# ENVIRONMENTAL EVALUATION OF NATIVE VEGETATION IN THE WHEATBELT OF WESTERN AUSTRALIA

## Principles and Criteria Used to Appraise Land Clearing Proposals

**Prepared for Western Australian Department of Environmental Protection**

by

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# CONTENTS

## INTRODUCTION

The purpose of this paper is to provide criteria for remnant vegetation assessment for the Department of Environmental Protection. These criteria aim to maintain a living landscape where biological diversity and ecological processes continue amidst more economic land uses. A major policy influence is Ecological Sustainable Development, our commitments under The National Strategy for Conservation of Australia's Biological Diversity and the need to ensure that all Western Australian species of flora and fauna, native ecosystems and communities can survive, flourish, retain their potential for evolutionary potential **and** contribute to sustainability in agricultural industries.

The paper discuss principles and criteria which may apply to all or part of an area of land under the following headings:

- **Regional processes** - importance of the land in maintaining viable ecological processes.
- **Representation** - role in conserving the genetic diversity of the region.
- **Viability** - survival of natural values.

The criteria have been selected with recognition of the following constraints:

- Operational personnel must be able to readily comprehend and implement assessment criteria and methods.
- The science behind the criteria must be clearly stated.

Criteria are considered independently so that people can ascribe different weights according to their priorities.

An assessment methodology, assessment forms and sources of data have been developed in parallel with this study by Dr. Gillian Craig. It is anticipated that many proposals will be handled through a desk study, some will require a rapid field assessment and a few will require detailed assessment of flora and fauna.

## SOURCES OF INFORMATION

This paper, unless otherwise quoted, is based on the procedures outlined in Safstrom, R. 1995. *Conservation Values of Small Reserves in the Central Wheatbelt of Western Australia: A Framework for Evaluating the Conservation Values of Small Reserves*, an unpublished report for the Department of Conservation and Land Management, Western Australia and the Water Authority of Western Australia. This paper provides a more detailed analysis of many of the criteria used and reasons why other criteria are considered inappropriate.

Ideas outlined in the Department of Conservation and Natural Resources, Victoria *Planning Guidelines for Native Vegetation Retention Controls (1996);* the *Principles of Clearance of Native Vegetation* in the South Australian Native Vegetation Act 1991 and *Land Assessment Process for Crown Lands in New South Wales,* Land Assessment Branch, Department of Conservation and Land Management, New South Wales are incorporated in the report.

Input from the following people is acknowledged: Charles Nicholson, Keith Bradby, Angas Hopkins, Richard Hobbs, Martin Choppin, Vaughan Cox, Ken Atkins, Penny Hussey.

### Other References

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Kitchener, D. J., Chapman, A. & Muir, B. G. (1980). *The conservation value for mammals of reserves in the Western Australian wheatbelt.* Biological Conservation 18, 179-207.

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# PRINCIPLES FOR EVALUATION OF NATIVE VEGETATION

The tables in this section provide a summary of principles to be considered when assessing priorities for retention of native vegetation. The third column can be used to note whether the principles apply to a particular piece of native vegetation. Criteria and justification for the principles are detailed in *Criteria for Evaluation Principles* on page 6.

## 1. REGIONAL PROCESSES

| Item | Principle - native vegetation should be retained if: | Yes/No/ Partly |
|---|---|---|
| 1.1 Water | the clearance of vegetation is likely to cause deterioration in surface and groundwater catchments which result in increases in salinity and eutrophication. | |
| 1.2 Soil | the clearance of vegetation is likely to contribute to soil erosion, waterlogging or flooding | |
| 1.3 Corridors and Buffers | the land provides a corridor or stepping stone between areas of conservation land or the land provides a buffer or is an inlier to areas reserved for conservation | |
| 1.4 Aesthetics and Cultural | the land provides high landscape values, has special physiographic features, aboriginal sites or heritage value | |

## 2. REPRESENTATION

| Item | Principle - native vegetation should be retained if: | Yes/No/ Partly |
|---|---|---|
| 2.1.1 Flora | it contains or is likely to contain threatened flora or flora of special interest. | |
| 2.1.2 Plant communities | it contains or is likely to contain threatened plant communities | |
| 2.1.3 Diversity | it contains areas of very high species richness | |
| 2.1.4 Wetlands | it contains wetlands of significance | |

## 2. REPRESENTATION (continued)

| Item | Principle - native vegetation should be retained if: | Yes/No/ Partly |
|---|---|---|
| 2.1.5 Local representation | within a 15 kilometre radius of the remnant there is less than 20% of the original cover of any plant community on the land represented by:<br><br>(i) viable occurrences in NPNCA National Parks or Nature Reserves.<br><br>(ii) viable occurrences in other Crown Land or Remnant Vegetation Protection Scheme covenants. | |
| 2.1.6 Regional representation | it includes vegetation communities not well conserved in the region compared with the original cover as represented in the Interim Biographical Representation in Australia (IBRA) | |
| 2.2.1 Wildlife | it contains or is likely to contain rare fauna | |
| 2.2.2 Habitats | it has significance as habitat for wildlife or if a loss of diversity by clearing part of the land will adversely impact on fauna dependent on a mosaic of vegetation types. | |

## 3. VIABILITY

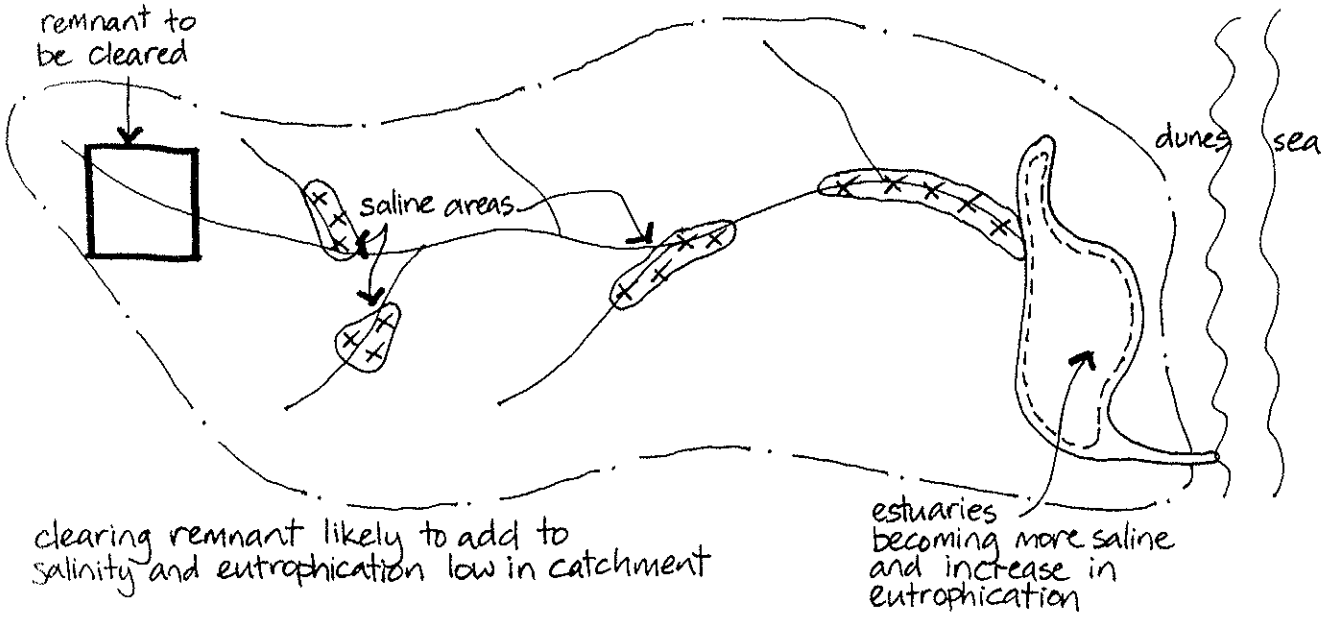
| Item | Principle - survival of natural values over the next 50 years. | Yes/No/ Partly |
|---|---|---|
| 3.1 Area | Large areas have higher conservation values, the maximum possible area of a remnant should be retained. Groups of small remnants can support fauna able to move between remnants and threatened species. | |
| 3.2 Shape | Very narrow areas of retained vegetation are less likely to be viable and of reduced value as corridors. | |
| 3.3 Intactness | Remnants with little or no intact vegetation are unlikely to be viable. | |
| 3.4 Diseases and Pests | The vegetation should be free of major diseases and pests such as Dieback. Disease free vegetation is more important for retention if similar vegetation communities in nearby reserves are diseased. | |
| 3.5 Invasive plants | Presence of invasive plants capable of, or with potential to, disrupt ecosystem processes. | |
| 3.6 Adjacent uses | Adjacent land uses impacting on the viability of the land must be considered. | |

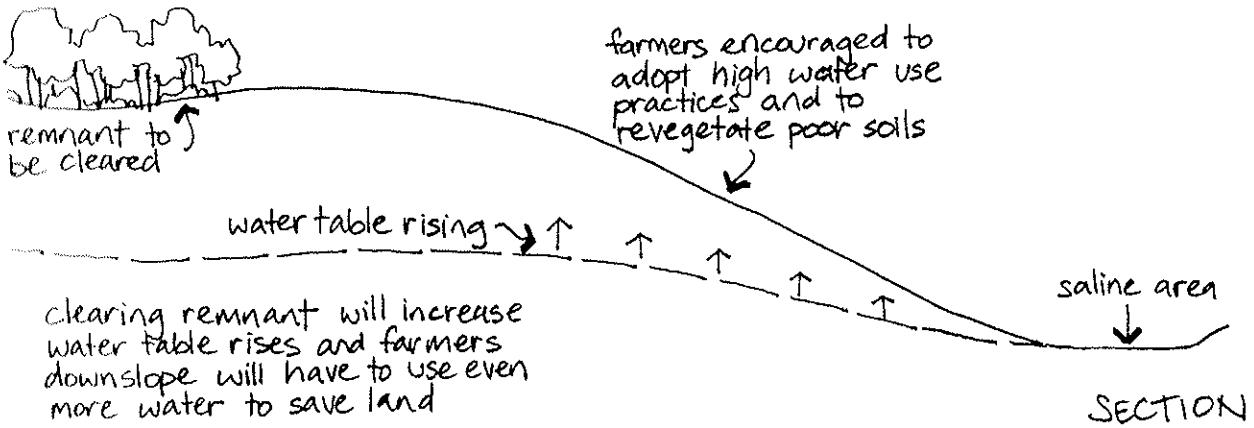
# CRITERIA FOR EVALUATION PRINCIPLES

The tables in this section are designed to detail and provide justification for the Evaluation Principles on page 4 and 5. Diagrams are provided on the adjacent page or below the criteria to demonstrate the criteria in visual format. The third column indicates whether the criterion can be evaluated by desk study or if a rapid or detailed field survey is required.

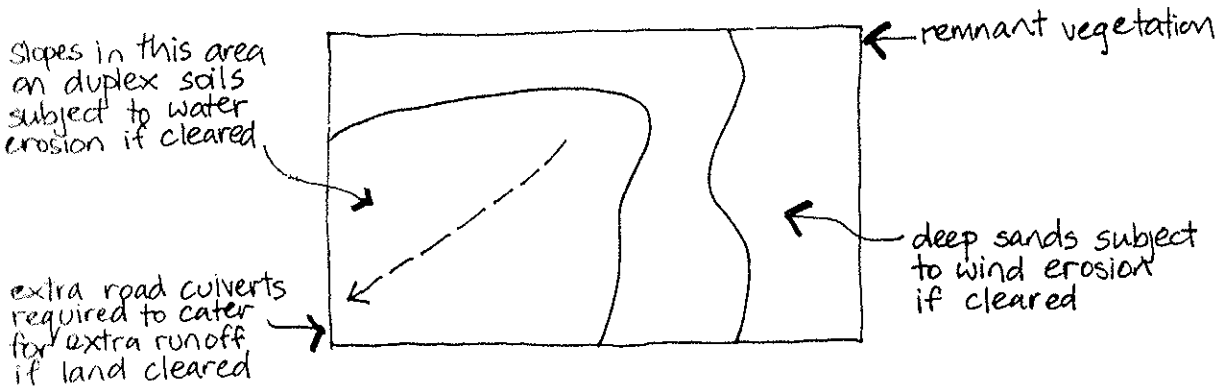
## 1. REGIONAL PROCESSES - importance of the native vegetation in maintaining viable ecological processes

| Criteria | Justification for criteria | Study type |
|---|---|---|
| 1.1 Water<br><br>There should be no deterioration in catchment processes - groundwater, salinity and eutrophication | The impact of clearing and subsequent land use on both surface and underground catchments needs to be considered. For example if the clearance of vegetation is likely to result in a rise in the water table or increasing eutrophication then caution is required.<br><br>It may be possible to calculate the additional groundwater recharge as a result of clearing native vegetation. Any increase in recharge in catchments known to have rising ground water is undesirable as extra amelioratory works will have to undertaken elsewhere in the catchment to make up for the increase.<br><br>Most valley woodlands are currently under threat in the wheatbelt from rising water tables in the next 50 years. They should be retained on the premise that landscape management will be initiated and water table rises arrested and that if degraded by salinity will be of little agricultural value. | Desk study, information on underground water available for some areas |
| 1.2 Soil<br><br>There should be no deterioration in soil processes - soil erosion and water logging | Remnant vegetation plays a role in preventing soil erosion by wind and water, and waterlogging. Native vegetation needs to be retained where land capability mapping indicates a high likelihood (Classes IV and V) of soil degradation if the land is cleared. | Desk study |




CRITERIA 1·1 CATCHMENT PROCESSES

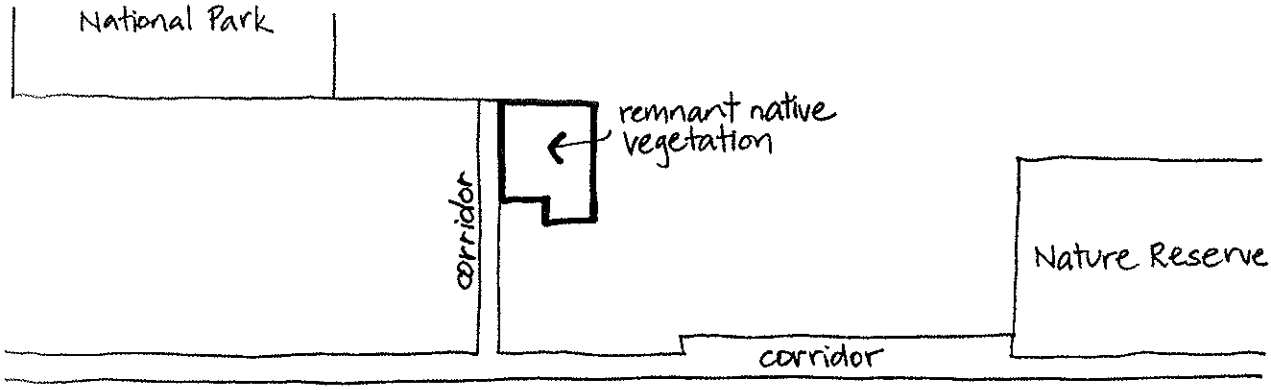



CRITERIA 1·2 SOIL PROCESSES

***Catchment and soil processes affected by clearing native vegetation***

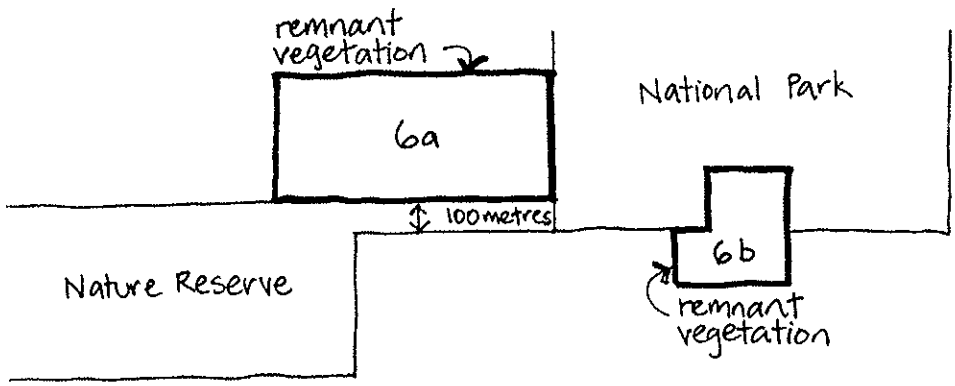
## 1. REGIONAL PROCESSES (continued)

| Criteria | Justification for criteria | Study type |
|---|---|---|
| 1.3.1 Corridors<br><br>Corridors or stepping stones between areas of conservation land requires protection | Native vegetation close to other remnants and with good connecting corridors have greater viability for many species. Due to lack of consistent data and the species specific nature of the benefits of connectivity it is difficult to recommend criteria for corridor and stepping stone design. It is assumed that even narrow bands of native vegetation (5-10 metres) with breaks less than 400 metres are useful for some species. Other species will require continuous linkages of wide corridors (500 metres plus) containing core areas of undisturbed vegetation which are habitats in their own right. | Desk study |
| 1.3.2 Buffers<br><br>Native vegetation which is adjacent, an inlier or provides a buffer to conservation land requires protection | Native vegetation adjacent to conservation reserves improves the viability and conservation values of the reserve by providing larger core areas, buffers the reserve from edge effects, sometimes consolidates boundaries and sometimes add plant communities not represented or under represented in the reserve. The width of buffers required will depend on the robustness of the vegetation associations, with vegetation communities on nutrient poor soils requiring smaller buffers than communities such as woodlands on richer soils. | Desk study |
| 1.4.1<br>High landscape -aesthetic values - should be maintained | The familiar rural landscape of farmland fringed and dotted with trees and patches of bush can only be maintained with positive action. Retain vegetation with high scenic quality, strongly defined vegetation patterns, unique specimen stands, areas of high plant diversity which display distinctive textural and colour patterns and dramatic displays of seasonal colour (*Reading the Remote Landscape Characters of Western Australia).* | Desk study and rapid field survey. |
| 1.4.2<br>Special physiographic features require protection | Special features on the land that may be of community interest such as outcropping dolerite dykes, granite outcrops, breakaways. | |
| 1.4.3<br>Significant aboriginal sites require protection | Presence of Aboriginal sites on the land | |




The remnant provides a corridor or stepping stone between areas of conservation land

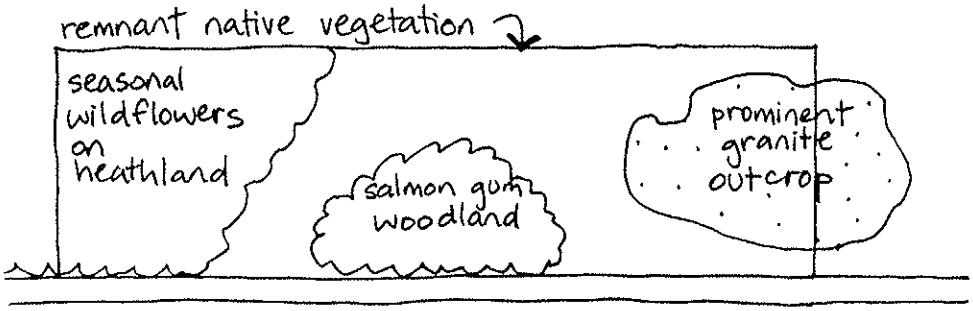
CRITERIA 1·3·1 CORRIDORS AND STEPPING STONES




6a: The remnant is adjacent to and provides a corridor between conservation land

6b: The remnant is an inlier and provides a buffer to conservation reserves

CRITERIA 1·3·2 BUFFERS AND INLIERS

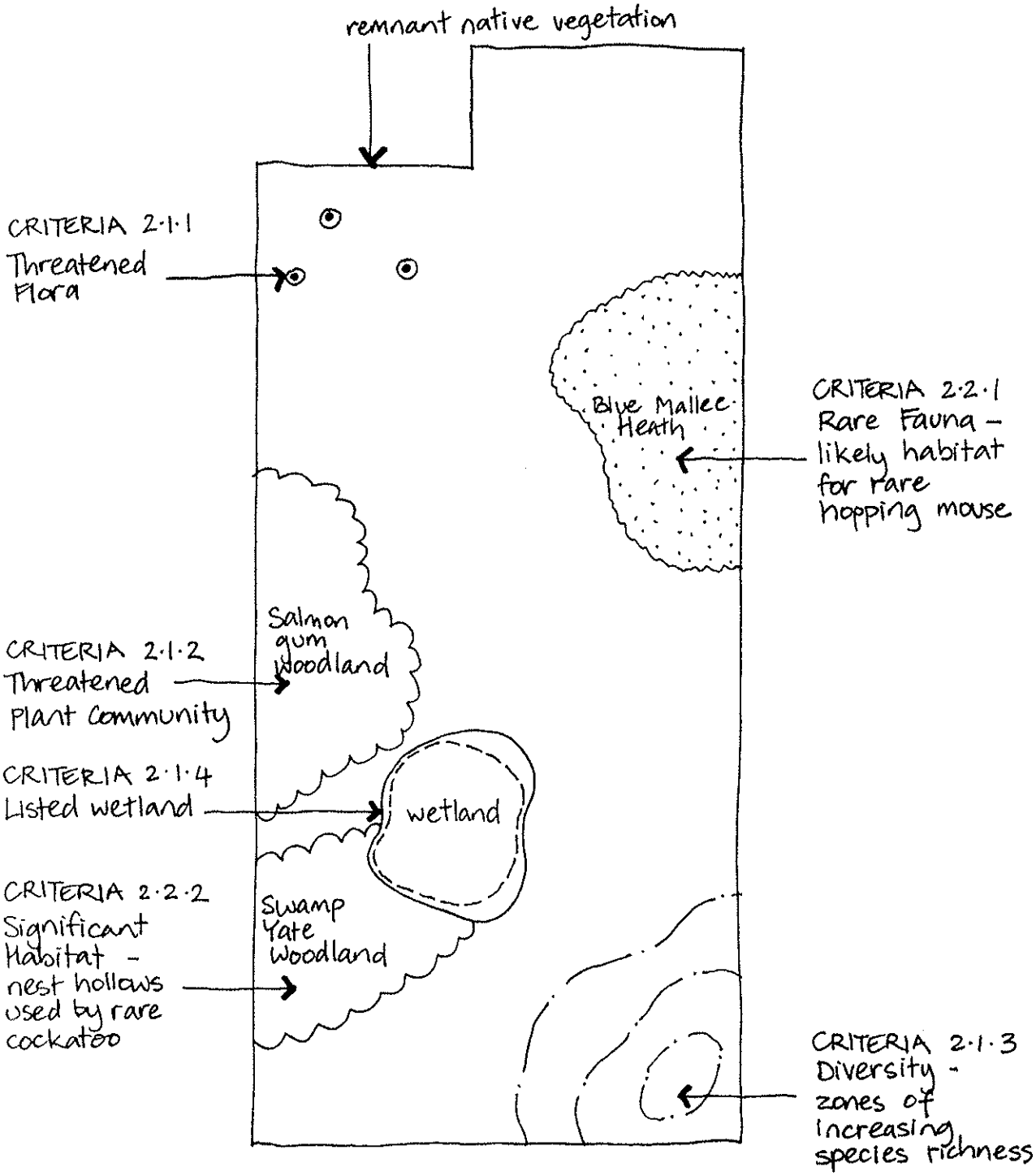



CRITERIA 1·4·1 HIGH LANDSCAPE VALUES

***Native vegetation provides corridors and stepping stones for wildlife, buffers for National Parks and Nature Reserves and aesthetic values***

## 2. REPRESENTATION - role in conserving the genetic diversity of the region

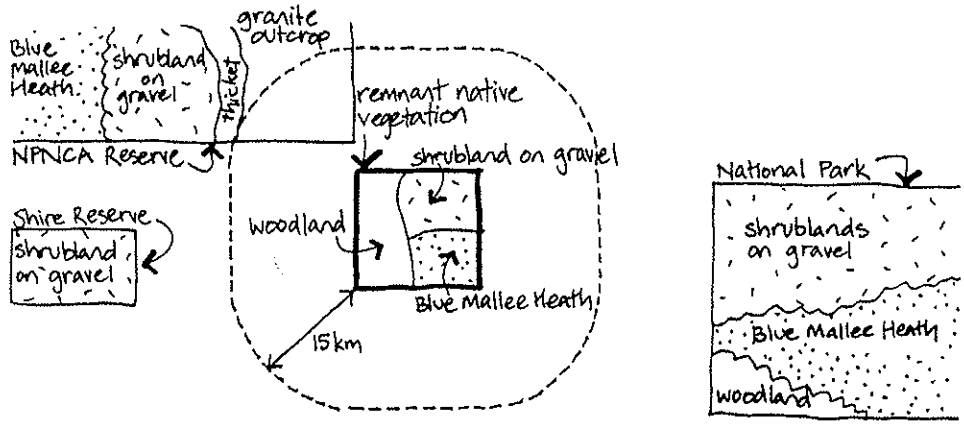
| Criteria | Justification for criteria | Study type |
|---|---|---|
| 2.1.1<br><br>Threatened flora, flora of special interest as listed by CALM require protection | Native vegetation which contains or is likely to contain threatened species, species of special interest should be a high priority for protection. *This study adopts the gazetted lists of threatened flora and priority lists as maintained by CALM.* | Information known from previous studies |
| 2.1.2<br><br>Threatened plant communities as defined by CALM or Priority one and two communities as listed in the RVPS require protection | Work by CALM is aimed at defining and ranking threatened plant communities but there has been little work in the wheatbelt at this stage. *This study uses the vegetation community priorities defined in the Remnant Vegetation Protection Scheme* . Other communities may also be important such as relictual Gondwanan genera/habitats | Desk study of Beard vegetation mapping, possibly rapid field assessment to identify vegetation communities |
| 2.1.3<br>Diversity - areas of high species richness (over 25 -30 perennial species per 100 square metres) require protection | Where areas of very high species richness have been identified (for example by isoflors) they are a high priority for protection. Plant communities known to have high ephemeral species richness are also a high priority for protection but assessment results will depend on the season.<br><br>Native vegetation with overall high species richness are also a high priority for protection but a detailed survey is required. | Desk study, detailed survey may be required |
| 2.1.4<br><br>Wetlands as listed are a priority for protection | Wetlands (and their surface and groundwater catchments) recorded in Table 1 of Protected Wetlands under the South West Agricultural Zone Wetlands, Environmental Protection Policy have a high priority for protection. Wetlands recognised as significant at a district level (refer DEP and CALM) are also a priority for protection. | Desk study and rapid field assessment |



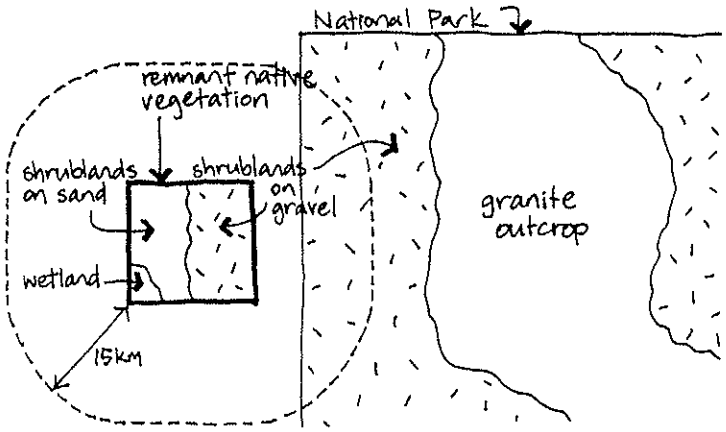

***Native vegetation may include areas with high nature conservation values***

## 2. REPRESENTATION (continued)

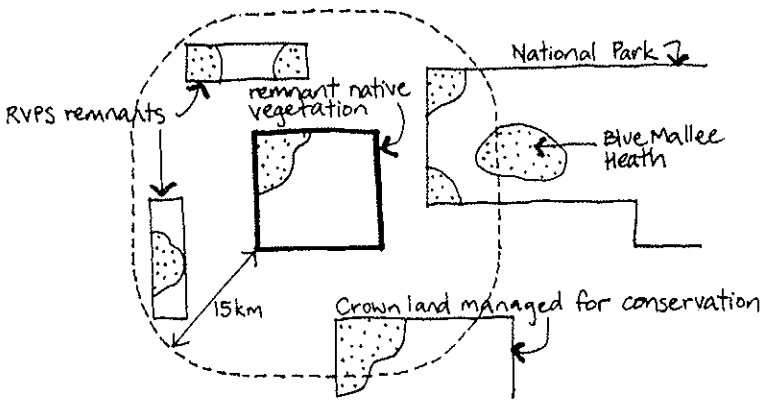
| Criteria | Justification for criteria | Study type |
|---|---|---|
| 2.1.5<br>Within a 15 kilometre radius of the remnant there are vegetation communities which do not have 20% of their original occurrence represented in NPNCA National Parks or Nature Reserves or in other Crown land or Remnant Vegetation Protection Scheme covenants .<br><br>Where remnant native vegetation contributes to representation up to 20% of the original occurrence of a plant community it is a high priority for protection. | If reserves in the region are to conserve the flora, especially rare species then stands within the same broad formations and soil types are required at least at intervals less than 15 kilometres. Spacing of reserves will have to be considerably less in species rich areas (Burgman 1988).<br><br>Replications of habitats is also very important. Hopper (1992). Natural catastrophes, land use change could mean the loss of occurrences.<br><br>20% of the original cover of each plant community should be retained. There is no scientific data to suggest that 20% is sufficient but 20 % is suggested as a baseline for the wheatbelt in line with the 20% rule for retention of remnant vegetation within a farm, catchment and Shire.<br><br>The most securely held reserves are vested in the National Parks and Nature Conservation Authority (NPNCA) and managed by CALM.<br><br>Other Crown reserves may be being managed sympathetically for nature conservation eg by shires and while less secure are considered in this study.<br><br>Some privately owned remnants are secured temporarily under 30 year covenants with AgWA under the Remnant Vegetation Protection Scheme. Other private remnant vegetation is also playing a major conservation role but is not considered at this stage as its security is uncertain. | Desk study of Beard vegetation communities, rapid field assessment may be required |
| 2.1.6<br>Vegetation communities not well represented in IBRA regions are a high priority for protection. | Where the land includes vegetation communities not well represented in the Interim Biographical Representation in Australia (IBRA) region they have a high priority for protection. | Desk study |




The whole of the remnant should be retained because it contains woodland which is poorly represented in the IBRA region and the shrublands on gravel and the blue mallee heath are not represented in National Parks, Nature Reserves or on Crown Land within a 15 kilometre radius of the remnant.




That part of the native vegetation containing shrublands on gravel is a lower priority for retention because there is greater than 20% of their original occurrence within 15 kilometres in the nearby National Park. The shrublands on sand and wetlands are a high priority for retention as they are not represented within a 15 kilometre radius of the remnant.



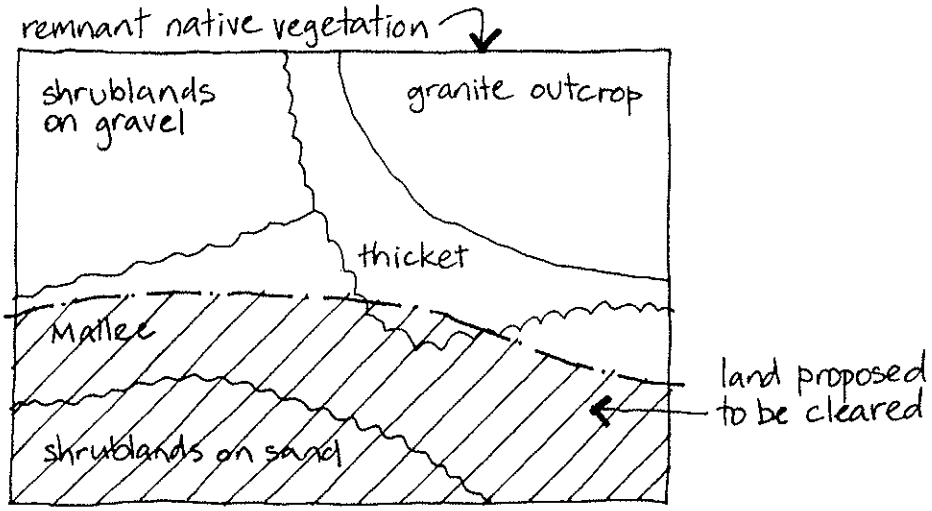

That part of the remnant vegetation containing blue mallee heath is a lower priority for retention because more than 20% of the original occurrence is represented in National Parks, Crown Land and RVPS covenants.

CRITERIA 2·1·5 REPRESENTATION

## *Examples of representation of plant communities*

## 2. REPRESENTATION (continued)

| Criteria | Justification for criteria | Survey type |
|---|---|---|
| 2.2.1<br>Rare and priority fauna as listed by CALM requires protection | Remnant vegetation known to contain or likely to contain rare fauna should be a high priority for protection. *This study adopts the gazetted lists of threatened fauna and priority lists as maintained by CALM.* | |
| 2.2.2<br>Significant habitats for wildlife require protection | Some areas are particularly valuable as habitats for wildlife, for example nest hollows in woodlands and if removed or their habitat values significantly reduced then there would be a high probability of regional population decline of a species.<br><br>The plant communities present can be significant for wildlife. Many species have adapted to and require a diverse environment to meet their seasonal food requirements. If one plant community is preferentially reduced by clearing, the remaining areas will be of reduced nature conservation value. The aim should be to retain sufficient adjacent areas of each plant community in a remnant to satisfy faunal requirements. | Desk study, rapid assessment may be required |




Clearing of Mallee and shrublands on sand would seriously disadvantage fauna dependent on those plant communities for part or all of the year

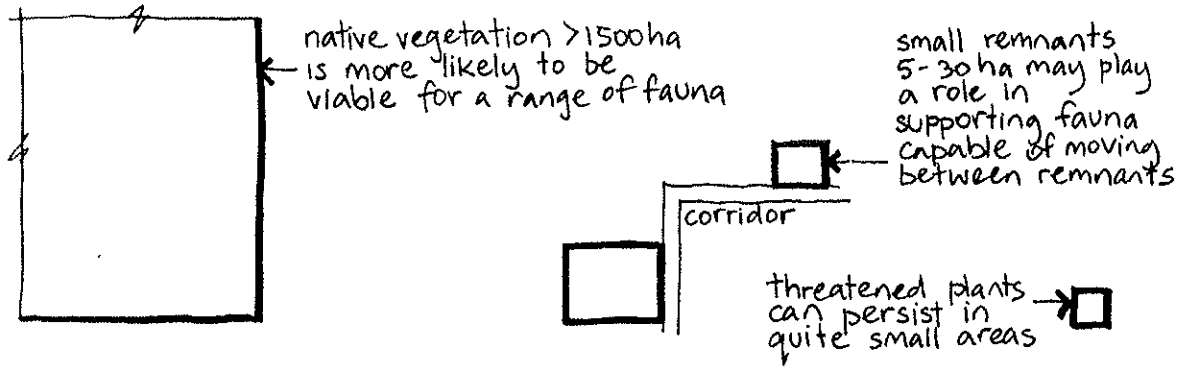
CRITERIA 2·2·2 HABITAT PROTECTION

***Many species of wildlife have adapted to and require diverse vegetation communities for their survival***

## 3. VIABILITY - survival of natural values

Viability considers factors which can be identified as having a high likelihood of resulting in serious degradation of the remnant over the next 50 years. Impacts of future human actions have not been considered. Areas which are degraded and considered not viable may be valuable if restorable or provide a seed source for habitat reconstruction. Water table rise can affect viability but have not been considered in this section on the premise that landscape management will be initiated and water table rises arrested.

| Criteria | Justification for criteria | Study type |
|---|---|---|
| 3.1 Maximise area of native vegetation to enhance viability | In this study it has been assumed that larger remnants, >1500 ha, have higher conservation values and are more likely to be viable for a range of fauna than small remnants (Kitchener et al 1980). The majority of privately held remnants in the Wheatbelt are small but may play a valuable role in supporting fauna species capable of movement between remnants, in species movements and sometimes are the only representation of the original vegetation.<br><br>There appears to be little agreement on the minimum size of remnants for conservation purposes. Wallace (1989) has suggested that 25 ha is one reasonable cut off based on the work of Kitchener et al (1980) on mammals. The Remnant Vegetation Protection Scheme has provided fencing assistance for areas down to 5ha. The study *Conservation of Small Reserves in the Central Wheatbelt* suggested that an intact area of 30 hectares was one criteria for a reserve to be considered for vesting in the NPNCA. Threatened plants can sometimes persist in quite small areas.<br><br>It is desirable to retain the maximum area of a remnant possible and aim to retain areas greater than 1500 ha with areas of 30 hectares and smaller still being valuable depending on the conservation goal. | Desk study |

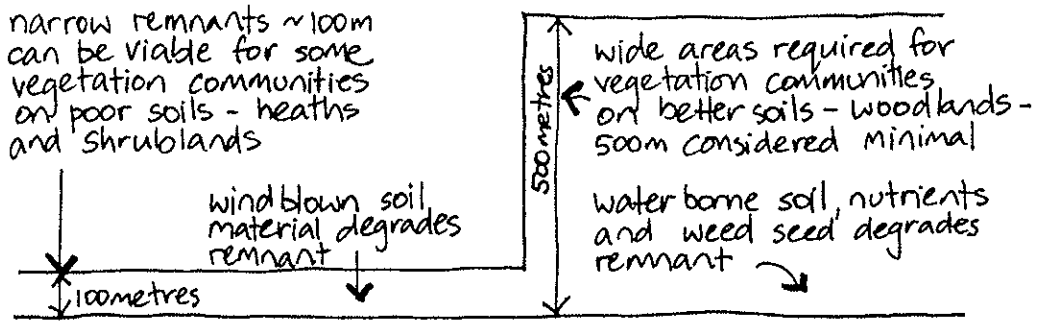



CRITERIA 3.1 AREA

***Native vegetation of all sizes can play a role in conserving flora and fauna in the Wheatbelt of Western Australia***

## 3. VIABILITY (continued)

| Criteria | Justification for criteria | Study type |
|---|---|---|
| 3.2 Native vegetation with small edge to area ratios are best for viability | Remnants with small edge to area ratios are likely to be better for nature conservation than remnants with large edge to area ratios and the shape of a remnant is likely to be more important in small and linear remnants as more edge habitat and edge disturbances are created.<br><br>It is suggested that edge to area ratios not be considered but small narrow isolated remnants with significant areas less than 100 metres in width will constitute mainly edge habitat with low viability. Narrow areas down to 5 metres can be viable on some soils or with a reasonable management regime.<br><br>Viability of narrow areas such as retained corridors will depend on the ability of the plant communities to resist weed invasion, the position in the landscape and disturbance level. Plant communities on very infertile soils eg shrublands on gravels have a high ability to resist weed invasion compared with woodlands. Plant communities downslope and down wind of farming land are likely to degrade rapidly due to inputs of nutrients and weed seed.<br><br>It is considered that 100 metres is a minimum width for retained native vegetation on poor soils with a minimum of 500 metres required for more fertile soils such as woodlands. These estimates are from field observations of weed invasion, there being insufficient information to quantitatively compare plant communities for inherent resistance to change. Corridors which are narrower or degraded can be very valuable for many species of wildlife but may require more management inputs to remain viable. | Desk study, rapid field survey to check indications of poor viability |

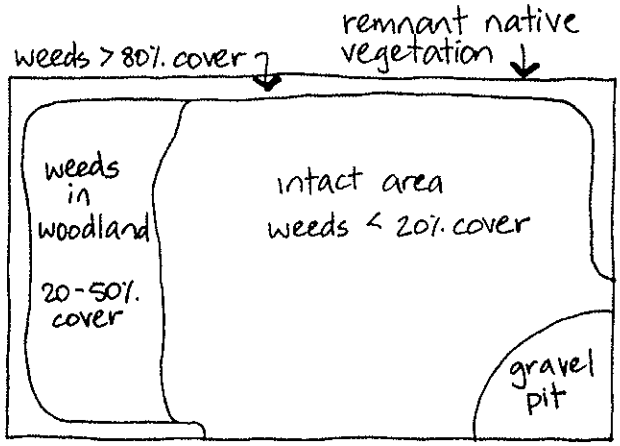



CRITERIA 3·2 REMNANT SHAPE

***Wide areas of native vegetation have better viability and better nature conservation values than narrow areas***

## 3. VIABILITY (continued)

| Criteria | Justification for Criteria | Study type |
|---|---|---|
| 3.3 Intact Area - intactness - should be maximised to improve viability | The level of degradation of a remnant has been assumed to affect the value of a remnant for wildlife. Remnants with large intact areas are likely to have better viability than remnants with smaller intact areas.<br><br>Mapping of weed cover together with mapping of other disturbances such as gravel pits and grazing provides a picture and repeatable measure of reserve condition. Weed cover often reflects grazing history. Weed cover can be mapped in the following classes : 0-20%, 20-50%, 50-80%, 80%+. Areas with less than 20% weed cover, and with no other degrading features, are assumed to be relatively intact. Note that weed cover is less useful in some situations subject to current heavy grazing such as on lateritic soils, seasonally inundated areas where the intactness of the community structure may be a better measure.<br><br>Remnants with no or very low areas of intact vegetation are assumed to have low viability. | Rapid field survey |

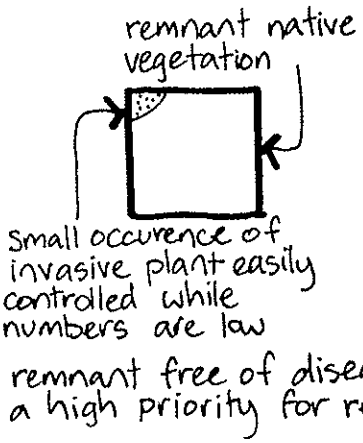


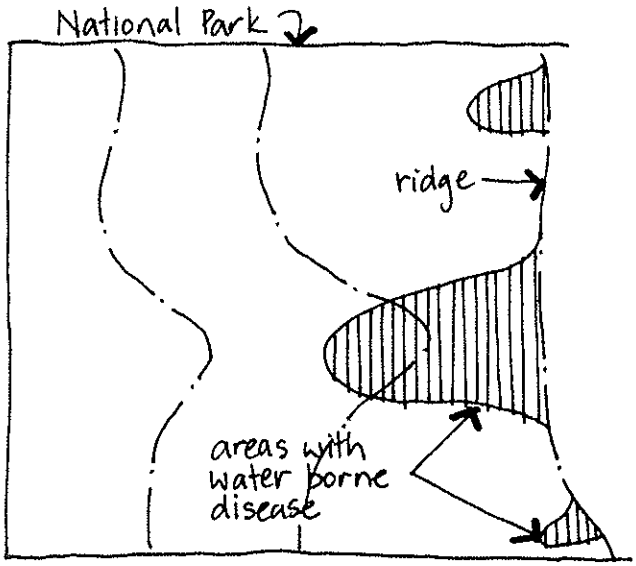

CRITERIA 3·3 INTACT AREA

***Intact native vegetation has high conservation values and viability compared to degraded areas but degraded areas can sometimes be rehabilitated and may provide a buffer to intact areas***

## 3. VIABILITY (continued)

| Criteria | Justification for criteria | Survey type |
|---|---|---|
| 3.4 Native vegetation with disease will have reduced viability | Diseases such as Dieback (Phytophthora species) can have a big impact on a vegetation community. In some cases disease will be present or likely to spread further in reserves but is yet to impact on private remnants. In these cases the value of the remnant to retain disease free examples of the original vegetation is increased. | Desk study and rapid field survey |
| 3.5 Invasive plants reduce viability | Presence of invasive plants capable of, or with potential to, cause modification to species richness, species abundance or ecosystem function or to totally and permanently destroy an ecosystem. | Rapid field survey |
| 3.6 Adjacent land uses may impact adversely on viability | Farming in the wheatbelt is the land use most likely to impact on a reserve and in most cases the effects are restricted to edges. Where drains for saline water disposal were constructed into a remnant the effects are severe and in such cases the affected parts of the reserve are considered to have low viability. Sandblown/deposition from adjacent paddocks with soils subject to wind erosion can be a major cause of bushland decline. | Desk study and rapid field survey |




CRITERIA 3.4 DISEASE & 3.5 INVASIVE PLANTS

***Diseases and invasive plants can reduce the viability of native vegetation***