purpose is to gather background information on the target area (usually at the locality scale). This involves a search of all sources for literature, data and map-based information.</p> <p>Reconnaissance survey The purposes are: i) to verify the accuracy of the background study; ii) to further delineate and characterise the fauna and faunal assemblages present in the target area; and iii) to identify potential impacts. This involves a target area visit by suitably qualified personnel to undertake selective, low intensity sampling of the fauna and faunal assemblages, and to provide habitat descriptions and habitat maps of the project area.</p>
Level 2 Surveys	<p>Incorporates Background research and Reconnaissance survey as preparation for more intensive survey that may range in form between detailed and comprehensive survey.</p> <p>Detailed survey The purpose is to enhance the level of knowledge at the locality scale. This applies where the general context is better known. This involves: i) one or more visit/s in each season appropriate to the bioregion and the faunal group being surveyed. Generally maximum survey will be the season that follows the season of maximum rainfall but there will be need to time surveys according to seasonal activity patterns of some faunal groups (e.g. molluscs or amphibians).</p> <p>Comprehensive survey The purpose is to enhance the level of knowledge at the locality scale and the context at the local scale. In some cases sub-region survey may be required to provide wider context. This applies where there is only broad general context. This involves survey, at the intensity applied in detailed survey, of both the locality and parts of the local area. Such work is likely to be more structured with longer-term study and multiple visits.</p>

Table 2: Indicative levels of terrestrial fauna and faunal assemblage survey expected by the EPA in relation to the scale and nature of impact of proposals and the sensitivity of the receiving environment

(adapted from EPA Position Statement No. 3)

The bioregions have been grouped in Table 2 according to the existing degree of regional modification or loss of biodiversity, degree of threat and sensitivity to further loss. As a guide to the use of this table, it is very important to note that there will be areas of greater sensitivity within each bioregion that will require special consideration (e.g. wetlands, threatened ecological communities, restricted geomorphological/soil type areas with the likelihood of presence of short-range endemic species including unnamed species, areas with Specially Protected Fauna or Priority species, etc.). Conversely, for areas with a high degree of pre-existing modification and reduced native fauna species (such as cleared agricultural land) the investigation effort expected is likely to be reduced in comparison to areas that are likely to support fauna in native vegetation.

Sensitivity of Environment (Bioregion Groups)	Numbers indicate level of terrestrial fauna and faunal assemblage survey expected (as defined in Table 1)		
	Scale and Nature of Impact		
	High	Moderate	Low
Group 1	2	2	1
Groups 2 and 3	2	1 or 2	1
Group 4	2	1	1

Bioregion Groups

- **Group 1: Warren, Avon Wheatbelt, Geraldton Sandplains, Esperance Plains, Mallee, Swan Coastal Plain** (bioregions of the South-West Botanical Province that are extensively cleared for agriculture).
- **Group 2: Gascoyne, Carnarvon, Yalgoo, Pilbara, Coolgardie, Murchison, Nullarbor, Hampton**, (bioregions of the Eremaean Botanical Province, native vegetation is largely contiguous but used for commercial grazing) **and Jarrah Forest** (this South-West Botanical Province bioregion is included here because the native vegetation remains extensive and largely contiguous but is used as a commercial forestry resource).
- **Group 3: Dampierland, Northern Kimberley, Central Kimberley, Ord-Victoria Plains, Victoria-Bonaparte** (bioregions of the Northern Botanical Province, native vegetation is largely contiguous but is used for commercial grazing).
- **Group 4: Great Sandy Desert, Gibson Desert, Great-Victoria Desert, Little Sandy Desert, Central Ranges, Tanami** (bioregions of the Eremaean Botanical Province, native vegetation is largely contiguous but is generally not used for commercial grazing).

Table 3: Consideration of the characteristics of proposal areas in defining the scale and nature of impacts on biodiversity

(to be used in conjunction with Tables 1 and 2 to provide guidance on the level of fauna and faunal assemblage survey required for a proposal)

SITUATION I: The area and its immediate surrounds are unlikely to support populations of native fauna.	
<p>The area of the proposal and adjacent areas that could be impacted by off site impacts from the proposal do not support native faunal populations in natural areas.</p>	<p>This Guidance Statement is not applicable It is not expected that the proposal will need to address fauna or faunal assemblage factors. Any proposal submitted to the EPA for assessment of other environmental factors should include comprehensive photographs of the area suitable for identifying the nature and condition of any vegetation and habitats in the area.</p> <p>Depending on the area and nature of the development it may be appropriate to consider some strategic habitat revegetation or landscaping to enhance faunal linkages with local provenance native plant species to re-establish them in the area.</p>
SITUATION II: The area and/or its immediate surrounds are likely to support populations of native fauna.	
<p>If there is native fauna in habitats in or adjacent to the proposal area that could be impacted then background research and reconnaissance survey is required as a minimum. Areas that could be impacted support native fauna in vegetation that is not completely degraded.</p> <p>Note: if the area supports native vegetation within a national park, nature reserve, conservation park, or other reserve formally protected or recommended for protection for a conservation purpose a comprehensive survey is required as a minimum.</p>	<p>This Guidance Statement is applicable. This Table provides guidance as to the level of fauna and faunal assemblage survey expected.</p>

AREA CHARACTERISTICS	EXPLANATION OF SIGNIFICANCE	SCALE AND NATURE OF IMPACT		
		HIGH	MODERATE	LOW
Degree of habitat degradation or clearing within region				
Determine the level of alteration of the original vegetation. The extent of clearing in the district and bioregion is the simplest measure of change and of sensitivity to further change. However, less obvious factors can be measured that have also altered the vegetation and consequently the fauna habitat. Examples in the Eremaean Province include change in faunal assemblages as a consequence of vegetation degradation resulting from grazing, and associated invasion of introduced species, especially predators and competitors.	This is a background factor in any region, with some regions having significantly higher cumulative degradation than others.	In either the local area or region: i) in fragmented ecosystems with less than 30% native vegetation or natural areas remaining; or ii) in more extensive ecosystems with less than 30% of vegetation in better condition.	In either the local area or region: i) in fragmented ecosystems with between 30-50% native vegetation or natural areas remaining; or ii) in more extensive ecosystems with between 30-50% of vegetation in better condition.	In either the local area or region: i) in fragmented ecosystems with more than 50% native vegetation or natural areas remaining; or ii) in more extensive ecosystems with more than 50% of vegetation in better condition.
Size/scale of proposal/impact				
The size of impact is important in determining the environmental significance of the proposal. This characteristic is not intended to imply relative natural values of bioregions. Rather it reflects the relative degree of disturbance in each group of bioregions.	Area of clearing/loss of habitat and native fauna as a result of the proposal.	>10 ha - Bioregion Group 1 >50 ha - Bioregion Groups 2-3 >75 ha - Bioregion Group 4	1-10ha - Bioregion Group 1 10-50ha - Bioregion Groups 2-3 20-75ha - Bioregion Group 4	<1ha - Bioregion Group 1 <10ha - Bioregion Groups 2-3 <20ha - Bioregion Group 4

AREA CHARACTERISTICS	EXPLANATION OF SIGNIFICANCE	SCALE AND NATURE OF IMPACT		
		HIGH	MODERATE	LOW
Rarity of vegetation and landforms				
Consider whether the proposal impacts on habitats in vegetation or landform units that are restricted or rare either naturally or as a result of clearing. Threatened Ecological Communities (TEC's) may fit either of these categories.	Impact on any naturally rare or restricted habitat and its component fauna is considered a high to moderate impact. Restricted distribution landform units such as Banded Ironstone Hills, areas with granite outcrops (e.g. in the Coolgardie/Yalgoo Bioregion), or areas with specialised faunal habitats such as Salmon Gum/York Gum woodlands that provide breeding resources for obligate tree hollow breeding species (in the Avon Wheatbelt Bioregion) and regionally rare wetlands may be important rare habitats.	Vegetation and landforms that: i) naturally comprises less than 5% in the local area (15 km radius) or the bioregion; or ii) is a Threatened Ecological Community.	Vegetation and landforms that naturally occupy from 5 to 10% of the local area (15 km radius) or the bioregion.	Vegetation and landforms that are naturally more widespread than 10% of local area (15 km radius) and the bioregion.
Significant Habitats				
Consider whether the area supports habitats that have particular significance for ecological reasons. For example, important feeding or breeding areas or habitats for species protected under international agreements or treaties (e.g. RAMSAR wetlands, migrating birds), Specially Protected and/or Priority Fauna, and habitats for short-range endemic species.	Sites that provide important habitats supporting populations of species that are specially protected by law.	Significant habitats are known in the area or are found in the area during reconnaissance survey.	The vegetation and area characteristics indicate that significant habitats are likely to occur.	Significant habitats are not known from the area or found by reconnaissance survey.

AREA CHARACTERISTICS	EXPLANATION OF SIGNIFICANCE	SCALE AND NATURE OF IMPACT		
		HIGH	MODERATE	LOW
Refugia				
<p>Consider whether the area serves as an ecological refuge for fauna species. These are more restricted environments that have been isolated for extended periods of time, or are the last remnants of such areas. They may be of high significance for fauna species or faunal assemblages with very restricted distributions, or support fauna species well outside their normal range. Examples include isolated hills (e.g. Banded Ironstone or Greenstone Formations or granite outcrops) which are remnants of an ancient eroding surface, islands, permanent wetlands in arid areas, permanent damplands in wetter regions which may retain Gondwanic elements, patches of ancient paleodrainage which have habitat that is not yet affected by secondary salinity as a result of clearing (especially in agricultural areas), mound springs, etc.</p>	<p>For Gondwanic values see Main 1996, Hopper <i>et al.</i> 1996, and Horwitz 1994. For short-range endemic values see Harvey (2002). Refuges may include taxa with preferences for stability/low seasonality, seclusion from fire, or for permanent water, or rainforest elements, with mesic features, or other derivatives that are now isolated (e.g. specific soil types).</p>	<p>Isolated, or disjunct fauna populations or faunal assemblages are known or are likely to be present. The presence of refuges indicates the potential impact is high.</p>	<p>The characteristics of the area indicate that it could serve as a refuge for some faunal groups.</p>	<p>Refugia are not known from the area or are not found by reconnaissance survey.</p>

AREA CHARACTERISTICS	EXPLANATION OF SIGNIFICANCE	SCALE AND NATURE OF IMPACT		
		HIGH	MODERATE	LOW
Fauna protected under international agreements or treaties, Specially Protected or Priority Fauna				
Consider whether the area supports species protected by international agreement or treaty (JAMBA/CAMBA), Specially Protected and/or Priority Fauna.	Areas support populations of statutory protected species.	<p>i) Species protected by international agreement or treaty (JAMBA/CAMBA), or Specially Protected Fauna are found in the area or in similar habitats in its immediate vicinity during reconnaissance survey; and/or</p> <p>ii) habitat characteristics indicate that species protected by international agreement or treaty (JAMBA/CAMBA), or Specially Protected Fauna species may occur.</p> <p>The presence of several Priority Fauna species may also raise the impact to high.</p>	<p>i) Priority Fauna species are found in the area or in similar habitats in its immediate vicinity during reconnaissance survey; and/or</p> <p>ii) the habitat and area characteristics indicate that Priority Fauna species may occur. Cumulative impact on the total number of populations should be considered.</p>	<p>Specially Protected and/or Priority Fauna species are not found by reconnaissance survey, and are not likely to be found in the area or its immediate vicinity, on the basis of existing information.</p> <p>Generally the area would be well known from one, and ideally more than one, well-timed and structured survey.</p>

AREA CHARACTERISTICS	EXPLANATION OF SIGNIFICANCE	SCALE AND NATURE OF IMPACT		
		HIGH	MODERATE	LOW
Other significant fauna or fauna assemblages				
Consider whether the area supports fauna or fauna assemblages that have particular significance for ecological reasons and/or large populations/ seasonal concentrations of particular species. N.B. If the area is known to support large populations from previous adequate surveys this could be used to assess the significance of the portion of the habitat within the proposal area.	The faunal assemblage may be relatively intact compared to other assemblages in the region and may contain species that have declining populations or declining distributions. The area may support species at the extremes of their range, or isolated outlying populations; or species with anomalous features, which may be undescribed.	Relatively intact faunal assemblages are known or are highly likely to be present. The area is known to support a large population/seasonal concentration of species.	Significant species or taxa are found or likely to be found in the area or in similar habitat in its immediate vicinity.	Significant species or taxa are not found or likely to be found in the area or in similar habitat in its immediate vicinity.
Size of remnant and condition/intactness of habitat and faunal assemblage				
Determine whether the proposal impacts on a relatively large more or less intact remnant (e.g. Bioregion Group 1) or is an area of more or less intact habitat in areas of extensively degraded landscapes (e.g. Bioregion Groups 2 and 3) and is likely to support a relatively intact faunal assemblage.	Large intact remnants are key biodiversity reservoirs in fragmented environments. In some cases even small, but intact, remnants may be highly significant because they support a relatively intact faunal assemblage. Areas of relatively intact habitat in regions/districts where the habitat is generally in poorer condition are also important for retention of biodiversity. Desktop study should seek to determine the size of remnants and/or habitat condition relative to those in the local surrounds ($\geq 15\text{km}$ radius).	Area is a relatively large compact remnant, or part of a large compact remnant in a district where habitats are fragmented by clearing and/or other degradation; or an area of habitat, which is more intact than typical for the local district or bioregion.	Area supports a remnant of less than average size and degree of intactness in the district; or the habitat and faunal assemblage is not more intact than that in the district.	Area is not in a fragmented environment or an environment with extensive areas of otherwise degraded habitats or faunal assemblages, such as some rangeland environments.

AREA CHARACTERISTICS	EXPLANATION OF SIGNIFICANCE	SCALE AND NATURE OF IMPACT		
		HIGH	MODERATE	LOW
Ecological Linkage				
Determine the ecological linkage role of the area in the local and regional context.	Ecological linkages have important biodiversity conservation roles, therefore the values of these roles are highly sensitive to change.	The area is part of an ecological linkage at the regional or local scale. Should also survey the bushland areas connected by the linkage to determine fauna species and populations maintained by the linkage.	The area is not directly connected to adjoining areas but is part of a minor ecological linkage.	The area is isolated with no ecological linkages.
Heterogeneity or complexity of the habitat and faunal assemblage				
Determine the characteristics of habitats relative to those in the local surrounds through desktop and reconnaissance surveys.	The relative complexity of the area is expressed by the range of landforms/habitats/ecotones offering a diversity of seasonal resources for fauna populations and faunal assemblages.	The area and/or its immediate surrounds are complex, with a wider range of habitats and ecotones and faunal assemblages relative to the character of the local and regional surrounds.	The area and/or its immediate surrounds have a similar range of habitats and faunal assemblages relative to the characteristics at the local and regional scale.	The area and its immediate surrounds are less complex relative to the characteristics of the local and regional scale.