A guide to the assessment of applications to clear native vegetation

under Part V of the *Environmental Protection Act 1986*

Under the *Environmental Protection Act 1986* (EP Act), clearing of native vegetation is an offence unless you have obtained a clearing permit or an exemption applies.

Further information on exemptions from the requirement for a clearing permit is contained in the Department of Environment and Conservation's (DEC) *Guide to Exemptions and Regulations for Clearing Native Vegetation under the Environmental Protection Act 1986* published on its website.

If no exemption applies, you will need to apply for a clearing permit.

This Guide sets out DEC's recommended approach for assessing an application to clear native vegetation against the requirements of the EP Act. It is intended to assist proponents including landowners, consultants, local government authorities, and State government agencies to:

- understand the assessment process;
- plan to undertake appropriate studies for projects that involve clearing; and
- provide advice and recommendations to the Chief Executive Officer (CEO) of DEC or the responsible officer under the delegation to the Department of Mines and Petroleum (DMP).

Where a word has a specific meaning in the context of this guideline, the first time it is used it is in bold font, andit is explained in the *Glossary* on page 28.

Further information

If you have any questions about this guide or are not sure if you can clear under an exemption, contact DEC's Native Vegetation Conservation Branch on 9334 0333. More general information about clearing native vegetation can be found at http://www.dec.wa.gov.au/nvc.

Please note.....
The following information provides a general guide to the assessment of applications to clear native vegetation under Part V Division 2 of the Environmental Protection Act 1986*. Persons who intend to undertake activities that may involve clearing are advised to consult the actual legislation and seek advice, including legal advice, where necessary. Whilst DEC has endeavoured to ensure the accuracy of the contents of this document, it accepts no responsibility for any inaccuracies and persons relying on this document do so at their own risk.*

Introduction

Under section 51C of the EP Act, clearing of native vegetation is an offence without a clearing permit or exemption. Exemptions for clearing that is a requirement of a written law, or authorised under certain statutory processes are contained in Schedule 6 of the EP Act. Exemptions for low impact routine land management practices are contained in the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. These exemptions do not apply within environmentally sensitive areas declared by the Minister for Environment under section 51B of the EP Act. Environmentally sensitive areas can be viewed at http://maps.dec.wa.gov.au/idelve/nv/index.jsp

The CEO, in making a decision about a clearing permit application under section 51O of the EP Act, shall have regard to the clearing principles contained in Schedule 5 of the EP Act so far as they are relevant to the matter under consideration.

Under section 51O of the EP Act the CEO shall also have regard to any **planning instrument** or other matter that the CEO considers relevant (see the 'Planning Instruments and Other Relevant Matters' section on page 25).

If a proposal is likely to have a significant environmental impact, the proposal may require referral to the Environmental Protection Authority (EPA) under section 38 of the EP Act. If the EPA decides to assess a significant proposal, the CEO may not make a decision that is contrary to the implementation decision made following the EPA's assessment. Clearing in accordance with an implementation decision does not require a clearing permit.

Guidelines

This Guide includes information that has been developed to facilitate the application of the clearing principles in the clearing assessment process. Tools have been identified to assist assessors and proponents in determining the significance of the native vegetation under each clearing principle.

This Guide provides the basis for assessment and is not intended to be an exclusive or exhaustive list of relevant considerations and information. In addition, while this Guide is based on the best available scientific information and ecological principles, it is recognised that scientific knowledge is constantly evolving and therefore this Guide may be subject to change.

In assessing a clearing application, assessors are to give consideration to each clearing principle and any planning instrument or other matter and note the extent to which they have been addressed. This includes the methodologies used, the limitations that apply to the assessment, and the relevance of the principle to the current application. The results of the assessment are documented in a decision report, which is published on DEC's website at https://secure.dec.wa.gov.au/cps_reports/

Assessment

The assessor undertakes an initial assessment, which includes a review of all current and relevant literature sources, databases and GIS information.

In most circumstances a site visit is required to:

- verify information obtained during the initial assessment;
- delineate key flora, fauna, soil, and groundwater and surface water values and potential sensitivity to impact; and
- undertake broad-scale vegetation and vegetation **condition** mapping based on selected sites.

A site visit may involve more than one government agency in order to identify the multiple **environmental values** of an area. These agencies could include:

- DEC;
- DMP;
- Department of Agriculture and Food WA; and
- Department of Water

Surveys and gathering additional information

A survey and additional information may be required where the scale and nature of the clearing proposal is likely to have at least a moderate or high impact on the environment, and where information obtained through the initial assessment is insufficient to make an informed decision on the application.

It is the responsibility of the proponent to provide any required additional information, which might include flora and fauna surveys or detailed investigations of land degradation or water issues. Some key considerations include:

- the study must be carried out by a **suitably qualified person**;
- the methodology used should be consistent with the EPA's standards and policies as outlined in Position Statements and Guidance Statements, and with established standards for analysis. These methodologies and standards are referenced where relevant to a clearing principle.

Assessment against the clearing principles, planning instruments and other matters

This Guide provides advice in relation to the factors for consideration during assessment of proposed clearing against the clearing principles, planning instruments and other relevant matters to determine the significance of the clearing. Each of these is addressed on the following pages.

Assessment is a judgement in accordance with the requirements of the EP Act on whether or not a clearing permit application is likely to have a significant effect on the environment. The guidelines and tools assist assessors in making that judgement.

Principle (a) – Native vegetation should not be cleared if it comprises a high level of biological diversity.

Guidelines

This principle aims to protect areas of high **biodiversity**. This principle protects intact natural systems with naturally occurring high levels of **species diversity**, **ecosystem diversity** or **genetic diversity** and natural systems that may be degraded but contain high levels of diversity compared with the remaining native vegetation of that **ecological community**.

The Threatened Species Scientific Committee for the Australian Government has identified areas as Biodiversity Hotspots for priority action. Many of these areas of outstanding biodiversity occur within Western Australia. These hotspots in WA include:

- North Kimberley;
- Hamersley – Pilbara;
- Carnarvon Basin;
- Geraldton to Shark Bay sand plains;
- Mount Lesueur – Eneabba;
- Central and Eastern Avon Wheat Belt;
- Busselton Augusta; and
- Fitzgerald River Ravensthorpe.

Assessment of biodiversity is complex because of the huge number of species, genetic variation within species and associations of species that exist within Western Australian ecosystems. In general, there are only reasonable data on the diversity and distribution of vertebrates, limited data on the diversity and distribution of vascular plants, and little data on invertebrates and micro-organism diversity.

It is recognised that this principle may concentrate on vascular flora as information on vascular plant biodiversity is relatively easy to collect and there are sufficient regional datasets available to allow for the comparisons that are inherent in the principle. This focus does not exclude other measures of biological diversity.

Genetic diversity is poorly understood and adequate information to assess this criterion is difficult to obtain. Taxon diversity (species, subspecies, variety and forms) is an alternative approach to address this issue where genetic diversity data are not available.

The EPA has noted that 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 hard to define. 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 (*EPA Position Statement No.3*).

Priority flora and other **significant flora** such as uncommon or range-restricted species are another measure of biodiversity values and should be considered under this principle. Similarly, **priority ecological communities** provide a measure of biodiversity for ecological communities . The presence of significant flora or priority ecological communities is indicative of **environmental values** worthy of protection and a higher level of biological diversity than might typically be expected in an area.

Examples

Under this principle, clearing of 'degraded' condition vegetation with low comparable diversity where there are significant areas of that vegetation in 'good' condition elsewhere in the **bioregion** and **local area**, is unlikely to be at variance with this principle.

However the following is likely to be at variance:

- clearing of native vegetation that is representative of an area of high biodiversity, such as the northern sandplains in the vicinity of Mount Lesueur;
- clearing of native vegetation that has a higher diversity than other examples of an ecological community in a bioregion; and
- clearing of native vegetation that is in 'degraded' condition yet is in better condition than other vegetation of the same ecological community in the local area (for example, a largely degraded rangelands ecological community).

Tools

Adequate assessment of this principle as part of an initial assessment will rely on existing site and regional studies for comparative purposes. The assessor will need to have skills in assessing vegetation **condition**, and determining floral species diversity and plant ecological community diversity generically to enable such comparisons to be made.

Where more information is needed the scope of the assessment will be determined on a case-by-case basis, but would be consistent with *EPA Position Statement No. 3*. Position Statement No. 3 outlines the EPA's principles for environmental impact assessment of biodiversity. The EPA sees proper understanding of the requirements of adequate surveys as central to achieving a sound assessment of biodiversity.

EPA Guidance Statement No 10, *Level of assessment for proposals affecting natural areas within the System 6 region and Swan Coastal Plain portion of the System 1 region*, *EPA Guidance Statement No 51*, *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* and *EPA Guidance Statement No. 56 Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* also provide guidance as to survey requirements.

Some key factors in using surveys to assess biodiversity include:

- The methodology used should be consistent with the approaches recommended in the EPA Guidance Statement. The methodology used, and any limitations of the surveys, should be outlined in the resulting report;
- The timing and time allocated should be determined by the natural cycles of the region (such as growth and flowering);
- The intensity of the sampling (number of sites; their spacing; and their area) should be based on the complexity of the flora, vegetation and faunal assemblages of the permit application area; and
- The level of effort should correspond with the existing data for that area, i.e. where less existing information is available, a greater survey effort would be required.

In undertaking an assessment specific measures of diversity include:

Plant species

- total vascular plant taxa (species, subspecies and varieties) diversity: and
- vascular plant taxa diversity for each ecological community.

Fauna species:

- total vertebrate and invertebrate fauna taxa (genera, species and subspecies) diversity

Ecosystem diversity:

- number of ecological communities (plant communities);
- number of ecological communities (fauna communities (assemblages));
- macrohabitat diversity;
- microhabitat diversity in each macrohabitat;
- a variety of soil types or geological formations; and
- micro-topographical diversity and edaphic variation.

Useful information for assessing principle (a)

- Interim Biogeographic Regionalisation for Australia
- Mapped pre-European Vegetation / Mattiske Vegetation / Heddle Vegetation Complexes
- Conservation estate and DEC-managed lands and waters
- Systems 1-12 boundaries
- Significant wetlands and watercourses (eg Ramsar sites)
- *EPA Position Statement No.2 Agriculture Region*
- Bush Forever sites
- Significant and priority flora
- Priority ecological communities
- Areas identified as significant in local government biodiversity inventories

Principle (b) – Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Guidelines

This principle aims to maintain indigenous fauna species and assemblages of species in their local natural habitat. This principle protects habitat for threatened fauna and **significant habitat** for **meta-populations** of fauna.

Fauna plays an important role in maintaining ecosystems and the life-supporting services provided by ecosystems by:

- cycling of material, through the browsing of flora, predation, digging, the consumption of organic matter generally, excretion, death and decay;
- the pollination, fertilisation and germination of plants; and
- maintaining the dynamic balance in ecosystems. The balance between assemblages of plants, animals and diseases, and environmental elements such as fire, soil structure and chemistry, can be destabilised by changes to any of the ecosystem components.

The ecological relationships between fauna, vegetation and their physical environment are affected by habitat decline and a consequent loss of ecological functions and processes. These may include:

- increasing edge to area ratios of native vegetation, which reduce the width of a remnant and increase its perimeter;
- loss of corridors, stepping stones (**ecological linkages**) and **buffering** vegetation;
- loss of large intact areas of native vegetation capable of supporting breeding populations of species with limited dispersal;
- loss of vegetation areas that support meta-populations;

- the loss of key habitat requirements, e.g. loss of tree hollows and fallen trees and branches that may be used for breeding or sheltering sites; the loss of proximity of the required combination of habitat types (for example Carnaby's Black Cockatoo is threatened because it requires a combination of woodland for breeding and heath habitat for feeding, and both habitat types have been extensively cleared);
- increased probability of weed invasion due to external influences such as nutrient enrichment, drainage water or wind-blown material;
- increased risk of disease entry and subsequent reduction in habitat values; and
- adjacent land uses which may impact adversely on habitat values.

In extensively cleared **landscapes** fauna specialist species have declined as a result of habitat loss and in many cases are declining further as a result of natural attrition and an inability to recruit. For example, specialist bird species of heathlands and specialist bird species of woodlands in the wheatbelt and Swan Coastal Plain have declined at least in proportion to the loss of those habitats.

It may be necessary to identify, from the total pool of faunal species present, the species that would become (more) vulnerable if a habitat was lost. For example, in the fragmented habitats of the WA wheatbelt, Lambeck (1997) found that birds were useful indicators of habitats.

To identify which species or communities may be vulnerable to local extinction, consideration should include whether:

- the breeding, sheltering and feeding sites within the subject land would be lost or reduced;
- the subject land provides an important linkage; or
- the habitat area would be reduced so that a breeding pair or functioning social group could not survive.

Examples

The following is likely to be at variance with this principle:

- clearing of native vegetation that is habitat for specially protected or threatened fauna; and
- clearing of native vegetation that is habitat for meta-populations of fauna.

Under this principle, a clearing proposal where only widespread fauna species are present, which are supported by the surrounding extensive, intact vegetation would not be at variance with this principle. An example could be common, widespread species of the Pilbara within extensive and intact Pilbara habitat.

Tools

To determine the likelihood of species or populations of **fauna that is otherwise significant**, ecological communities or their habitat within the site or its vicinity, an assessment should include the following considerations.

1. Consult fauna references and/or key agencies (Species and Communities Branch at DEC; WA Museum) to determine whether any specially protected or threatened fauna, **priority fauna** or fauna otherwise of significance occurs within the geographic range of the land. Compile a field list of each of these species, and their habitat requirements.

2. Note the presence or absence of each of the specific habitat elements required by field list species. Identify relevant areas on the application area map.

3. Determine if any of the following habitats are present in the area where populations of fauna that is otherwise significant may exist:
   - foraging areas (food sources) – studies also need to record species that may only be present on a seasonal basis and rely on the vegetation in that season, e.g. nest hollows or an autumn food source;

- trees with hollows;
- abundance of ground cover and/or fallen trees;
- caves, rock outcrops, overhangs or crevices;
- permanent or intermittent waterways or water bodies; and
- other (with a description).

4. Determine whether the habitat is part of either an ecological linkage or forms a large area of intact vegetation that may support meta-populations of fauna.

5. Note any signs of fauna presence, including distinctive scratches, nests, diggings, scats, pellets, calls, burrows, bones, etc. Record any sightings of fauna, including the habitat in which they were seen.

If the results of the assessment show the potential for significant fauna values, a survey of fauna habitats and values may need to be undertaken. The scope of the survey will be determined on a case-by-case basis, but would be consistent with *EPA Guidance Statement No.56*. In marine environments, *EPA Guidance Statement No.29* provides a set of principles to be applied when considering proposals that may result in removal or destruction of, or damage to, marine benthic primary producer communities or the habitats which support them.

Useful information for assessing principle (b)

- Interim Biogeographic Regionalisation for Australia
- Mapped pre-European Vegetation / Mattiske Vegetation / Heddle Vegetation Complexes
- Significant wetlands and watercourses (eg Ramsar sites)
- *EPA Position Statement No.2 Agriculture Region*
- Specially protected, threatened and priority fauna

Principle (c) – Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

Guidelines

Rare flora refers to flora that is declared as rare under section 23F of the *Wildlife Conservation Act* 1950 and gazetted from time to time in the *Wildlife Conservation (Rare Flora) Notice*.

This principle aims to provide for the continuing in situ existence of rare flora and protects habitat necessary for its maintenance. This principle also considers the buffer necessary to protect the rare flora from deleterious impacts by maintaining ecological processes and functions within the habitat of the surrounding vegetation.

Rare flora are protected under the *Wildlife Conservation Act 1950* and may not be taken except with the written consent of the Minister for Environment. The term “to take” includes “to gather, pluck, cut, pull up, destroy, dig up, remove or injure the flora or to cause or permit the same to be done by any means” and includes activities such as burning and grazing.

Areas within the buffer necessary to maintain ecological processes and functions for rare flora should not be cleared under this principle. The value of the subject land for the ongoing maintenance of rare flora should be determined. Buffer areas are measured from location of the flora, or in the case of more than one individual, from the outermost individual(s). The determination of a buffer as an ongoing and viable area to protect the rare flora and ecological processes and functions, should be made on a case by case basis, and is related to the characteristics of the species being protected and the surrounding land uses.

All studies must be undertaken by a suitably qualified person of a timing, duration and extent necessary for the adequate identification of rare flora.

Examples

The following is likely to be at variance with this principle:

- clearing of flora declared as rare or listed as threatened; and/or
- clearing of buffers or other areas necessary to maintain ecological processes and functions for rare flora.

Tools

To determine the likelihood of rare flora or habitat suitable for rare flora within the site or its vicinity, an assessment should be carried out which would ideally use the following approach:

1. Consult flora references and/or key agencies (Species and Communities Branch at DEC; WA Herbarium) for advice on the presence of known populations of rare flora, and site-specific studies for the presence of rare flora. This advice may attract a fee.

2. Refer to DEC FloraBase and any appropriate regional or area-specific studies to determine whether habitats likely to support rare flora are present.

3. Compile a field list of each of the taxa that may occur within the geographic area and its habitat requirements. The appropriate geographic area for this should be determined on a case-by-case basis in consultation with DEC's Species and Communities Branch.

4. Note the presence or absence of each of the specific habitats recorded in the field list. Identify relevant areas on the property map.

Adequate assessment of this principle may not be possible as part of an assessment unless comprehensive and adequate site surveys to identify rare flora have been undertaken unless no habitat likely to be suitable for such species occurs.

The scope of a survey (if required) would be determined on a case-by-case basis, and should be consistent with *EPA Guidance Statement No.51*. Appropriate buffers would also need to be determined as part of this.

Useful information for assessing principle (c)

- Declared rare and priority flora database
- Commonwealth database for threatened flora
- Herbarium Specimen Collection Database (FloraBase)
- Soils, State wide
- Interim Biogeographic Regionalisation of Australia
- Mapped pre-European Vegetation / Mattiske Vegetation / Heddle Vegetation Complexes

Principle (d) – Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.

Guidelines

The aim of this principle is to provide for the continuing *in situ* existence of threatened ecological communities declared under section 51B of the EP Act to be environmentally sensitive areas and those listed under the *Environment Protection and Biodiversity Conservation Act 1999*. This principle also protects habitat necessary for the maintenance of these threatened ecological communities.

Vegetation that has a **bioregional conservation status** of **depleted** or worse (less than 50 per cent representation) is more likely to contain threatened or other significant ecological communities.

The principle also considers the buffer necessary to protect the ecological communities from deleterious impacts by maintaining ecological processes and functions within these habitats. Buffer areas are measured from outermost edge of the ecological community. To ensure an ongoing and viable area remains to protect the ecological communities and their ecological processes and functions, a buffer is recommended This should be determined on a case by case basis and is related to the characteristics of the ecological communities being protected, and the surrounding land uses.

Examples

The following is likely to be at variance with this principle:

- clearing of native vegetation in which threatened ecological communities are present;
- clearing of native vegetation if habitat necessary for the maintenance of threatened ecological communities is present.

Tools

To determine the likelihood of occurrence of threatened ecological communities or their habitat within the site or its vicinity, an assessment should use the following approach:

1. Consult references and/or key agencies (Species and Communities Branch at DEC and Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA) database) for advice regarding known sites of threatened ecological communities declared by the Minister for Environment under section 51B or listed in the *Environment Protection and Biodiversity Conservation Act 1999*. This advice may attract a fee.

2. Refer to any appropriate regional or area-specific studies to determine whether areas are likely to support threatened ecological communities. These can be determined on a case-by-case basis in consultation with DEC's Species and Communities Branch.

3. Based on a site visit, determine whether habitats are present that may contain threatened ecological communities.

Adequate assessment of this principle may not be possible as part of an assessment unless comprehensive and adequate site surveys to identify threatened ecological communities have been undertaken or the habitat is unsuitable for such communities.

The scope of a survey (if required) would be determined on a case-by-case basis, and should be consistent with *EPA Guidance Statement No.51*. Appropriate buffers would also need to be determined as part of this survey.

Useful information for assessing principle (d)

- DEC Threatened ecological communities database
- DEWHA database of threatened ecological communities
- Environmentally sensitive areas declared under section 51B of the EP Act

Principle (e) – Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Guidelines

This principle aims to maintain sufficient native vegetation in the landscape for the maintenance of ecological values. It also recognises the need to protect ecological communities that have been extensively cleared and to retain a representation of each ecological community in local areas throughout its pre-European range. It is in this principle that the cumulative impacts of clearing within a particular area should be considered.

The *National Objectives and Targets for Biodiversity Conservation 2001-2005* (Commonwealth of Australia 2001a) recognise that the retention of 30 per cent or more of the pre-clearing extent of each ecological community is necessary if Australia's biological diversity is to be protected. This is the threshold level, below which species loss appears to accelerate exponentially and loss below this level should not be permitted. This level of recognition is in keeping with the targets recommended in the review of the *National Strategy for the Conservation of Australia's Biological Diversity* (ANZECC 2000) and in *EPA Position Statement No.2* on environmental protection of native vegetation in Western Australia (EPA 2000).

Ecological communities that are naturally rare or restricted may require substantially greater than 30 per cent of their pre-European extent to be retained for effective representation and ecological viability.

The level of 30 per cent representation within a bioregion does not consider the effect of habitat fragmentation and isolation. Studies have shown that larger areas of native vegetation generally support a greater number and diversity of species than smaller areas (e.g. Kitchener et al., 1980a, 1980b, 1982), and that smaller areas are more vulnerable to edge effects and other disturbances. Habitat fragmentation acts to reduce the area of available habitat. Representation levels may need to be increased considerably above 30 per cent in already fragmented landscapes in order to maintain biodiversity.

A typical pattern of vegetation clearing in highly fragmented landscapes (e.g. from analysis of vegetation in the Greater Bunbury Regional Scheme study area) shows that relatively few large remnants remain, and the vast majority of remnant areas are small, mostly less than five hectares. In these fragmented landscapes, larger remnants should be retained as a priority as they provide core habitat areas necessary to support populations of species that are unable to survive in smaller areas of native vegetation. Note that these areas should also be significant when assessed against Principle (a) and Principle (b).

In extensively cleared landscapes the task of mapping and classifying the extent of woody vegetation remaining becomes increasingly more complex as areas of native vegetation become smaller and more fragmented, and the quality of the vegetation more variable. Thus in fragmented landscapes the estimates of remaining native vegetation are less reliable. In these areas mapping is likely to incorporate aggregations of trees and degraded native vegetation with limited understorey component, as well as intact native bushland. There is also likely to have been some further reduction in vegetated areas since the information was captured. Therefore the current area of intact native vegetation is likely to be significantly less than the indicated figure.

To perform some ecosystem services, retention of more than 30 per cent of some ecological communities may be necessary; for example, retention of riverine vegetation is necessary to assist in maintaining healthy river systems or to maintain hydrological balance in areas at risk of salinity.

In some areas there may be less than 30 per cent of pre-European extent of native vegetation in good condition if the systems are degraded for example in the rangelands. These areas may be significant despite an overall level of greater than 30 per cent of pre-European extent remaining. *EPA Position Statement No. 5 Environmental Protection and Ecological Sustainability of the Rangelands in Western Australia* provides some guidance for pastoral areas.

EPA Guidance Statement No.10 includes criteria for the identification of regionally significant natural areas in the System 6 / part System 1 region (outside the Bush Forever study area). The criteria include representation of ecological communities, diversity, rarity, maintaining ecological processes or natural systems, scientific or evolutionary importance and general criteria for protection of wetland, streamline, and estuarine **fringing vegetation** and coastal vegetation. In applying the criteria, individual area attributes are considered including size and shape, vegetation condition and uplands and wetlands.

EPA Guidance Statement No. 33 provides information and advice on a range of environmental issues and their protection and management in the context of planning and development. It is of particular use in relation to **constrained areas.**

Examples

The following is likely to be at variance with this principle:

- clearing in landscapes where the existing vegetation is required to maintain ecosystem services (e.g. hydrological processes), or to compensate for a high degree of fragmentation.

Under this principle, clearing in areas with greater than 30 per cent native vegetation is not likely to be at variance if there is greater than 30 per cent of the total vegetation in the local area and within the bioregion in 'good' condition. A Jarrah-Marri forest that is in an area with significant forests on public land may be an example.

*EPA Position Statement No.*9 identifies **vegetation complexes** with 30 per cent or less or their pre-clearing extent remaining in a bioregion, or 10 per cent or less of their pre-clearing extent remaining in constrained areas on the Swan Coastal Plain, to be **critical assets**. Clearing of critical assets would generally be either at variance or seriously at variance to this principle.

It is important to consider the context and condition of vegetation in assessing this principle.

Tools

Remnant vegetation data exist for the whole State, but reliable statistics may be difficult to obtain. To determine whether there is significant remnant vegetation present, an assessment should be carried out using the following approach.

1. Determine the ecological communities on the subject land.
   The best available knowledge should be used in determining the ecological communities in an area.

   Vegetation complexes, which are mapped for the entire extent of the Swan Coastal Plain in the System 6 and System 1 Region (Heddle *et al.* 1980; Mattiske and Havel 1998) and the area covered by the Regional Forest Agreement, which includes the Jarrah Forest bioregion within System 6 (Mattiske and Havel 1998; Havel 2000), are used as the base mapping of ecological communities. On the Swan Coastal Plain, this should be supplemented by information on floristic community types (Gibson *et al.,*

1994, Department of Environmental Protection, 1996). Outside of these areas, **vegetation types** as defined by Beard (1990) are used as the base mapping of ecological communities.

2. Determine the percentage remaining of these types within the bioregion, subregion and local area. This can be determined using the **vegetation type** / vegetation complex and floristic community type at Interim Biogeographic Regionalisation for Australia (IBRA) region and subregion scale and the local area of that type.

3. Determine if the application area is a constrained area (including urban, urban deferred or industrial) within the constrained area of urban development.

   In recognition of past land use planning decisions, constrained areas have been identified on the Swan Coastal Plain of the Greater Bunbury Region Scheme, Peel Region Scheme and within the Bush Forever Study. Within these constrained areas, retention objectives may be varied to "at least 10%". However, other principles do apply within these constrained areas, subject to exemptions for assessed schemes and deemed works of subdivisions. This includes the need to recognise locally significant bushland.

   Outside of these defined constrained areas of the Perth Metropolitan, Peel and Greater Bunbury Region Schemes, the target (noting that in many regions clearing has proceeded well beyond this point) to achieve at least 30 per cent representation applies.

4. Determine the degree of fragmentation of the local area, and consider that highly fragmented landscapes and naturally rare or restricted ecological species require a high level of representation to maintain a full suite of values for the long term.

Useful information for assessing principle (e)

- Interim Biogeographic Regionalisation of Australia (bioregions)
- Mapped pre-European Vegetation / Mattiske Vegetation / Heddle Vegetation Complexes
- Region Schemes (e.g. Metropolitan Region Scheme, Greater Bunbury Region Scheme, Peel Regional Scheme)
- Bush Forever
- *EPA Position Statement No.2 Agriculture Region*

Principle (f) – Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Guidelines

This principle aims to conserve vegetated watercourses and wetlands and their buffers. In this principle, the word "association" refers to the buffer area. The criteria consider both the area identified as watercourse or wetland and an appropriate buffer required to maintain the hydrological and ecological values of the watercourse or wetland. The watercourse or wetland buffer is the area outside of vegetation dependent on waterlogged soil. Under this principle, vegetation dependent on waterlogged soils would be protected e.g. damplands and floodplains.

Watercourses and wetlands are an integral part of our heritage, have diverse ecological functions and support a wide range of activities including agriculture and tourism. Watercourses provide important linkages between landforms in our predominantly dry landscape. Wetlands are widely recognised as important wildlife habitats and as being among the most biologically productive and diverse habitats on the planet. They directly and indirectly supply food to a broad range of animals and also serve important water purification functions. Both watercourses and wetlands support specialist plant assemblages and restricted

plant species. However, as a result of human land use and inappropriate management, many have been degraded.

Buffers are designed to protect watercourse and wetland vegetation from potentially deleterious impacts caused by surrounding land uses. Buffers aid in safeguarding and maintaining the ecological processes and functions occurring directly within or adjacent to watercourses or wetlands and, wherever possible, promote these processes within the buffer itself. For wetland and watercourse ecosystems, the buffers are measured from the edge of the boundary, which encompasses both waterlogged and inundated areas and the wetland-dependant vegetation, to the outside edge of any proposed development or activity.

For watercourses the process for determining appropriate buffer areas should be based on biological and physical criteria. These criteria are summarised as, but not limited to vegetation, hydrology, soil type, erosion, geology, climate, topography, function/uses, habitat, land use and heritage.

For wetlands the Water and Rivers Commission's *Position Statement: Wetlands (2001)* provides recommended buffer widths for certain land uses. *EPA Position Statement No.4* has as a goal of "no net loss of wetland values and functions" and recognises the need for appropriate buffers to ensure adequate protection of these values.

Biological communities associated with groundwater-dependent ecosystems, such as wetlands, groundwater-dependent terrestrial vegetation, cave streams and springs, have adapted to existing water regimes. Clearing can alter these regimes and cause degradation of existing biological communities. Degradation could result in local extinction of vegetation species, loss of diversity of fauna or loss of habitat diversity.

Where groundwater-dependent ecosystems are likely to be affected by changes in water table caused as a result of clearing, assessment of the ecological water requirements of groundwater-dependent ecosystems (generally by qualified ecologists) may be required. Hydrogeologic modelling can then be employed to ensure that the proposed clearing of native vegetation does not breach the water level criteria.

On the Swan Coastal Plain, groundwater-dependent ecosystems most likely to be affected by a rising water table are those in areas with a depth to groundwater of zero to six metres.

Examples

Under this principle, clearing of native vegetation that is watercourse or wetland dependent is likely to be at variance (e.g. damplands and floodplains).

Tools

To determine whether vegetation is associated with a wetland or watercourse an assessment should be carried out to include the following.

1. Identify watercourses and wetlands including their associated riparian zones, wetland-dependent vegetation and appropriate buffers.

   Determine whether the watercourse or wetland is listed as significant. These include those listed as:
   - Environmental Protection Authority (1992). *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992.* Western Australian Government Gazette, 24 December , 1992, pp 6287-93
   - Environmental Protection Authority (1998). *Environmental Protection (South West Wetlands) Policy 1998*
   - Environmental Protection Authority (1992). *Environmental Protection (Peel Inlet - Harvey Estuary) Policy 1992*
   - Conservation category wetlands in the geomorphic wetland maps held by, and available from, DEC

- Significant wetlands of the South Coast Region
- Wetlands listed under the Ramsar Convention
- Wetlands in the *Directory of Important Wetlands in Australia* available from the Commonwealth Department of the Environment, Water, Heritage and the Arts
- Other wetlands and watercourses declared under section 51B of the EP Act as environmentally sensitive areas
- Wild rivers identified by the Department of Water
- Watercourses and wetlands listed in EPA Systems 1-12

Sources of information that will aid in the identification of significant watercourses and wetlands are listed below. This is not a definitive list of work completed to date. DEC (wetlands) and DoW (watercourses) offices should be contacted to ensure the most up to date information for the area is used. Information is limited for areas outside the southwest of Western Australia.

- Swan Coastal Plain wetland mapping north of Bunbury is available through the Geomorphic Wetlands Database.
- Swan Coastal Plain wetland mapping south of Bunbury is available in Hill *et al.,* (1996) Wetlands of the Swan Coastal Plain Volume 2B: Wetland Mapping, Classification and Evaluation. Wetland Atlas.
- Additional wetland mapping around the state is provided in the following reports.
  - V & C Semeniuk Research Group (2000) *Wetlands of the northwestern Great Sandy Desert in the LaGrange hydrological sub-basin.* Unpublished report for the Water and Rivers Commission.
  - V & C Semeniuk Research Group (2000) *Wetlands of the Pilbara Region: description, consanguineous suites, significance.* Unpublished report for the Water and Rivers Commission.
  - V & C Semeniuk Research Group (1994) *Ecological Assessment and Evaluation of Wetlands in the System 5 Region.* Report to the Australian Heritage Commission.
  - V & C Semeniuk Research Group (1998) *Evaluation of Wetlands on the Southern Swan Coastal Plain.* Unpublished report for the Water and Rivers Commission.
  - Pen, L. (1997) *A Systematic Overview of Environmental Values of the Wetlands, Rivers and Estuaries of the Busselton-Walpole Region.* WRC Report # WRAP 7.
  - V & C Semeniuk Research Group (1997) *Mapping and Classification of Wetlands from Augusta to Walpole in the South West of Western Australia.* WRC Report # WRT12.
  - V & C Semeniuk Research Group (1998) *Preliminary Delineation of Consanguineous Wetland Suites Between Walpole and Fitzgerald Inlet, Southern Western Australia.* Unpublished report for the Water and Rivers Commission.
  - V & C Semeniuk Research Group (1999) *Preliminary Delineation of Consanguineous Wetland Suites in the Pallinup-North Stirling Region, South Western Australia.* Unpublished report for the Water and Rivers Commission.
  - ecologia Environmental Consultants (2000) *A Preliminary Evaluation of Wetlands in the Esperance Water Resource Region.* Unpublished report for the Water and Rivers Commission.

2. Determine appropriate buffers (where necessary) for watercourses and wetlands.
   Additional information that may aid in the application of buffers to watercourses and wetlands:
   - Water and Rivers Commission Restoration Report No.16 *Determining Foreshore Reserves*
   - Water and Rivers Commission Position Statement: *Wetlands, 2001*
   - Guide to Water and Rivers Commission Foreshore Policy 1: *Identifying the Foreshore Area*
   - DEC (2008) Soil and Water Conservation Guideline (DRAFT for public consultation)

Watercourse and wetland buffers

In order to protect a watercourse or wetland and its associated riparian area, the DEC's policy is that a **foreshore area** or buffer is determined based on an assessment of the biological and physical features associated with the watercourse or wetland, and its values and pressures. The features to be used in the assessment are known as 'biophysical criteria'.

These criteria can be summarised as, but are not limited to, the following:

- *Vegetation* – fringing vegetation and native vegetation associated with or influencing the watercourse or wetland, and its condition or value;
- *Hydrology* – processes and changes in water levels and flow regimes; water quality; flood-prone land and areas subject to changes in channel location over time;
- *Soil Type* – soil types that influence the extent of fringing vegetation, active channel processes or wetland processes, and/or the fate of potential contaminants;
- *Erosion* – soil types prone to erosion;
- *Geology* – geological features which influence the watercourse or wetland;
- *Climate* – Climatic variations and resultant changes in flow regimes, vegetation etc
- *Topography* – landscape features including slope, shape, relief and diversity that influence, or are influenced by, the watercourse or wetland;
- *Function/uses* – the function of the watercourse or wetland and foreshore area or buffer area – flood protection, recreation or habitat conservation - and relative values;
- *Habitat* – habitats such as river pools, woody debris, riffles and fringing vegetation and their condition and values;
- *Land Use* – land uses, activities and/or associated contaminants that influence, or are influenced by, the riparian area or fringing vegetation (i.e. how the pressure / contaminant may affect the buffer / watercourse / wetland and how the buffer / watercourse / wetland may affect the pressure / contaminant); management response to contamination; and
- *Heritage* – archaeological and ethnographic sites.

Foreshore Policy 1 does not specify compatible land or water activities for foreshore areas or buffers. However, within a buffer area there is a presumption against supporting any activity likely to degrade its protective function, including activities that are likely to require, cause, or result in the following: clearing, filling, mining, drainage into or out of, effluent discharge into, pollution of, or environmental harm.

Details of how to use biophysical criteria to determine the size or width of a foreshore area or watercourse buffer, including the underlying rationale, can be found in the Water and Rivers Commission Water Note *Determining Foreshore Reserves* (WN23 October 2001).

Wetland buffers are determined using a similar, biophysical assessment process. For a guide to wetland buffer requirements for a range of land uses on the Swan Coastal Plain refer to the table in the Water and Rivers Commission *Position Statement: Wetlands* (06/06/01).

Useful information for assessing principle (f)

- Rivers / lakes / linear hydrography
- Wild Rivers
- Geomorphic Wetlands (Mgt Categories), Swan Coastal Plain
- Ramsar wetlands
- Register of Important Wetland (Commonwealth Department of the Environment, Water, Heritage and the Arts)
- Swan Coastal Plain EPP Lakes
- South West Agricultural Zone Wetlands
- Hydrographic Catchments
- Other wetlands and adjacent areas declared under section 51B of the EP Act as environmentally sensitive areas

Principle (g) – Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Guidelines

This principle aims to maintain sufficient native vegetation in the landscape to prevent land degradation. Native vegetation should not be cleared if it is likely to cause land degradation. This includes soil erosion, salinity, nutrient export, acidification, waterlogging and flooding that affect the present or future use of land.

The assessment of land degradation risk takes into consideration a number of often interacting factors including soil type, landform and slopes, rainfall zone and intended land use.

Land Capability

Generally land of low or very low capability for its intended use should not be cleared. Such land has severe physical limitations not usually overcome by standard development techniques and/or have a high risk of land degradation. For example, the clearing of sand dunes or areas of deep pale sands for crops and pasture production may result in increased ground water recharge, surface water runoff, soil erosion or nutrient export.

Soil Erosion

Soil erosion generally occurs where there is insufficient vegetative cover to protect soils from high intensity winds and rainfall. In the south west land division, the vulnerability of land to water erosion is dependent upon a combination of factors including rainfall intensity, soil properties (soil type, organic matter, structure and permeability) slope length and gradient, land use and soil conservation practices. In general, land with slopes greater than nine per cent should not be cleared.

In the arid tropics, high intensity rainfall is commonly experienced and severe soil erosion can occur on land with as little as one to two per cent slopes if it is cleared and/or cultivated. Land use systems that maintain greater than 2.5 tonnes/ha of standing dry matter are usually required to achieve soil stability on such land.

The rangelands comprise a diverse range of soils and land forms, including some that are particularly prone to wind and water erosion. Many potentially erodible soils are protected by stony mantles. Accelerated erosion usually occurs where the protective vegetation or stony mantles are removed or natural flow regime (often sheet flow) is altered. Once gullies have established, vegetation communities down gradient that are dependent upon receiving sheet flows can be seriously compromised.

Wind erosion risk is determined by a combination of soil strength, structure, particle size and landform. Thus fine loose sands on a dune or exposed flat plain are particularly prone to erode. Similarly fine textured kopi soils in and around salt lake systems are particularly prone to erode if cleared and can be difficult to stabilise and rehabilitate.

In the rangelands, loss of nutrient rich top soil and leaf litter through wind and water erosion greatly reduces productivity and when severe can cause scalding. Scalds tend to become permanent landscape features. Alluvial plains adjacent to rivers are particularly prone to erosion.

Soil Acidity

Soil acidification results in a lack of crop performance and can occur after clearing certain soil types. In the northern and central agricultural regions, yellow sand plain soils supporting wodgil vegetation should be tested for pH and risk of aluminium toxicity. Generally soils that show pH<4.0 in 1:5 0.5M KCl and >20 µM Al are unsuitable for crop and pasture production. Such land is a wind erosion risk as well as increased groundwater recharge causing salinity down gradient.

Localised soil acidity may also occur where pyritic material is exposed to air and rainfall. The resulting acid run off or drainage water will kill most vegetation and may have severe impacts on wetlands systems.

Salinity

Dryland salinity occurs where the hydrological balance has been altered by clearing and the subsequent land use. It is an intractable problem of the medium and low rainfall zones of the wheatbelt on soils developed over crystalline rock. Irrigation salinity is dependent upon soil type, water quality and water management practice.

Risk assessment is site-specific and takes into account average annual rainfall, catchment information such as; soil types, landform, underlying geology and hydrology and the intended use of the land after clearing.

Examples

Under this principle, the following types of clearing are likely to be 'at variance':

- clearing of land that is likely to increase salinity either on-site or off-site;
- clearing of land that is likely to increase waterlogging either on-site or off-site;
- clearing of land that is likely to result in nutrient export;
- clearing of land that is likely to increase water and wind erosion on-site or off-site; and
- clearing of land that is likely to increase in soil acidity.

Tools

Advice on land degradation is available from the Commissioner of Soil and Land Conservation (at DAFWA).

DAFWA Ag Map CD-ROMs can provide an indication of land use capability for the Swan Coastal Plain, Mortlock Catchment, and areas in the South West and Great Southern. The DAFWA *Technical Report 298: Land evaluation standards for land resource mapping: assessing land qualities and determining land capability in South-Western Australia* provides further detail on land use capability assessment.

GIS databases can highlight potential dry land salinity, groundwater salinity, and erosion risk using topographic contours to determine slope gradient.

Useful information for assessing principle (g)

- Salinity risk / mapping / monitoring
- Groundwater salinity, confined / superficial aquifers
- Soils, statewide
- Land System Mapping (Kimberley / Rangelands)
- *Country Area Water Supply Act 1947* Clearing Control Catchments
- Topographic contours
- Rainfall, Mean Annual
- Hydrology / hydrogeology
- Ag Maps Horticulture Land Capability Swan Coastal Plain Lancelin to Augusta CD-ROM (DAFWA)
- Ag Maps Land Profiler Capel, Busselton and Augusta-Margaret River CD-ROM (DAFWA)
- Ag Maps Land Manager Serpentine-Jarrahdale, Kwinana, Rockingham, Mandurah, Murray, Boddington, Waroona and Harvey CD-ROM (DAFWA)
- Ag Maps Land Manager Albany Eastern Hinterland CD-ROM (DAFWA)
- Ag Maps Land Manager Mortlock Catchment, encompassing parts of the shires of Dalwallinu, Wongan-Ballidu, Moora, Victoria Plains, Toodyay, Northam, Goomalling, Cunderdin, Dowerin, Koorda, Wyalkatchem, Tammin, Kellerberrin, Trayning & Mount Marshall CD-ROM (DAFWA)

Principle (h) – Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

Guidelines

This principle aims to ensure that the conservation values of **conservation areas** are not reduced as a result of native vegetation clearing.

Habitat fragmentation poses one of the greatest threats to biodiversity. When core habitat reserves are isolated from one another by human land uses, the diversity of native species generally declines and the probability of species extinction increases. This process of ecosystem decay has been well-documented in fragmented landscapes throughout the world.

Ecological linkages and buffers in the context of this principle contribute to the functioning and viability of existing conservation estate by:

- establishing connectivity between conservation areas and other areas of native vegetation;
- contributing to the maintenance or restorability of one or more key ecological processes required to sustain the conservation areas; and
- expanding the functional size of an existing conservation area or partially compensating for less than ideal shape.

The basic ecological functions of smaller, remnant natural areas can only be maintained through connectivity with the broader natural landscape.

Native vegetation adjacent to or near conservation reserves improves the viability and conservation values of the reserve by providing larger core areas, buffering the reserve from edge effects, consolidating boundaries or adding plant communities and habitats not represented or under-represented in the reserve. The size of a buffer to be effective will depend on the vegetation types present and their resilience.

Ecological linkages of vegetation between larger areas of conservation value are important for enabling fauna to continue to move through the landscape and between reserves. This is vital both for species that are nomadic and for maintaining populations of less mobile species that may otherwise become locally extinct in individual reserves.

Remnant patches within the vicinity of large contiguous areas of native vegetation (outliers) are more likely to support wildlife than more isolated patches – with greater the separation distances fewer species will have the mobility necessary to maintain access.

Tools

To determine whether native vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area an assessment should be carried out to include the following:

1. Determine if land held or managed for conservation is present. Assessors will need to:
    - refer to land status maps for existing reserves and CALM/DEC region plans / EPA System 1-12 reports and Bush Forever for proposed reserves and **protected areas**;
    - refer to DLI data for reserves that have a dual purpose (e.g. recreation and conservation) and are not vested with the Conservation Commission (managed by DEC);
    - check with LGA for Shire reserves that may have a dual purpose;
    - check with DEC for CALM/DEC covenants, Land for Wildlife sites, World Heritage areas, biosphere reserves;

- check with National Trust of Australia (WA) (NTWA) for covenants and Bush Bank sites;
- check with Worldwide Fund for Nature (WWF) for Woodland Watch sites;
- consider areas on the Register of the National Estate for natural values;
- consider significant wetlands identified under principle (f)
- Perth Biodiversity Project Local Biodiversity Guidelines and subsequent Local Biodiversity Plans for regional and local ecological linkages and Local Biodiversity Areas with high priority for retention and protection (i.e. Local Conservation Areas).

2. Determine whether the land provides a buffer, ecological linkage or outlier to a conservation area. These may include areas that provide large, regional connections to conservation areas and buffer the conservation area from adverse impacts. Alternatively, a narrow, disjunct, impacted, or otherwise tenuous habitat linkage connecting to conservation areas may exist. These are essential to maintain landscape-level connectivity, but are particularly in danger of losing connectivity function. An example is a narrow peninsula of habitat, surrounded by a human-dominated land uses, that connects larger habitat blocks, such as the South Coast Region Macro-corridor project.

3. Factors to consider in determining whether an area has a function as an ecological linkage or buffer, or contributes significantly to the environmental values of a conservation area include:
   - distance to the conservation area and between other possible ecological linkages;
   - size and shape of the ecological linkage or buffer;
   - types of habitats (riparian, coastal, woodland, etc.) present within the linkage or buffer and key focal species and ecological processes that may be present that would indicate connectivity;
   - types of land cover (eg. natural vegetation, pastoral/grazing, cropland/irrigated agricultural, low density residential, etc.) within and immediately adjacent to the linkage;
   - primary barriers that are impediments to faunal movement, gene flow and ecological processes (dirt road, agriculture, urban areas); and features that facilitate these within a linkage (watercourses, riparian habitat, continual habitat coverage, underpasses,); and
   - any studies that exist to demonstrate the use and functions of the linkage or buffer, including any anecdotal evidence or field studies conducted on this particular linkage or buffer.

4. Determine if the land provides habitats not well represented on the conservation land. Less than 15 per cent representation in conservation reserves is a benchmark.

Useful information for assessing principle (h)

- DEC-managed Lands and Waters
- DOW-managed Estate
- System 1-12 boundaries
- Bush Forever
- Local government areas of biodiversity significance
- Register of National Estate
- Conservation covenants and agreements to reserve under the *Soil and Land Conservation Act 1945* (registered as a memorial on the Certificate of Title)
- CALM / DEC nature conservation covenants
- National Trust of Australia (WA) nature conservation covenants
- Cadastre

Principle (i) – Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

Guidelines

This principle considers biological, chemical and physical parameters, and water quantity as far as these affect overall environmental quality. This principle aims to ensure that the quality of water supplies are not reduced, that salinity, pH or levels of nutrients in water bodies and discharge water, are not significantly altered by clearing, and that water regimes and environmental water provisions are not adversely affected.

The assessment should consider both on-site and off-site impacts, so that problems are not transferred from the cleared site to another part of the catchment or aquifer.

Within Public Drinking Water Supply Catchments, the impacts of clearing must be compatible with the Public Drinking Water Supply Catchments guidelines and Water Source Protection Plans.

In certain controlled catchments reserves under the *Country Areas Water Supply Act 1947* (CAWS), clearing controls are in place to prevent salinity. In these areas, the CAWS Clearing Guidelines should be consulted to identify additional water quality considerations. Clearing may be restricted through compensation payments or due to location in the catchment and salinity risk.

Consideration should be given to clearing that may be likely to significantly alter the salinity or pH of water tables. Consideration should also be given to the possibility that sedimentation, erosion, turbidity or **eutrophication** of water bodies on or off site is likely to be caused or increased.

It need to be noted that clearing of relatively substantial areas of vegetation can alter existing water regimes and cause degradation of groundwater-dependent ecosystems (discussed under Principle (f)). Degradation could result in local extinction of vegetation species, loss of diversity of fauna or loss of habitat diversity.

Examples

Under this principle, the following types of clearing are likely to be at variance:

- clearing of native vegetation where the clearing is likely to lead to adverse environmental impacts through sedimentation entering water bodies;
- clearing of native vegetation where the impacts of the clearing are likely to contribute to increased nutrient levels in the catchment;
- clearing of native vegetation where there is potential for low pH waters and/or acid sulphate soils to form as a result of clearing;
- clearing of native vegetation where the impacts of the clearing are likely to contribute to increased salinity in catchments already affected by or likely to be affected by salinity; and
- clearing of native vegetation where the clearing is likely to lead to changes in water regimes of, or result in breaches of environmental water provisions for, Groundwater Dependent Ecosystems (GDEs) on or off site and subsequent degradation of the biological communities associated with these systems.

Tools

An assessment should include consideration of the following factors.

General

- Geological Series Maps (Department of Mines and Petroleum) - identifies soil types and geomorphology.

Groundwater

1. Estimate depth to water table and identify existing water quality readings from Water Information Network (WIN) sites and drilling project reports, obtained from DoW.

2. Consult salinity risk mapping series to identify if salinity (electrical conductivity) is rising in the area (south west only). If it is, then obtain all water quality monitoring parameters from WIN and look at the long-term trend, focusing on pH and electrical conductivity.

3. Where clearing is likely to have a high impact on ground water advice should be sought from DoW. Hydrogeological modelling may be necessary to determine the likely spatial and temporal extent and magnitude of impact on the water table of clearing, particularly where large areas of vegetation are proposed to be cleared.

   Where GDEs are likely to be affected by water table rises, assessment of the Ecological Water Requirements of groundwater-dependent ecosystems (generally by qualified ecologists) may be required. Hydrogeologic modelling can then be employed to ensure that the proposed clearing of native vegetation does not breach the water level criteria.

Surface water

1. Identify the nearest Water Information Network (WIN) DoW database surface water site and view historical pH, electrical conductivity and nitrogen and phosphorus readings. The Phosphorus Retention Index (PRI) may be useful to determine the nutrient capacity of the soils (DAFWA, Land Resources Series No. 1). If there is a trend, then obtain all WIN readings for the area and consider long term trends.

2. Determine nutrient trends for wetlands in the catchment where data exist. Determine soils in the catchment and their risk of erosion and nutrient holding capacity.

3. Determine soil types in the catchment and the risk of erosion of nutrient-rich soil particles and/or leaching. No increase in nutrient levels is acceptable in systems with a trend towards elevated nutrient levels.

4. In other areas, determine whether soil types have the potential to generate acid sulfate soils. Consult the Acid Sulfate Soils Guideline Series for information on this. Consider any previous studies carried out in the area.

   Within the north-west of the State, mangrove areas and tidal flats provide the main indicator of conditions that may potentially result in acid sulfate soils and low pH waters.

   In the southwest, the situation is more complex. The following geomorphic or site description criteria should be used to determine if acid sulfate soils are likely to be present within the south west:

   - land with elevation less than five metres AHD;
   - soil and sediment of recent geological age (Holocene);
   - marine or estuarine sediments and tidal lakes;
   - low-lying coastal wetlands or back swamp areas, waterlogged or scalded areas, stranded beach ridges and adjacent swales, interdune swales or coastal sand dunes;
   - coastal alluvial valleys;
   - areas where the dominant vegetation is tolerant of salt, acid and/or waterlogging conditions e.g. mangroves, saltcouch, swamp-tolerant reeds, rushes, paperbarks (*Melaleuca* sp.) and swamp oak (*Casuarina* sp.); and
   - areas identified in geological descriptions or in maps as:
     - bearing sulfide minerals;
     - coal deposits or marine shales/sediments (geological maps and accompanying descriptions may need to be checked); and

- deep older estuarine sediments below ground surface of either Holocene or pre-Holocene age.

The Acid Sulfate Soils Guideline Series available from DEC provides further information on this issue.

Useful information for assessing principle (i)

- Salinity risk / mapping / monitoring
- Public Drinking Water Source Areas (PDWSA)
- Acid sulfate soil risk mapping
- Soils, statewide
- WIN groundwater sites (monitoring / Water Corporation / other)
- WIN surface water sites (stream gauging, other)
- WIN telemetry sites and uncatalogued sites
- Evaporation isopleths
- Isohyets
- Topographic contours
- Groundwater salinity, confined / superficial aquifers
- Hydrography, linear, catchments, sub-catchments
- Rainfall, Mean Annual
- Potential Groundwater Dependent Ecosystem Areas
- Environmental Protection Policy areas, lakes
- Geodata, Lakes
- Surface water / groundwater areas, irrigation districts, rivers under the *Rights in Water and Irrigation Act 1914*

Principle (j) – Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding.

Guidelines

This principle aims to ensure that there is no increase in the frequency or intensity flooding resulting from native vegetation clearing.

Consideration of this principle may require extensive modelling of the whole catchment and should only be considered for large clearing proposals.

For smaller proposals, clearing should not cause water logging (localised flooding). This is already considered under principle (g) (land degradation). Flooding and/or water logging may also exacerbate criteria under principle (i) such as salinity, sedimentation, low pH waters or **eutrophication** or result in unacceptable changes in water regimes or environmental water provisions, both on and offsite.

Tools

To determine if clearing the vegetation is likely to cause, or exacerbate the incidence of flooding an assessment should consider the following factors:

1. Determine possible water logging problems using the following indicators:
   - soil compaction and infiltration
   - soil profile depth
   - soil drainage/recharge rates
   - perched water tables – groundwater contours and monitoring well water levels could be considered
   - water logging observed on adjacent properties

2. Floodplain mapping for major towns (1 in 100 year flood levels).

To further determine the risk of flooding, hydrological modelling or hydrological advice maybe required as part of a secondary assessment.

Useful information for assessing principle (j)

- Perth Basin Hydrogeology,
- DWAID (Divertible Water Allocation Inventory Database) Aquifers
- Evaporation Isopleths
- Isohyets
- Hydrography
- Topographic Contours, Statewide
- Rainfall, Mean Annual

3. Determine possible water logging problems using the following indicators:
   - soil compaction and infiltration
   - soil profile depth
   - soil drainage/recharge rates
   - perched water tables – groundwater contours and monitoring well water levels could be considered
   - water logging observed on adjacent properties

4. Floodplain mapping for major towns (1 in 100 year flood levels).

To further determine the risk of flooding, hydrological modelling or hydrological advice maybe required.

Planning instruments and other relevant matters

Planning instruments

In considering a clearing matter, the CEO shall have regard to any planning instrument and other relevant matters when making decisions as to clearing permits.

Local and regional level planning strategies, by-laws and policies should be considered as part of the recommendations to the CEO and decision-making. Examples of these include Local Biodiversity Guidelines and related Local Biodiversity Plans prepared by Local Government, or regional planning strategies related dealing with public infrastructure.

EPA's Guidance Statement No. 33 *Environmental Guidance for Planning and Development* is a useful resource in considering planning and development issues in the context of environmental impact.

Other relevant matters

In considering a permit application the CEO shall also have regard for any other relevant matter. 'Other matters' are not defined in the EP Act, and consequently are any matters the CEO considers relevant. Other matters are generally environmental issues not directly within the scope of the clearing principles, but within the object and principles of the Act.

Other matters typically include consideration of land use impacts, previous decisions related to the area, other legislative requirements related to the proposal and the necessity of the clearing.

Land use impacts

Environmental, economic and social impacts arising from land use is an 'other matter' the CEO would consider when making a decision regarding the clearing application.

Previous decisions

Any previous decisions related to the area should be considered in undertaking an assessment. These decisions could include whether the EPA has formally assessed the proposal and any advice given. It could also include any decisions under the previous Notice of Intent to Clear system under the *Soil and Land Conservation Act 1945*.

Legislative requirements

Legislative requirements under other written laws may be a consideration in assessing the clearing of native vegetation. These include whether the proposal requires a prescribed premise works approval or licence under the EP Act, a groundwater or surface water licence under the *Rights in Water and Irrigation Act 1914* and Native Title requirements under *Native Title Act 1993*, Aboriginal Sites of Significance under the *Aboriginal Heritage Act 1972* and local government requirements such as extractive industry licences.

Necessity

Native vegetation clearing should only be considered after all other reasonable attempts to mitigate adverse impacts have been exhausted. Potential environmental impacts should be addressed using the impact mitigation sequence:

- avoid – avoid impact altogether;
- minimise – limit the severity of the impact;
- rectify – restore the impacted site as soon as possible;
- reduce – eliminate the impact over time; and
- offset – offset significant residual impacts.

In determining the necessity of the clearing higher priority will be given to clearing for public use than private benefit or commercial gain.

Environmental protection policies (EPPs)

The CEO shall refuse to grant a clearing permit if the CEO considers that the associated effect on the environment would be inconsistent with any approved policy. An approved policy is an environmental protection policy approved by the Minister for Environment under section 31(d) of the EP Act. Further information on these is available by contacting the Native Vegetation Conservation Branch.

Approved policies for which clearing may be inconsistent include:

- *Environmental Protection (Gnangara Mound Crown Land) Policy 1992*;
- *Environmental Protection (Peel Inlet - Harvey Estuary) Policy 1992*;
- *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992*;
- *Environmental Protection (South West Agriculture Zone Wetlands) Policy 1998*;
- *Environmental Protection (Western Swamp Tortoise Habitat) Policy Approval Order 2002*.

Agreements to reserve, conservation covenants and soil conservation notices under the Soil and Land Conservation Act 1945

The CEO is prevented from making a decision to grant a clearing permit on land which is subject to an agreement to reserve under the *Soil and Land Conservation Act 1945* without the written approval of the Commissioner of Soil and Land Conservation. DEC will contact the Commissioner to seek his written advice if the land under application is subject to an agreement to reserve.

The CEO is also prevented from making a decision to grant a clearing permit:

- on land which is the subject of a conservation covenant under section 30B(2) of the *Soil and Land Conservation Act 1945*; or
- in contravention of a soil conservation notice imposed under Part V of the *Soil and Land Conservation Act 1945*.

DEC will advise any applicant affected by these instruments or requirements in writing.

Tools

Consideration of planning instruments and other relevant matters typically includes the following.

1. Determine whether the clearing is consistent with a region or local planning scheme, any relevant planning approvals, approved policy or local planning strategy.

2. Consider whether any previous decisions have been made related to the proposal or other legislative requirements need to be fulfilled for the proposal to proceed. These could include:
   - Prescribed premise works approval or licence;
   - Groundwater or surface water licence;
   - Extractive industry licences;
   - Native Title requirements;
   - Aboriginal Sites of Significance; or
   - local government requirements.

Useful information for assessment

- Region Schemes
- Town Planning Schemes
- Environmental impact Assessments decisions
- Environmental Protection Policies
- Native Title Claims
- Aboriginal Sites of Significance
- Acid Sulfate Soil risk map
- Ag Maps Horticulture Land Capability Swan Coastal Plain Lancelin to Augusta

Glossary

Biodiversity describes the variety of life forms: the different plants, animals and microorganisms, the genes they contain, and the ecosystems they form. It is usually considered at three levels: **genetic diversity**, **species diversity** and **ecosystem diversity** (NSCABD 1996). Also referred to as **biological diversity**.

Bioregion means a bioregion of Western Australia as defined in *Revision of the Interim Biogeographic Regionalisation of Australia (IBRA) and the Development of Version 5.1 – Summary Report* (2000) published by the Commonwealth Department of the Environment and Heritage, Canberra. A bioregion represents an area with common ecological characteristics, including climate, geomorphology, landforms, lithology and characteristic flora and fauna. The IBRA regions represent a **landscape**-based approach to classifying the land surface. Specialist ecological knowledge combined with regional and continental scale data on ecological characteristics were interpreted to describe these patterns. The resulting integrated regions were ascribed the term biogeographic regions. The IBRA was developed in 1993-94 under the coordination of Environment Australia by the States and Territories as a basis for developing priorities for the Commonwealth in funding additions to the reserve system under the National Reserve System Cooperative Program. It has been subsequently revised in the light of new knowledge.

Bioregional conservation status of ecological vegetation classes

Presumed extinct:	probably no longer present in the **bioregion**
Endangered*:	Less than 10 per centof pre-European extent remains
Vulnerable*:	10-30 per cent of pre-European extent exists
Depleted*:	More than 30 per cent and up to 50 per cent of pre-European extent exists
Least concern:	More than 50 per cent pre-European extent exists and subject to little or no degradation over a majority of this area

*or a combination of depletion, loss of quality, current threats and rarity gives a comparable status (Department of Natural Resources and Environment 2002).

Buffer means an area designed to protect significant **environmental values**, including **significant flora**, significant **ecological communities**, and wetlands and watercourses, from deleterious impacts by maintaining ecological processes and functions in the habitat. Refer also **watercourse or wetland buffer**.

Clearing means (a) the killing or destruction of; (b) the removal of; (c) the severing or ringbarking of trunks or stems of; or (d) the doing of any other substantial damage to, some or all of the native vegetation in an area, and includes the draining or flooding of land, the burning of vegetation, the grazing of stock, or any other act or activity that causes (e) the killing or destruction of; (f) the severing of trunks or stems of; or (g) any other substantial damage to, some or all of the native vegetation in the area.

Condition, in an environmental context, is a rating given to vegetation to categorise disturbance related to human activities. This rating refers to the degree of change in the structure, density and species present in vegetation in relation to undisturbed vegetation of the same type. The most widely used condition system is that defined by Keighery (1994):

1. Pristine: no obvious signs of disturbance.
2. Excellent: vegetation structure intact; disturbance affecting individual species and weeds are non-aggressive.
3. Very Good: vegetation structure altered; obvious signs of disturbance.
4. Good: Vegetation structure significantly altered by obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it.
5. Degraded: Basic vegetation structure severely impacted by disturbance. Scope for regeneration of vegetation structure, but not to a state approaching 'good' **condition** without intensive management.
6. Completely Degraded: The structure of the vegetation is no longer intact and the area is completely or almost completely without native species.

Other condition ratings commonly used are described in Bush Forever (Government of WA 2000).

Conservation area is a term used in the *Environmental Protection Act 1986* to describe a conservation park, national park, nature reserve, marine nature reserve, marine park or marine management area within the meaning of the *Conservation and Land Management Act 1984* or any other land or waters reserved or managed for the purpose of, or purposes including, nature conservation.

Constrained areas, for the purpose of this document, are those defined within the:

- Perth Metropolitan Regional Scheme (and Bush Forever Study Area);
- Greater Bunbury Regional Scheme; and
- Peel Regional Scheme,

where there is a reasonable expectation that development will be able to proceed. This may include areas zoned urban, urban deferred or industrial zoned land. Regional schemes, town planning schemes and local planning strategies can be viewed on the Western Australian Planning Commission's website at http://www.wapc.wa.gov.au/Region+schemes.

Critical assets represent the most important environmental assets in the State that must be fully protected and conserved for the State to meet its statutory requirements and to remain sustainable in the longer term.

Declared rare flora refer to **rare flora**.

Depleted refer to **bioregional conservation status**.

Ecological community describes a naturally occurring biological assemblage that occurs in a particular type of habitat. Note: the scale at which ecological communities are defined will often depend on the level of detail in the information source, therefore no particular scale is specified (English and Blyth 1999).

Ecological linkage describes a network of native vegetation that maintain some ecological functions of natural areas and counter the effects of habitat fragmentation.

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 describes a dynamic complex of plant, animal, fungal, and microorganism communities and the associated non-living environment interacting as an ecological unit (NSCABD 1996), including abiotic components, being partly determined by soil, parent material and climate.

Ecosystem diversity is the diversity of all living organisms and non-living components within a given area and their relationships.

Ecosystem services describes the processes by which the environment produces resources that provide benefits to humans e.g. flood and disease control, clean air.

Eutrophication is a natural process of accumulation of nutrients leading to increased or abnormal aquatic plant growth in lentic wetlands, rivers, harbours and estuaries. Human activities contributing fertilisers and other high nutrient wastes can speed up the process, leading to algal blooms and deterioration in water quality.

Environmental values are the particular values or uses of the environment that are important for a healthy ecosystem or for public benefit, welfare, safety or health and which requires protection from the effects of pollution and harm (ANZECC and ARMCANZ, 2000; see *Environmental Protection Act 1986*).
A **beneficial use**, in an environmental context, means the use of the environment which is:
(a) conducive to public health or aesthetic enjoyment and which requires the protection from the effects of emissions or environmental harm; or
(b) identified and declared within the *Environmental Protection Act 1986* to be a beneficial use to be protected under an approved policy.
An **ecosystem health condition** means a condition of the ecosystem that is:
(a) relevant to the maintenance of ecological structure, ecological function or ecological process and which requires the protection from the effects of emissions or of environmental harm; or
(b) identified and declared to be a beneficial use to be protected under an approved policy.

Fauna that is otherwise significant are defined as:
- Threatened / **specially protected fauna** as endorsed by the Minister;
- fauna species that are habitat specialists;
- wide-ranging fauna species with reduced populations in the **bioregion**;
- short-range endemic species;
- fauna species that have few populations in the **bioregion**;
- fauna species which have reduced ranges or few recent records in the **bioregion**; and/or
- internationally-listed migratory species.

Foreshore reserve means the foreshore area or watercourse **buffer** set aside as a reserve under planning legislation.

Fringing vegetation refers to the **riparian vegetation** adjacent to a water body and directly dependent on the proximity of a watercourse or wetland. **Riparian vegetation** may include both wetland and dryland vegetation. Wetland vegetation can tolerate some period of inundation and is typically found below the high water mark or within the floodway, for example flooded gums and paperbarks, and submerged and emergent species like rushes. Dryland vegetation is not tolerant of permanently or seasonally waterlogged conditions. **Riparian vegetation** provides many important functions including habitat for many aquatic and terrestrial species, stabilisation of the banks, energy dissipation, **ecological linkages**, and sediment and nutrient retention; it assists in maintaining the integrity of the watercourse or wetland in a number of ways.

Genetic diversity represents the heritable variation within and between populations of organisms. 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. There are so many genes and different possible combinations of genes that for most types of organism every individual, population and species is genetically distinct.

High value asset/s represents those environmental assets that are in 'good' or better condition (refer to Appendix 1 for condition rating), are considered valuable by the community and/or government, but are not identified as 'critical'.

Landscape describes the physical environment made up of basic elements – climate, geology, topography, vegetation, fauna and humans – biophysical characteristics that can be used to identify differences between different **landscapes.**

Local area summarises the surrounding environment within a radius that varies with region and indicates the distance across which there is little change in a vegetation community. For example, in the mallee region of the south-west, a local area is typically a radius of 15 kilometres from the subject land. For **ecological communities** where there is rapid change over distance, such as the Lesueur and Fitzgerald River areas, a distance of five kilometres is more appropriate. In the Eremaean Province, a distance of 50 kilometres is recommended. This will need to be determined on a region and vegetation specific basis.

Meta-population describes a population of populations. A defined set of geographically separate populations with at least some exchange of individuals between the separate populations – in other words, systems of local populations connected by dispersing individuals.

Native vegetation means indigenous aquatic or terrestrial vegetation but does not include vegetation that was intentionally sown, planted or propagated unless (a) that vegetation was sown, planted or propagated as required under this Act or another written law; or (b) that vegetation is of a class declared by regulation to be included in this definition, and includes dead vegetation unless that dead vegetation is of a class declared by regulation to be excluded. Note that this definition includes non-vascular plants (e.g. mosses, fungi, algae) and marine plants (seagrass, macroalgae / seaweed).

Planning instrument means:

(a) a scheme or a strategy, policy or plan made or adopted under a scheme;
(b) a State planning policy approved under section 29 of the *Planning and Development Act 2005* and published in the *Gazette;*, or
(c) a local planning strategy made under the *Planning and Development Act 2005*.

Plant association is a vegetation unit that considers plant associations that have a similar physiognomy (a combination of vegetation structure and growth-form) independent of specific floristic composition, and is the component species with particular dominants of a given area. If the vegetation of another area has the same dominants it is in the same association.

Plant formation is the basic unit of vegetation as determined by the component species with particular dominants of a given area to define the **vegetation association** that considers plant associations that have a similar physiognomy (a combination of vegetation structure and growth-form), independent of specific floristic composition.

Priority ecological community means an ecological community that does not meet survey criteria for 'threatened' status or that are not adequately defined. They are listed by DEC under one of five categories ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as threatened ecological communities.

Priority fauna refers to conservation significant animal species listed by DEC'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**.

Priority flora refers to plant taxa that are either under consideration by DEC as **rare flora** but are in need of further survey to adequately determine their status, are adequately known but require ongoing monitoring to ensure their security does not decline, or are conservation dependent and require active management to maintain their status.

Protected area/s describes an area of land especially dedicated to the protection and maintenance of biological diversity and managed through legal and other effective means. (ICUN 1994).

Rare flora refers to flora that is declared rare in the current *Wildlife Conservation (Rare Flora) Notice* under section 23F of the *Wildlife Conservation Act 1950*.

Representativeness describes the extent to which areas selected for inclusion in the national reserves system are capable of reflecting the known biological diversity and ecological patterns and processes of the **ecological community** or ecosystem concerned (Commonwealth of Australia 1996).

Riparian vegetation means the distinctive vegetation associated with a wetland or watercourse. This vegetation is influenced by the passage and storage of water.

Significant flora are defined as:

- species that are confined to a specific area (ie endemic to the **bioregion**) or otherwise geographically restricted;
- distinctive local forms that have not been recognised taxonomically (not a species, subspecies or variety);
- populations that are outside the main geographic range (ie disjunct populations);
- populations at the end of the plant's geographic range;
- populations that represent a significant number of the known individuals of the taxon in the **bioregion**; or
- **priority flora** of priority 1 to 4 as listed by DEC – taxa that are under consideration as **rare flora** but are in need of further survey or continued monitoring.

Significant habitat/s refers to habitat that provides resources (breeding, resting and feeding), connectivity or habitat area for a species or community that is critical for its survival.

Specially protected fauna refers to fauna that is declared in the current gazetted *Wildlife Conservation (Specially Protected Fauna) Notice* under the *Wildlife Conservation Act 1950*.

Species diversity 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. A more precise measurement of taxonomic diversity also considers the relationship of species to each other. The greater the difference between one species and another 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.

Suitably qualified person means a person with specific training and/or experience in a field of interest relating to Western Australian ecosystems and/or landscapes, e.g. flora and/or fauna identification, ecology, threatening processes, hydrology and land degradation.

Threatened ecological community means an ecological community listed, designated or declared under a written law or a law of the Commonwealth as threatened, endangered or vulnerable. In practice, these are those declared under section 51B of the EP Act as an environmentally sensitive area, and those under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. Categories relating to the status of the threat to a particular community are determined following assessment, and are 'presumed totally destroyed', 'critically endangered', 'endangered' or 'vulnerable'.

Vegetation association / complex / type

Associations as defined by Beard (1980) are based on three principal characteristics of vegetation:

1. Floristic Composition: the species of plants, which comprise vegetation.
2. Vegetation Structure: the height of plants in layers, their shape and their spacing
3. Growth Form: the morphological characteristics of the component plants, such as woody or herbaceous, annual or perennial, thorny or succulent, evergreen or deciduous, and leaves of a certain texture, size and shape.

Complexes as defined by Heddle *et al* (1980) and Mattiske and Havel (1998) are based on the pattern of vegetation at a regional scale as it reflects the underlying key determining factors of landforms, soils and climate.

Types as defined by Beard (1980) are mapped principally at the level of **plant formation** and most often at the 1:250,000 scale with minor attention to **plant associations** where they could be readily distinguished.

Watercourse means:
(a) any river, creek, stream or brook in which water flows;
(b) any collection of water (including a reservoir) into, through or out of which any thing coming within paragraph (a) flows;
(c) any place where water flows that is prescribed by local by-laws to be a watercourse;
and includes the bed and banks of any thing referred to in paragraph (a), (b) or (c).
For the purposes of this definition:
(a) a 'flow' or 'collection' of water includes those that are intermittent or occasional;
(b) a river, creek, stream or brook includes a conduit that wholly or partially diverts it from its natural course and forms part of the river, creek, stream or brook; and
(c) it is immaterial that a river, creek, stream or brook or a natural collection of water may have been artificially improved or altered.

Watercourse or wetland buffer means land adjoining, or directly influencing a watercourse or wetland that is managed to protect watercourse and wetland values, including any riparian areas. It is basically an area outside a watercourse or wetland where clearing and certain activities are inappropriate. The size of the buffer area should take into account watercourse or wetland values, condition, pressures and responses to pressures.

Wetland means an area of seasonally, intermittently or permanently waterlogged or inundated land, whether natural or otherwise, and includes a lake, swamp, marsh, spring, dampland, tidal flat or estuary.

Bibliography

Department of Environment and Conservation, *Declared Rare and Priority Flora List for Western Australia*. Kensington, WA (updated periodically).

Australian New Zealand Environment and Conservation Council (ANZECC) 2000. *Core Environmental Indicators for Reporting on the State of the Environment.* ANZECC State of the Environment Reporting Task Force. March 2000.

Beard, J.S. 1990 *Plant Life of Western Australia*. Kangaroo Press.

Commonwealth of Australia 2001. *National Targets and Objectives for Biodiversity Conservation 2001-2005*, AGPS, Canberra.

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Department of Environment and Conservation (2008) *Soil and Water Conservation Guideline* (DRAFT for public consultation)

Department of the Environment and Heritage (2000). *Revision of the Interim Biogeographic Regionalisation of Australia (IBRA) and the Development of Version 5.1 – Summary Report*. Department of the Environment and Heritage, Canberra.

Department of Environmental Protection 1996. *System 6 and Part System 1 Update Programme*. Unpublished bushland plot and area records and analysis. Department of Environmental Protection, Perth, Western Australia.

Department of Natural Resources and Environment 2002. *Biodiversity Action Planning. Action planning for native biodiversity at multiple scales – catchment Bioregional, landscape, local.* Department of Natural Resources and Environment, Victoria.

Environment Australia 2001. *National objectives and targets for biodiversity conservation 2001-2005*.

Environmental Protection Authority 1992. *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992.*

Environmental Protection Authority 1998. *Environmental Protection (South West Wetlands) Policy 1998.*

Environmental Protection Authority 2000. *Environmental Protection of Native Vegetation in Western Australia. Clearing of Native Vegetation, with particular reference to the agriculture area.* **Position Statement No.2**. Perth, Western Australia.

Environmental Protection Authority 2002. *Terrestrial Biological Surveys as an Element of Biodiversity Protection.* **Position Statement No.3**. Perth, Western Australia.

Environmental Protection Authority 2004. *Benthic Primary Producer Habitat Protection for Western Australia's Marine Environments*. Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986). **Guidance Statement No.29**. Perth, Western Australia.

Environmental Protection Authority 2004. *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia.* Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986). **Guidance Statement No.51**. Perth, Western Australia.

Environmental Protection Authority 2004. *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia.* Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986). **Guidance Statement No.56**. Perth, Western Australia.

Environmental Protection Authority 2004. *Environmental Protection of Wetlands.* **Position Statement No.4**. Perth, Western Australia.

Environmental Protection Authority 2004. *Environmental Protection and Ecological Sustainability of the Rangelands in Western Australia.* **Position Statement No.5**. Perth, Western Australia.

Environmental Protection Authority 2006. *Level of Assessment for Proposals Affecting Natural Areas Within the System 6 Region and Swan Coastal Plain Portion of the System 1 Region.* Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986). **Guidance Statement No.10***.* Perth, Western Australia.

Environmental Protection Authority 2007. *Environmental Guidance for Planning and Development* **Guidance Statement No. 33.** Perth, Western Australia.

Gibson, N., Keighery, B.J., Keighery, G.J. Burbidge, A.H. and Lyons, M.N. 1994. *A Floristic Survey of the Southern Swan Coastal Plain.* Unpublished report for the Australian Heritage Commission, prepared by the Department of Conservation and Land Management and the Conservation Council of WA (Inc.).

Government of Western Australia 1997. *Wetlands Conservation Policy for Western Australia*. Department of Conservation and Land Management and Water and Rivers Commission.

Government of Western Australia 2000, Perth's *Bush Forever*. Volumes 1 and 2. Western Australian Planning Commission, Perth.

JANIS Forests Criteria 1997. *Nationally agreed criteria for the establishment of a comprehensive, Adequate and Representative reserve System for Forests in Australia.* A report by the Joint ANZECC/MCFFA National Forest Policy Statement Implementation Sub-committee. Regional Forests Agreement process. Commonwealth of Australia, Canberra.

Keighery, B.J. 1994. *Bushland Plant Survey: A Guide to Plant Community Survey for the Community*. Wildflower Society of WA (Inc). Nedlands, Western Australia.

Kitchener, D.J., Chapman, A., Dell, J., Muir, B.G. and Palmer, M. 1980a. Lizard assemblage and reserve size and structure in the Western Australian wheatbelt – some implications for conservation. *Biol. Conserv.* **17:** 25-62.

Kitchener, D.J., Chapman, A., Dell, J., Muir, B.G. and Palmer, M. 1980b. Conservation value for mammals of reserves in the Western Australian wheatbelt. *Biol. Conserv.* **18:** 179-207.

Kitchener, D.J., Dell, J., Muir, B.G. and Palmer, M. 1982. Birds in Western Australian wheatbelt reserves. *Biol. Conserv.* **22:** 127-63.

Lambeck, R.J. 1997. Focal Species: A Multi-Species Umbrella for Nature Conservation. *Conservation Biology* 11(4): 849-856.

NSW Department of Land Water Conservation, 2001. Offsets, *Salinity and Native Vegetation*. Paper.

Petroleum Division – Department of Industry and Resources website

Water and Rivers Commission (2001). *Determining Foreshore Reserves*. Water and Rivers Commission Restoration Report No.16, Perth

Water and Rivers Commission Position Statement: Wetlands

Western Australian *Wildlife Conservation Act 1950*

APPENDIX 1

Determining vegetation condition

Bush Forever Volume 11 defines vegetation condition:

> *"Condition is a rating given to bushland to categorise disturbance related to human activities. This rating refers to the degree of change in the structure, density and species present in the bushland in relation to undisturbed bushland of the same type. Different people have used a series of scales of disturbance. Condition ratings used commonly in the Perth Metropolitan Region are described in Volume 2 (Connell 1995, Government of WA 1995, Keighery 1994)."*

Condition Scale **(Extract from Table 12 on page 48 of Bush Forever Volume 2 from Keighery B.J. (1994)2)**	
Pristine	Pristine or nearly so, no obvious signs of disturbance.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good	Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation is no longer intact and the areas is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora composing weed or crop species with isolated native trees or shrubs.

1 *Bush Forever Final Report* (December 2000), Western Australian Planning Commission.
2 Keighery, B.J. (1994) *Bushland Plant Survey. A Guide to Plant Community Survey for the Community*. Wildflower Society of WA (Inc), Nedlands, Western Australia.

APPENDIX 2

Critical assets

As defined in the EPA's Position Statement No.9 *Environmental Offsets* and Guidance Statement No.19 *Guidance for the Assessment of Environmental Factors (Environmental Offsets)*.

1. **Public conservation reserve system**
   - Nature reserves, national parks, conservations parks, regional parks, marine parks, marine nature reserves and marine management areas.
2. **Native vegetation**
   - Where adverse impacts are considered to be 'seriously at variance' with any of the ten clearing principles in Schedule 5 of the EP Act.
   - Where proposed clearing would result in the pre-European extent of a vegetation complex to fall below 30% in a bioregion (vulnerable).
   - Where proposed clearing would result in the pre-European extent of a vegetation complex to fall below 10% in constrained areas on the Swan Coastal Plain (endangered).
   - Bush Forever reserves, excluding those subject to negotiated planning solutions, having regards to WAPC's SPP No.2.8 *Bushland Policy for the Perth Metropolitan Region* (draft).
3. **Biodiversity**
   - Declared Rare Flora and Declared Threatened Fauna where proposed clearing would significantly impact local populations.
   - Having regard for threatened ecological communities which are considered to be 'presumed totally destroyed', 'critically endangered', 'endangered', 'vulnerable' or 'data deficient'.
   - Having regard for the Priority Species List (flora and fauna).
4. **Wetlands**
   - Ramsar wetlands.
   - A wetland listed in *A Directory of Important Wetlands in Australia* and Australian Wetlands Database.
   - Environmental Protection Policy (EPP) wetlands.
   - Conservation category wetlands (CCWs).
5. **Rivers**
   - Wild and Scenic Rivers.
6. **Landscape**
   - Where proposed clearing will result in irreversible damage to or destruction of an important landscape, natural feature or environmental icon.
7. **Environments sensitive to emissions/discharges**
   - In areas where new or an addition to existing emissions present a significant risk to human health or the environment, or exceed a prescribed environmental or health standard, or contribute to a global environmental problem such as ozone depletion.
8. **Ecosystems vulnerable to threats**
   - Where proposed clearing threatens or has the potential to threaten the survival, abundance or evolutionary development of an indigenous species or ecological community as identified above for rare flora, specially protected or threatened fauna, threatened ecological communities and priority species.
9. **Heritage**
   - Where proposed clearing could compromise identified values of places of State, National or World Heritage significance (including places of indigenous heritage of high importance) within the scope of the EP Act.

APPENDIX 3

Surveys and gathering additional information

During the preliminary assessment of a clearing application it may become apparent that insufficient information exists to make a confident determination of variance against one or more of the clearing principles. In this instance it will be necessary to obtain the additional information required by undertaking a survey and gathering additional information.

Where a survey and gathering additional information is needed the scope of this will be determined on a case-by-case basis, but would be consistent with *EPA Position Statement No.3*. This document outlines the EPA's principles for environmental impact assessment of biodiversity. The EPA sees proper understanding of the requirements of adequate surveys as central to achieving a sound assessment of biodiversity.

EPA Guidance Statement No.10, *EPA Guidance Statement No.51*, and *EPA Guidance Statement No.56* also provide guidance as to survey requirements.

Some key factors in using surveys to assess biodiversity include:

- the methodology used should be consistent with the approaches recommended in the EPA Guidance Statements No's 10, 51 and 56 – the methodology used, and any limitations of the surveys, should be outlined in the resulting report;
- the timing and time allocated should be determined by the natural cycles of the region (such as growth and flowering);
- the intensity of the sampling (number of sites; their spacing; and their area) should be based on the complexity of the flora, vegetation and faunal assemblages of the permit application area; and
- the level of effort should correspond with the existing data for that area, i.e. where less existing information is available, a greater survey effort would be required.

In undertaking a survey and gathering additional information, specific measures of diversity include the following.

Plant species

- total vascular plant taxa (species, subspecies and varieties) diversity: and
- vascular plant taxa diversity for each ecological community.

Fauna species

- total vertebrate and invertebrate fauna taxa (genera, species and subspecies) diversity

Ecosystem diversity

- number of ecological communities (plant communities);
- number of ecological communities (fauna communities (assemblages));
- macrohabitat diversity;
- microhabitat diversity in each macrohabitat;
- a variety of soil types or geological formations; and
- micro-topographical diversity and edaphic variation.

Other aspects

It may be necessary to gather more detailed information on the physical aspects of an application, such as the extent of land degradation and possible hydrological changes as a result of an incidence clearing.