

# ***BioMetric***

Version 1.8

A Terrestrial Biodiversity Assessment Tool for the  
NSW Property Vegetation Plan Developer

## **Operational Manual**

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The full Copyright and Disclaimer Statement is in the *BioMetric Tool*.

### **Acknowledgments**

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## Summary

This Manual is a guide for using *BioMetric*. *BioMetric* is an Excel™ tool used to assess the impacts (positive and negative) on terrestrial biodiversity of applications for clearing and applications for incentives in native vegetation under the NSW Native Vegetation Act (2003).

*BioMetric* assesses the value of native vegetation for terrestrial biodiversity at the national, regional, landscape and site scales.

*BioMetric* is used in conjunction with: a GIS tool that maps features of proposals; tools that assess threatened species, soils, salinity, water quality and invasive native scrub; a tool that collates this information into a Property Vegetation Plan; and a system that databases this information.

### Proposals to clear native vegetation

Clearing of native vegetation is permitted under the NV Act if it improves or maintains environmental outcomes.

In *BioMetric* no further clearing of native vegetation is permitted in vegetation types or landscapes that are already overcleared or listed as threatened at the national, regional or landscape scales, unless the vegetation is in low condition.

Other native vegetation can only be cleared if losses from proposed clearing can be offset by commensurate long-term gains from management. Offsets can only improve or maintain environmental outcomes if:

- a) offsets are in vegetation types of equal or greater Regional Value (the conservation status of the vegetation type) to the vegetation proposed for clearing; AND
- b) improvement in Landscape Value (the configuration of vegetation) from the offset are commensurate with losses in Landscape Value brought about by proposed clearing; AND
- c) improvement in Site Value (the quality and quantity of vegetation) from the offset are commensurate with losses in Site Value from proposed clearing.

### Proposals to obtain incentive funding for native vegetation management

Applications for incentive funding under the NV Act are assessed using the same criteria as applications for clearing (i.e., Regional Value, Landscape Value and Site Value) with the addition of measures for the duration of management commitment and a threatened species index which is taken from a separate *Threatened Species Tool*.

Unlike clearing proposals, incentive proposals are summarised into a single metric, or score, for terrestrial biodiversity value that combines the above elements. This single metric facilitates the option of using market-like instruments to disseminate incentive funding. However, the way in which this metric is used to allocate incentives is not a subject covered in *BioMetric*.

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## 1 Introduction

This Manual is a guide for using *BioMetric*. *BioMetric* is an Excel™ tool that provides a quantitative assessment of the impacts (positive and negative) to terrestrial biodiversity of management activities. This tool, in conjunction with other tools that map native vegetation, assess threatened species, invasive native scrub, soils, water quality and salinity, is used to underpin the preparation of Property Vegetation Plans (PVPs) under the NSW *Native Vegetation Act* (2003).

*BioMetric* assesses losses of biodiversity from proposed clearing (including thinning), gains in biodiversity from proposed offsets, and gains in biodiversity from management actions proposed for incentives. *BioMetric* is a tool for assessing terrestrial biodiversity at the scale of the patch, paddock or property - it is not a planning tool.

Neither the *BioMetric* nor this Manual deals with assessments of threatened species, invasive native scrub, water quality, soils or salinity. *BioMetric* does not deal with private native forestry, clearing for routine agricultural management activities, continuation of existing farming activities, or clearing of regrowth.

### 1.1 The NSW Native Vegetation Act (2003)

Property Vegetation Plans are developed under the NV Act (2003). The objects of the NV Act (2003) are:

- a) to provide for, encourage and promote the management of native vegetation on a regional basis in the social, economic and environmental interests of the State, and
- b) to prevent broadscale clearing unless it improves or maintains environmental outcomes, and
- c) to protect native vegetation of high conservation value having regard to its contribution to such matters as water quality, biodiversity, or the prevention of salinity or land degradation, and
- d) to improve the condition of existing native vegetation, particularly where it has high conservation value, and
- e) to encourage the revegetation of land, and the rehabilitation of land, with appropriate native vegetation, in accordance with the principles of ecologically sustainable development.

Under the NV Act (2003) PVPs may be submitted by landholders for native vegetation management. Among other things, PVPs may provide for:

- a) proposals for clearing native vegetation on the land, and
- b) proposals to enable landholders to obtain financial incentives for managing natural resources, including funding native vegetation management activities by Catchment Management Authorities (CMAs).

### 1.2 Proposals for clearing native vegetation

Proposals for clearing (including thinning) native vegetation generally fall into one of the following categories:

- ‘green’ category - actions that improve or maintain environmental outcomes in their own right and can be undertaken without offsets or mitigating actions (thinning native vegetation to benchmark stem densities for that vegetation type falls within this category)
- ‘amber’ category - actions that usually require offsets or mitigating actions to improve or maintain environmental outcomes (offsets that provide gains equal to, or exceeding, losses from clearing subsequently fall into the ‘green’ category)
- ‘red’ category - actions that cannot be undertaken as they do not improve or maintain environmental outcomes (clearing native vegetation with high conservation value, i.e. vegetation not in low condition and of a type, or within a landscape, that is highly cleared, falls into this category as do offsets that do not provide gains equal to, or exceeding, losses from clearing).

A flow chart outlining the framework for assessing proposals to clear native vegetation is in Figure 1.

### 1.3 Proposals for incentive funding

A score, or metric, is allocated to incentive proposals based on the existing biodiversity value of the site and the predicted biodiversity value of the site with proposed management inputs. This score is calculated using similar data to that used to assess proposals to clear native vegetation. The mechanism for allocating funds is external to the assessment process in *BioMetric*.

## 2 An outline of the assessment process

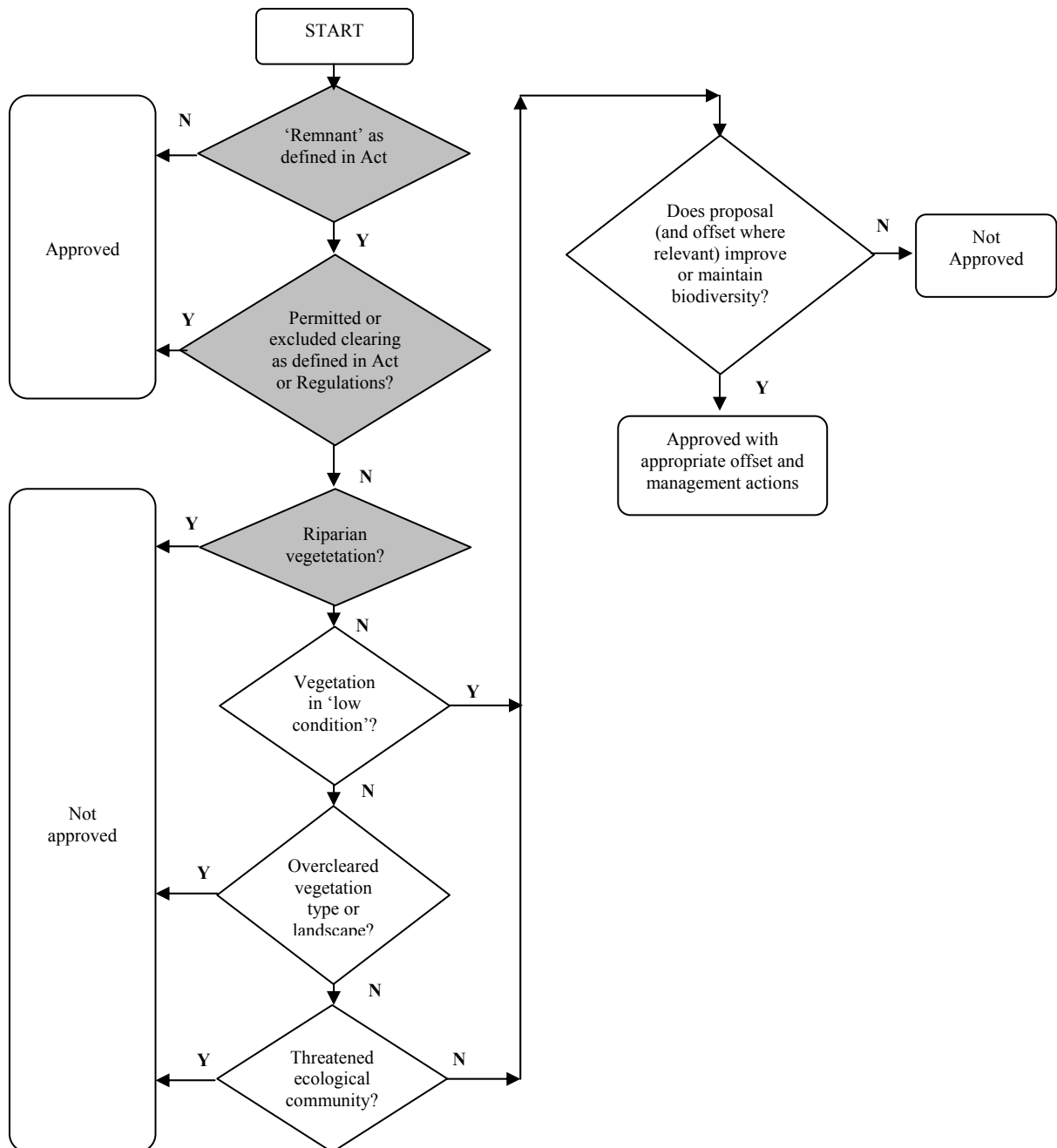
This section outlines the process for assessing proposals to clear, thin or obtain financial incentives for, native vegetation using *BioMetric*. *BioMetric* incorporates the following steps (details of which are provided in the next section):

- Step 1. PVP type
- Step 2. Can assessment proceed?
- Step 3. What are the impacts of clearing?
- Step 3b. Can thinning proceed without offsets?
- Step 4. Can the impacts of clearing be offset?
- Step 5. Incentives
- Step 6. Summary of *BioMetric* assessment.

### 2.1 Resources required to complete an assessment

The following resources are required to complete an assessment using *BioMetric*:

- ❑ hard copy of the *BioMetric* Operational Manual
- ❑ laptop computer loaded with the *PVP Developer* software (note that *BioMetric* works best with the computer screen resolution set to 1024x768)
- ❑ orthorectified digital imagery for the property extending a distance of at least 1.75km from the property boundary
- ❑ a digital layer of any vegetation mapping in the study area is desirable
- ❑ hard copy printout of imagery for the proposal that can be annotated.



**Figure 1. Flow chart of the assessment process for clearing in a PVP. Unshaded steps in the flowchart are in *BioMetric*. Steps shaded grey are not assessed using *BioMetric*. Note that threatened species, water quality, soils, salinity and invasive native scrub are assessed using other tools.**



- ❑ hard copy data entry sheets (templates available at [http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric\\_tool](http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric_tool)) (these can be customised as required)
- ❑ printed copy of relevant vegetation types and definitions for the CMA from *BioMetric* (i.e. there are descriptions of each vegetation type in the CMA in *BioMetric* that can be formatted as required). These are also available on the website listed above
- ❑ definitions of potential Threatened Ecological Communities (TECs) that may occur on the site listed under the *Threatened Species Conservation Act* (<http://www3.environment.nsw.gov.au/npws.nsf/Content/Threatened+Species+Search> and search for Ecological Communities), and *Environmental Protection and Biodiversity Conservation Act* (<http://www.deh.gov.au/cgi-bin/sprat/public/publiclookupcommunities.pl>)
- ❑ relevant benchmarks for vegetation condition from [http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric\\_tool](http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric_tool) or from reference sites
- ❑ Global Positioning System (GPS) receiver
- ❑ 2 x 50m measuring tapes and tent/surveyors pegs to secure tape ends
- ❑ small measuring tape/diameter tape
- ❑ clipboard and pencils
- ❑ digital camera (not essential)
- ❑ plant identification books if required (native and weeds)
- ❑ portable printer to leave preliminary copies of PVP with landholder if feasible.

## 2.2 Prior to the site inspection

Background work done prior to the site inspection will reduce the amount of time spent at the site. An initial visit to the site prior to the inspection proper may be desirable. *BioMetric* can be used to do a desk-top simulation of proposals to obtain indicative results, however, all assessments must be ultimately validated with field data. The suggested actions prior to the site inspection are as follows:

1. Refer to the *BioMetric* website for the most recent versions of supporting documentation and data ([http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric\\_tool](http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric_tool)).
2. At first contact with the landholder obtain as much information about the proposal as possible (i.e. boundaries and areas of proposal including offsets if relevant, vegetation types and general condition of vegetation in proposal areas, and proposed nature and impact of clearing on all zones that form the proposal). Inform the landholder about offsets (i.e. that offsets must provide a gain in biodiversity that is equivalent to the expected loss in biodiversity from development and must be located in a similar vegetation type to the development site). This step could require an initial visit to the site.
3. Use the *PVP Mapper* to place the approximate location of the proposal area in the Mitchell Landscape layer and any available vegetation maps to determine whether the proposal is likely to be in an over-cleared landscape or over-cleared vegetation type and therefore could be a “Red light”. Vegetation maps are usually too coarse for reliably showing vegetation types at the scale of the patch or paddock, so the actual vegetation types must be confirmed during a site visit. However, vegetation maps may indicate vegetation types likely to be at the site.
4. Undertake as much of the assessment as possible in the office using the *PVP Mapper* and *BioMetric* and available data prior to the site inspection.

5. If sufficient information has been provided to indicate that the proposal will be unsuccessful as it stands, then consider discussing with the landholder prior to the site inspection.
6. Print a hard copy of the orthorectified image with property boundary, riparian areas, proposal area (if known) and Mitchell Landscape boundaries marked on it. Annotate each Mitchell Landscape with its per cent cleared estimate (obtained from Step 1 in *BioMetric*). Consider printing the 0.2, 0.55 and 1.75km radii circles on a transparency at the same scale as the image/photo for overlaying in the field (see Step 3).
7. Print hard copies of all data sheets from *BioMetric* for completion in the field.
8. Print a copy of the relevant vegetation type definitions from *BioMetric*.
9. If data have been entered into *BioMetric*, save a copy of the preliminary assessment on the laptop in the PVP Developer and take it to the site inspection.

## 2.3 The site inspection

A suggested order of assessment using *BioMetric* for each type of PVP (Clearing, Clearing (thinning only), and Incentives) is provided in this section (the actual order of assessment will be at the discretion of the site assessor, and will depend on information gleaned prior to the site inspection, availability of facilities to use a laptop computer and the complexity of the assessment). The process detailed below is based on the assumption that data are initially entered in field sheets printed from *BioMetric* and a laptop computer is not used until the end of the assessment (i.e. either at the homestead or back at the assessor's office). However, data can be entered into the laptop at any stage through the assessment if conditions allow.

### 2.3.1 Proposals to clear native vegetation

The steps for assessing proposals to clear native vegetation in the field are:

1. Outline the process with the landholder or proponent.
2. Map the proposal area(s) on the hard copy aerial photo or satellite image with the landholder.
3. Walk and/or drive around the proposal area, identify and map the discrete vegetation zones on the hard copy aerial photo or satellite image (see Step 2, below, for definitions of zone).
4. Collect required field information for each zone and record in the relevant field data sheet (see Step 2).
5. If the application is a "Red light" (see Step 2 for criteria) then discuss options with the landholder (e.g. modifying the proposal, considering incentives). The assessment for biodiversity for the current clearing proposal is complete if an application is determined to be a "Red light" at this point.
6. If the proposal is not a "Red light" then record the necessary plot data for each zone in the relevant field data sheet (see Step 3, below).
7. If facilities for using a laptop computer are available then transpose data from the data sheets into *BioMetric* at the property and discuss the offset requirements.
8. If facilities for using a laptop computer are not available then discuss the likely offset requirements with the landholder and undertake Step 4 of *BioMetric* on the offset site(s) using the relevant data sheets. This process is similar to steps 2-5 (above). If it is determined in the field that the offset is inadequate during Step 4 then this should be discussed with the landholder. If no feasible options are available then the assessment for biodiversity is complete for the proposal being

assessed. Necessary data for the PVP should then be entered in the laptop to verify the results.

9. If all information has been collected on the site, and there are indoor facilities available, then complete Step 6 of *BioMetric*, and print a draft PVP on site. The advantage of running *BioMetric* at the site is that any modifications to the proposal can be discussed and tested on site without a further site visit.
10. If the assessment cannot be completed on site then complete the above step in the CMA office. Discuss the results with the landholder via telephone or arrange another meeting. If the proposal is unsuccessful discuss options.
11. Obtain the appropriate clearance for the assessment before finalising the PVP.

### **2.3.2 Proposals to thin native vegetation**

The steps for assessing proposals to thin native vegetation in the field are:

1. Outline the process with the landholder or proponent.
2. Map the proposal area(s) on the hard copy aerial photo or satellite image with the landholder.
3. Walk and/or drive around the proposal area, identify and map the discrete vegetation zones on the hard copy aerial photo or satellite image (see Step 2, below, for definitions of zone) and record relevant data in field data sheets.
4. If there are indoor facilities available, then enter relevant data on benchmark stem densities for each vegetation type using information provided at the *BioMetric* website ([http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric\\_tool](http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric_tool)), or collected by the assessor on good condition reference sites. If the landholder wishes to thin below the benchmark then the assessment must continue as a clearing proposal as outlined in [Section 2.3.1](#)
5. Complete Step 6 of *BioMetric*, and print a draft PVP on site if feasible to do so. The advantage of running *BioMetric* at the site is that any modifications to the proposal can be discussed and tested on site without a further site visit.
6. If the assessment cannot be completed on site then complete the above two steps in the CMA office. Discuss the results with the landholder via telephone or arrange another meeting.
7. Obtain the appropriate clearance for the assessment before finalising the PVP.

### **2.3.3 Incentive PVPs**

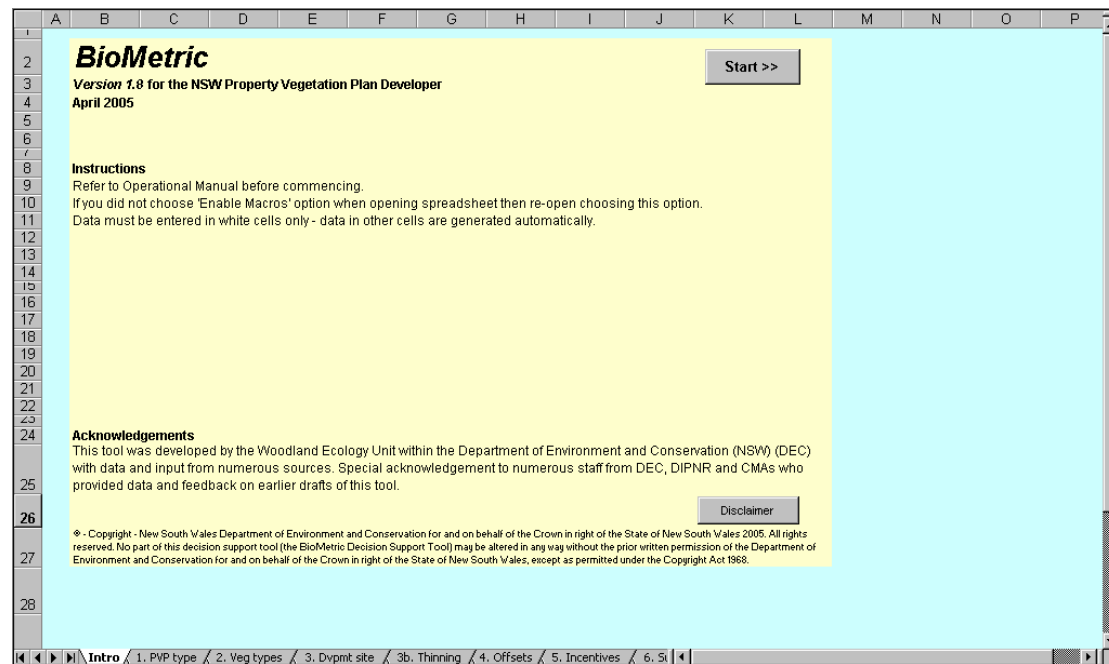
1. Outline the process with the landholder or proponent.
2. Map the proposal area(s) on the hard copy aerial photo or satellite image with the landholder.
3. Walk and/or drive around the proposal area, identify and map the discrete vegetation zones on the hard copy aerial photo or satellite image (see Step 2, below, for definitions of zone).
4. Collect required field information for each zone and record in the relevant field data sheets (see Step 5).
5. If facilities for using a laptop computer are available then transpose data from the data sheets into *BioMetric* at the property.
6. If all information has been collected on the site, and there are indoor facilities available, then complete Step 6 of *BioMetric*, and print a draft PVP on site. The advantage of running *BioMetric* at the site is that any modifications to the proposal can be discussed and entered on site without a further site visit.
7. If the assessment cannot be completed on site then complete the above step in the office and provide a copy to the landholder.

8. Obtain the appropriate clearance for the assessment and submit to the relevant incentive process for the CMA.
9. Formally notify the landholder as soon as results are available regarding funding.

### 3 A step-by-step guide to running *BioMetric*

The following sections describe how to work through the steps in the *BioMetric* tool.

#### 3.1 Introduction



This section of *BioMetric* contains basic instructions, copyright information and a link to a Disclaimer statement. When opening *BioMetric* you must select “Enable Macros”. *BioMetric* works optimally with the computer screen resolution set to 1024x768 . For new assessments always begin with a blank copy of the tool.

**Note these important points:**

- **Data are entered in white cells only.**
- **Any changes to data entry in drop-down cells should be made only after deleting the previous entry.**
- **Do not cut and paste data into drop-down cells.**

## 3.2 Step 1 - PVP type

### 3.2.1 What is the PVP number generated by the PVP Mapper?

Type in the application number generated by the *PVP Mapper*.

### 3.2.2 What is the CMA?

Select the CMA in which the proposal occurs from the drop-down list. All subsequent data for the assessment in *BioMetric* will be linked to this CMA.

### 3.2.3 What is the nature of the proposal?

Select the type of PVP from the drop-down list (the options are Clearing, Clearing (thinning only), Incentive or Continuous Use). The subsequent step in *BioMetric* differs with the type of PVP. *BioMetric* must be run separately for different types of PVP. If the application is for continuous use then further assessment using *BioMetric* is not required.

### 3.2.4 Clear all data

This button clears all data from *BioMetric*. Any data that is not saved will be lost.

## 3.3 Step 2 - Can assessment proceed?

Zone	Low condition?	Mitchell Landscape	Vegetation formation [CMA]	Vegetation type [CMA]	Threatened ecological community?	Can PVP assessment proceed for Zone?	L'scape % cleared	Veg. type % cleared
7d	No	Bega Granites	Wet Sclerophyll Forests (Shrubby subformation) [SR]	Wadbilliga River Valley Forest [SR]	No	Yes	69	0

This step identifies clearing proposals that can, and cannot, proceed from the outset. Native vegetation cannot be cleared if it: (a) occurs in an over-cleared landscape (>70% of native vegetation in Mitchell landscape cleared), OR (b) is an over-cleared vegetation type (>70% of vegetation type in the CMA is cleared), OR (c) is a threatened ecological community (as listed on the TSC Act or EPBC Act) AND (c) is NOT in low condition. Vegetation that is in low condition can be assessed further for clearing.

### 3.3.1 How many vegetation zones in proposal?

Select the number of zones (defined below) in the proposal from the drop-down list. Unwanted zones are hidden from view. The tool accepts up to 10 zones. If a proposal has more than 10 zones then it must be assessed as multiple proposals.

### 3.3.2 Zone

The development proposal must be divided into relatively homogenous or discrete zones for assessment. Each zone should represent a distinct vegetation type (according to the vegetation types provided in *BioMetric*) and broad condition state (vegetation in low condition must always form a separate zone to vegetation not in low condition). Zones within proposals do not need to be continuous (i.e. a single zone could occupy two or more discrete areas). Each zone must be >0.25ha in area (equivalent to 50mx50m). These zones should be digitized and labelled using the *PVP Mapper*, and the same zone labels entered into *BioMetric*. An example of a clearing proposal divided into zones is provided in Figure 2.

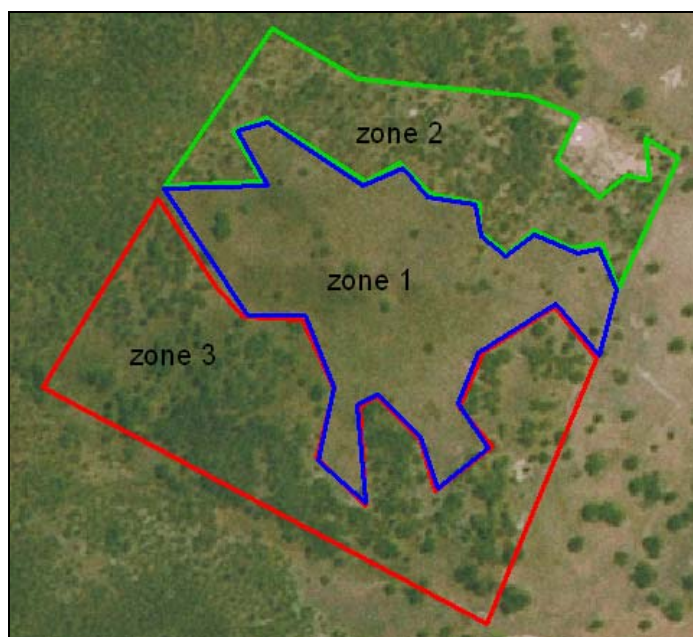


Figure 2. An example of how an area proposed for clearing (proposal area) should be broken into relatively homogeneous vegetation zones before commencing the assessment. This proposal has been broken into three zones: Zone 1, bounded by blue, is essentially cleared and was determined to be a single vegetation type; Zone 2, bounded by green, appears to be a distinct vegetation type that is in a broadly uniform condition state; and Zone 3, bounded by red, is the same vegetation type as in Zone 1, but is in a different condition state.

### 3.3.3 Low condition?

If the vegetation on the proposal site meets the definition of “low condition” then the assessment progresses to the next step regardless of whether the landscape and/or

vegetation type are highly (>70%) cleared. Vegetation in low condition has a high likelihood of not being viable in the long-term under current management, so an offset that improves long-term viability of other vegetation is appropriate. Definitions of vegetation in “low condition” are provided in Box 1.

**Box 1. Definitions for native vegetation in low condition.**

A. Native woody vegetation is in low condition if:

The over-storey per cent foliage cover is <25% of the lower value of the over-storey per cent foliage cover benchmark for that vegetation type

**AND**

<50% of vegetation in the ground layer is indigenous species or >90% is ploughed or fallow.

B. Native grassland, shrubland, wetland or herbfield in low condition if:

<50% of vegetation in the ground layer is indigenous species or >90% is ploughed or fallow.

Notes:

Only patches of vegetation >0.25ha are assessed separately (as distinct zones) from surrounding vegetation (e.g. a patch of vegetation with benchmark over-storey cover that is <0.25ha is not assessed separately from surrounding vegetation with sparser over-storey cover).

The ground layer must be assessed using a method consistent with the Regulation or the method detailed in [Appendix 3](#).

The over-storey is assessed using one of the methods in [Appendix 3](#).

### **3.3.4 Mitchell Landscape**

Native remnant vegetation cannot be cleared if it: occurs in a Mitchell Landscape that is >70% cleared and is NOT in low condition (see definitions of low condition in Box 1). The analysis of % cleared by Mitchell Landscape type was undertaken by overlaying the NSW Landscapes coverage (Mitchell 2002) with a presence/absence layer of native vegetation in NSW - an updated version of the layer developed by Pressey *et al.* (2000) called “SCMP Presence/Absence Vegetation” (NSW National Parks and Wildlife Service 2002).

Identify the Mitchell Landscape in which the site occurs using the NSW Landscapes coverage (Mitchell 2002) loaded in the *PVP Mapper*. Mitchell Landscapes were mapped at a broad scale (1: 250,000) so the Landscape in which a proposal occurs may not always be the landscape mapped (e.g. where the proposal occurs near the boundary of landscapes). The Mitchell Landscape chosen from the drop-down list in *BioMetric* can be different from the Landscape indicated by the map in the *PVP Mapper* if the description of an adjacent Landscape more accurately reflects the environment in which the proposal occurs. Field descriptions of Mitchell Landscapes are loaded into *BioMetric* to enable this and are accessed by selecting the



“Descriptions” button. When a Mitchell Landscape is selected *BioMetric* will look up the per cent of native vegetation cleared in this Landscape (this figure is provided to the right of screen). This figure can be annotated on the hard copy image printed for the site assessment.

### 3.3.5 Vegetation formation

Next the assessor selects the vegetation formation (Keith 2004) present in each zone to identify the list of possible vegetation types that will occur on the site. Select the vegetation formation that best matches the vegetation in the zone from the drop-down list (the “Definitions” button links to a key to the vegetation formations). If the vegetation is in low condition an expert judgment as to the vegetation formation that originally occupied the site must be made in the field based on the pattern of surrounding vegetation types at similar positions in the landscape. Do not use predicted pre-clearing vegetation maps to make this decision without field inspection.

### 3.3.6 Vegetation type

Remnant native vegetation cannot be cleared if it is a vegetation type that is >70% cleared and NOT in low condition (see definitions in Box 1). The National Objectives and Targets for Biodiversity 2001-2005 Agreement (Commonwealth of Australia 2001) signed by NSW, and the Natural Heritage Trust Bilateral Agreement (2003) signed between NSW and the Commonwealth for the provision of NHT funding require NSW to prevent clearing of ecological communities that are already >70% cleared.

The vegetation type closest to the vegetation at the site or likely to have originally occurred at the site (i.e. pre-clearing, or pre-1750) must be selected from the drop-down list. That is, the vegetation type should be the original vegetation type at the site, not the derived vegetation type. Derived vegetation types can be selected from the list only where the original vegetation type cannot be determined.

Vegetation types are an expression of environmental continua (Austin 1999) and therefore change continuously across a landscape. However, dividing vegetation into discrete communities is required for management. Some vegetation types observed in the field will not fit neatly into any of the vegetation types listed for a CMA in *BioMetric* (e.g., where the vegetation lies in an ecotone between two types). In these cases professional judgement is required regarding the closest matching vegetation type in *BioMetric*. Vegetation type is used in *BioMetric* as a surrogate for regional conservation value. Thus, the vegetation type chosen from the list in *BioMetric* should reflect this. For example, a site containing a mix of plant species typical of vegetation in flat, productive and highly cleared environments and plant species typical of steeper, less productive and less cleared environments should be classified as the vegetation type that is more typical of the environment supporting the vegetation.

The lists of vegetation types were assembled for each CMA based on best available data for each region (see the field definitions provided in *BioMetric* for a list of sources). Only sources that provided % cleared estimates could be used. A major review of vegetation types in NSW is underway by John Benson of the Royal Botanic Gardens. A link to definitions for each vegetation type within the chosen CMA is provided via the “Field Definitions” button (Figure 3). This list can be filtered or formatted as required. A list of vegetation types should be printed for use in the field



(or a subset comprising those vegetation types likely to be present at the proposal). Estimates of % remaining for the vegetation type selected (rounded to the nearest 5%) can be seen to the right of the screen in Step 2. These estimates are also provided with the field definitions.

	A	B	C	D	E	F	G	H	I
1	Definitions of vegetation types for Northern Rivers CMA								<< Go back
2	Use "Find" (Ctrl-F) to search the sheet								
3	Vegetation type	Dominant canopy spp	Main associated spp	Landscape position	Characteristic mid-storey spp	Characteristic groundcover spp	Other diagnostic features	Full reference details	Vegetation formation [CMA]
5	Angophora paludosa Rough barked Apple	Open forests and woodlands dominated by Angophora paludosa						NRAC (1995). Vegetation Survey and mapping of upper north east New South Wales. Natural Resources Audit Council.	Dry Sclerophyll Forests (Shrubby subformation) [NR]
6	Angophora robur Rough barked Apple	Characterised by A. robur. This species may be monodominant or mixed with other species including E. bancroftii, and E. tindaliae		Occurs in the Central Clarence region where it forms dry sclerophyll woodlands and forests on poor sandy soils	Dogwood (Jacksonia scoparia), Xanthorrhoea latifolia	Lomandra longifolia, Bossiaea rhombifolia, Dillwynia retorta, Banksia aemula, Banksia oblongifolia, Lomatia silaifolia		NRAC (1995). Vegetation Survey and mapping of upper north east New South Wales. Natural Resources Audit Council.	Dry Sclerophyll Forests (Shrubby subformation) [NR]
	Apple-Black Cypress (152)	Callitris endlicheri, Eucalyptus prava, Angophora floribunda, Eucalyptus subtilior			Leucopogon attenuatus, Hibbertia obtusifolia, Melichrus urceolatus, Acacia buxifolia, Xanthorrhoea johnsonii, Leucopogon muticus, Monotoca scoparia, Leptospermum trinervium, Cassinia quinqueferia, Lomatia silaifolia, Persoonia cornifolia, Acacia venulosa.	Dianella revoluta, Eragrostis brownii, Chelanthus sieberi, Aristida jerichoensis, Schoenus apogon, Imperata cylindrica, Gonocarpus tetragona, Lepidosperma laterale, Styphelia triflora, Lomandra longifolia, Trachymene incisa, Laxmannia complanata, Echinopogon caespitosus, Patersonia sericea, Entolasia stricta,		NPWS (1999). Forest Ecosystem Classification and mapping for the upper and lower north east CRA regions. CRA Unit Northern Zone National Parks and Wildlife Service.	Dry Sclerophyll Forests (Shrub/grass subformation) [NR]

Figure 3. An example of field definitions provided for vegetation types within a CMA.

### 3.3.7 Threatened ecological community?

Vegetation that is a threatened ecological community AND is NOT in low condition (see definitions in Box 1) cannot be cleared.

Determine whether the vegetation type is a threatened ecological community by referring to definitions in the TSC Act

(<http://www3.environment.nsw.gov.au/npws.nsf/Content/Threatened+Species+Search> and search for Ecological Communities) and the EPBC Act

(<http://www.deh.gov.au/cgi-bin/sprat/public/publiclookupcommunities.pl>). A full list of threatened ecological communities and their definitions should be assembled for the CMA prior to commencing assessments. This list should be updated periodically from the above websites.

### 3.3.8 Can PVP assessment proceed for zone?

A development proposal can only proceed to the next step if the answer to this question is "Yes" for all zones. If "Yes" is not answered in all zones, then the proposal must be revised for the assessment to continue. The assessor should ensure that the rows are filled from the top if the assessment proceeds (i.e. do not leave any blank rows above rows populated with data). If a change to the proposal is made delete the existing data for that row and re-enter the new data or an error will occur (this is a limitation associated with Excel and the Data Validation command).

### 3.4 Step 3 – What are the impacts of clearing?

**Step 3 - What are the impacts of clearing?**

	Regional value	Landscape value	Site value	Offsets required?	
Balance	-9	-20	-51	Yes	Go to Step 4 - Offsets

The impacts of clearing are assessed in terms of Regional Value (the vegetation type), Landscape Value (the configuration of vegetation) and Site Value (the quality and quantity of vegetation). These impacts are summarised in the fixed yellow pane at the top of the screen (note that if there is no impact of clearing at the scale of the site it follows that there cannot be an impact at the scale of the landscape or region). Negative impacts are represented by negative numbers.

#### 3.4.1 Regional Value

**Regional value**

Zone	Area (ha)	Vegetation formation [CMA]	Vegetation type [CMA]	%cleared
1	10	Dry Sclerophyll Forests (Shrub/grass subformation) [BRG]	Apple-Black Cypress (FE 182) [BRG]	55
2	8	Dry Sclerophyll Forests (Shrub/grass subformation) [BRG]	Dry Grassy Stringybark (FE 35) [BRG]	35
18		Total area (ha)		

Regional Value is based on the relationship between the % cleared of the vegetation types on the site relative to their pre-European (or pre-1750) extent within each CMA. A score is allocated based on the relationship between % cleared and a generic species area curve (Rosenzweig 1995). The area of each zone (in hectares obtained from the *PVP Mapper*) must be entered. Vegetation formation and type information for each zone are automatically transferred from Step 2.

#### 3.4.2 Landscape Value

**Landscape value**

	Current	With development
% cover within 1.75km radius (1000ha)	0-10%	0-10%
% cover within 0.55km radius (100ha)	0-10%	0-10%
% cover within 0.2km radius (10ha)	0-10%	0-10%
Connectivity value	Moderate	Low
Total adjacent remnant area	Small	
<b>Score</b>	13	7

Landscape Value is an assessment of the spatial configuration of vegetation, viz. total cover, connectivity and adjacency of native vegetation up to 1000ha around the proposal. For each measure (except Total adjacent remnant area) there is one assessment of the current state of the landscape around the entire proposal and one assessment of the state of the landscape were the proposal to proceed.

The measures of Landscape Value are:

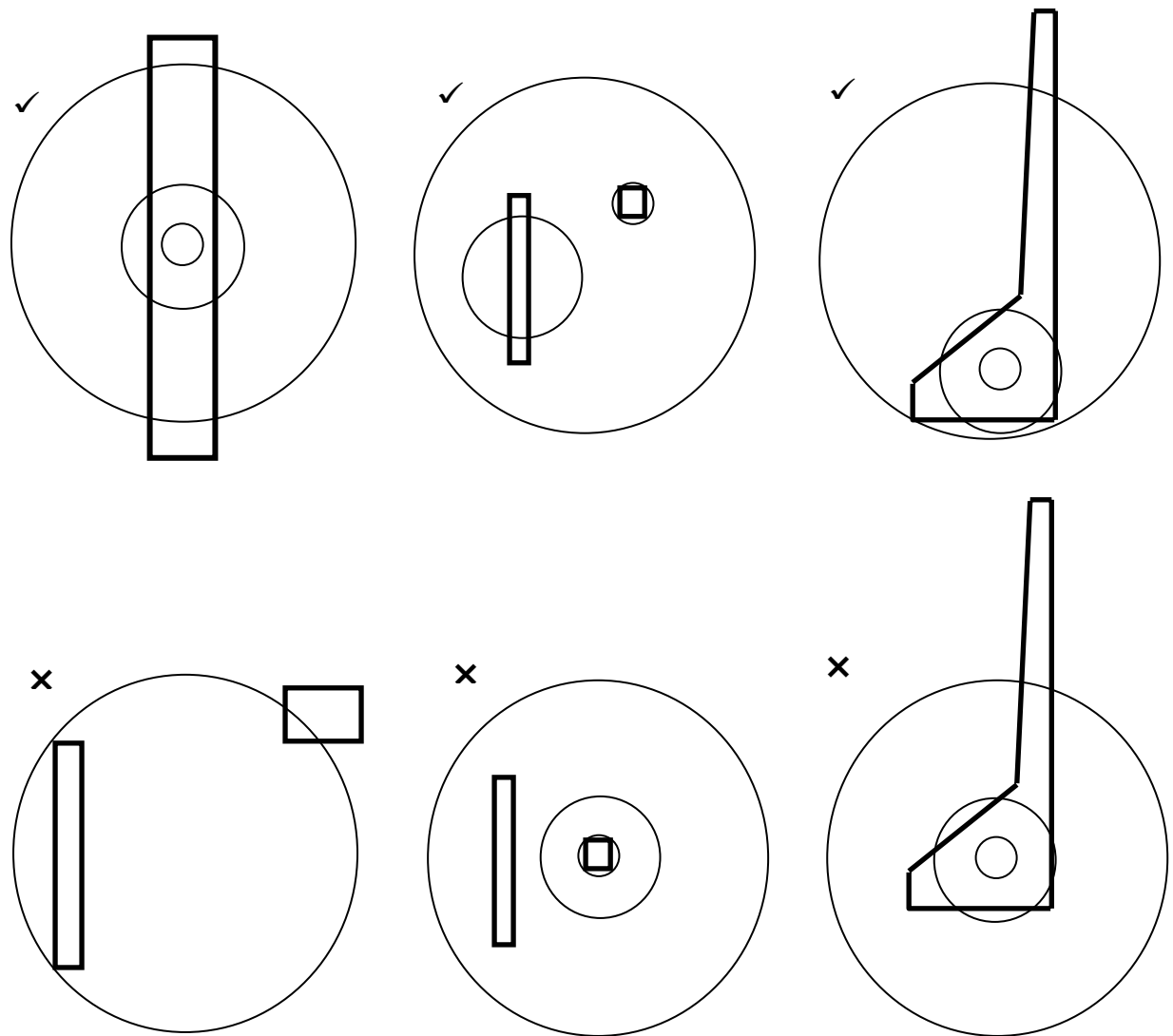
1. *% native vegetation cover in the landscape.* Current native vegetation cover and native vegetation cover after clearing must be assessed within radii of 1.75km (1000ha), 0.55km (100ha) and 0.2km (10ha) around the proposal site. Cover is estimated in categories of 0-10%, 11-30%, 31-70%, or >70% cover using the imagery in the *PVP Mapper* or on the hard copy printouts. These percentages represent thresholds at which fragmentation effects generally escalate for

different biota (Andren 1994, McIntyre *et al.* 2000). The different radii recognise that different biota range over, and are affected by, activities at different scales. Broader scales are assessed by other measures.

Tools in the *PVP Mapper* draw circles with these three radii. Each circle should be centred so it captures the maximum area of the proposal (see Figure 4). Non-contiguous proposals should be split into separate proposals if they cannot be completely contained within the largest circle (see Figure 4).

[Appendix 2](#) contains diagrams to assist with visual estimates of native vegetation cover in landscapes. Digitising tools in the *PVP Mapper* can be used to estimate the area of cover within any given circle if it lies close to a threshold that cannot be confidently assessed by eye. Cover estimates in woody vegetation are based on the % cover of the overstorey relative to the approximate benchmark for that vegetation type. For example, a completely vegetated circle with benchmark overstorey cover around the proposal would be assessed as >70% cover whether it is open woodland or closed forest. However, if the cover still occurred across the whole circle, but was around 30-70% of the benchmark overstorey cover for that vegetation (e.g. because of thinning) then the estimate of cover would be 30-70%. In non-woody vegetation (e.g. grassland) the assessment is based on the amount of vegetation in the landscape that is unlikely to meet the definition of low condition. These estimates can be made from the imagery and knowledge of the area. Any vegetation native to Australia can contribute to this measure (i.e. planted native species not indigenous to the area can contribute to this measure).





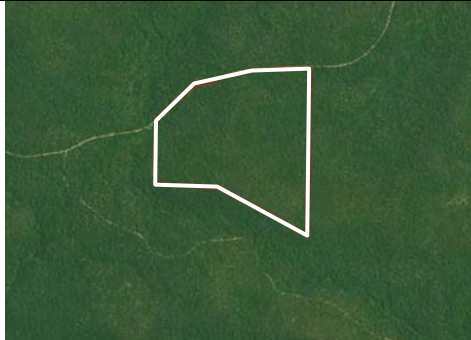
2. *Connectivity value.* This measure aims to assess the impact of the proposal on connectivity between surrounding vegetation. Assess the current connectivity value of the proposal area and the connectivity value with the proposal using the imagery of the site in the *PVP Mapper* as one of four levels: high, moderate, low, and nil, using the criteria in Table 1. Examples are provided in Figure 5 to assist with the assessment. The change in connectivity value that would occur were the proposal to proceed is used in *BioMetric* to calculate the impact of the proposal in this respect.



**Figure 4. Examples illustrating how to assess % native vegetation cover in the landscape for different proposals (outlined in bold). Each circle in which cover is assessed must be centred so it captures the maximum area of the proposal. Non-contiguous proposals should be split into separate proposals if they are not completely contained within the largest circle.**

**Table 1. Criteria for assessing connectivity value. Where the proposal includes multiple types of vegetation, choose the highest connectivity value that pertains to vegetation within the proposal. Vegetation is linked to surrounding native vegetation if it is  $\leq 100\text{m}$  from native vegetation that is, in turn, linked to native vegetation not in low condition and  $\geq 1\text{ha}$ . Any gap  $>100\text{m}$  within a proposal means that the vegetation is not linked. Low condition is as defined in Box 1, [Section 3.3.3](#).**

Connectivity value	Current	With proposal
High	The proposal includes vegetation that: <ul style="list-style-type: none"> <li>is <b>not</b> in low condition</li> <li>has an average width <math>&gt;100\text{m}</math>, and</li> <li>links to surrounding native vegetation on more than one compass quarter of the proposal.</li> </ul>	At least one high connectivity value vegetation link is maintained (following clearing) or created (by the offset or incentive proposal) between surrounding native vegetation on more than one compass quarter.
Moderate	The proposal includes vegetation that: <ul style="list-style-type: none"> <li>is <b>not</b> in low condition,</li> <li>has an average width of <math>&gt;30\text{m}</math>-<math>100\text{m}</math>, and</li> <li>links to surrounding native vegetation on more than one compass quarter of the proposal.</li> </ul>	At least one moderate connectivity value vegetation link is maintained (following clearing) or created (by the offset or incentive proposal) between surrounding native vegetation on more than one compass quarter.
Low	The proposal includes vegetation that: <ul style="list-style-type: none"> <li>is in low condition,</li> <li>has an average width <math>&gt;100\text{m}</math>, and</li> <li>links to surrounding native vegetation on more than one compass quarter of the proposal;</li> </ul> OR The proposal includes vegetation that: <ul style="list-style-type: none"> <li>is <b>not</b> in low condition</li> <li>has an average width <math>\geq 5\text{m}</math>-<math>30\text{m}</math>, and</li> <li>links to surrounding native vegetation on more than one compass quarter of the proposal.</li> </ul> The proposal includes vegetation that: <ul style="list-style-type: none"> <li>links to surrounding native vegetation via exotic vegetation with similar structure to the proposal on more than one compass quarter.</li> </ul>	At least one low connectivity value vegetation link is maintained (following clearing) or created (by the offset or incentive proposal) between surrounding native vegetation on more than one compass quarter.
Nil	The proposal includes vegetation that meets none of the above definitions.	No links between vegetation surrounding proposal that meet any of the above criteria will be maintained (following clearing) or created (by the offset or incentive proposal).

Example clearing proposal	Current	With clearing
	Moderate, because the vegetation in the proposal area: <ul style="list-style-type: none"> <li>• is not in low condition,</li> <li>• has an average width of &gt;30-100m, and</li> <li>• is linked to surrounding native vegetation on two compass quarters.</li> </ul>	Nil, because no link (of any connectivity value) will be maintained between the surrounding areas of native vegetation following clearing of the proposal area.
	Low, because the vegetation in the proposal area: <ul style="list-style-type: none"> <li>• is in low condition,</li> <li>• has an average width &gt;100m, and</li> <li>• is linked to surrounding native vegetation on 4 compass quarters.</li> </ul>	Low, because a low connectivity value vegetation link will be maintained between surrounding remnants following clearing of the proposal area.
	Low, because the vegetation in the proposal area: <ul style="list-style-type: none"> <li>• links to other native vegetation via exotic vegetation with similar structure to the proposal (i.e. exotic pine plantation) on 3 compass quarters.</li> </ul>	Low, because a low connectivity value link will be maintained between surrounding native vegetation remnants ( $\geq 1$ ha) via exotic vegetation with similar structure (i.e. exotic pine plantation) following clearing of the proposal area.
	High, because the vegetation in the proposal area: <ul style="list-style-type: none"> <li>• is not in low condition</li> <li>• has an average width &gt;100m, and</li> <li>• is linked to surrounding native vegetation on 3 compass quarters.</li> </ul>	Moderate, because one vegetation link of moderate connectivity value (i.e. not in low condition and >30m-100m wide) will be maintained between the areas of surrounding native vegetation following clearing of the proposal area.
	High, because the vegetation in the proposal area: <ul style="list-style-type: none"> <li>• is not in low condition</li> <li>• has an average width &gt;100m, and</li> <li>• is surrounded by native vegetation (ie. is linked on 4 compass quarters).</li> </ul>	High, because high connectivity value vegetation links will be maintained between all areas of surrounding native vegetation following clearing of the proposal area.

**Figure 5: Clearing examples illustrating the four levels of connectivity value. Note, very dark vegetation patches (examples 3 and 4) are areas of exotic pine plantation.**



3. *Total adjacent remnant area.* The aim of this measure is to encourage offsets to be established adjacent to, or as part of, remnants that are of equivalent size or larger than the remnant in which clearing is proposed to occur. This reflects findings that vegetation that is adjoining, and therefore part of, large remnants is generally of more value to biota than vegetation that is adjoining, and therefore part of, smaller remnants (e.g. Platt 2002). Record the total remnant area of which the proposal is a part as one of four levels: very large, large, medium, or small. Very large, large, medium, and small remnants are defined differently according to the extent to which the Mitchell Landscape in which most of the proposal occurs has been cleared (Table 2). This figure can be obtained from Step 2 in *BioMetric*. Digitising tools in the *PVP Mapper* can be used to help estimate the area of the adjacent remnant if necessary.

**Table 2. Criteria used for assessing total adjacent remnant area. Adjacent remnant area refers to the area (ha) of native vegetation that is not in low condition and is linked to ( $\leq 100$ m from) the proposal area. The % of native vegetation cleared in the Mitchell Landscape in which most of the proposal occurs is calculated in Step 2.**

Level for total adjacent remnant area	% native vegetation cleared in the Mitchell Landscape in which most of proposal occurs			
	<30%	30-70%	71-90%	>90%
Very large	>500	>100	>50	>20
Large	201-500	51-100	21-50	11-20
Medium	101-200	21-50	11-20	1-10
Small	<100	<20	<10	<1

### 3.4.3 Site Value

**Site value** Go to plot data entry sheet before proceeding with this section [Go to plot data entry sheet](#)

Zone

	Current score (0-3)	Score with development (0-3)	
Native plant species	3	2	
Native over-storey cover	2	2	
Native mid-storey cover	0	0	
Native ground cover (grasses)	3	3	
Native ground cover (shrubs)	3	3	
Native ground cover (other)	3	2	
Lack of exotic plant cover	3	2	
Number of trees with hollows	2	2	
Overstorey regeneration	3	3	
Total length of fallen logs	2	0	
<b>Total (out of 100)</b>	68	47	<b>Score</b>
<b>Total x Area</b>	169	118	-51

Site Value is assessed for each zone by measuring the ten condition variables in plots and comparing the measured values with benchmarks. Benchmarks represent the range of variability for the condition variables in relatively unmodified examples of the same vegetation type. Each condition variable is allocated a score in *BioMetric* from 0-3 (0=low, 1=moderate, 2=high, 3=very high) based on the difference between its measured value and its benchmark. This scoring system is explained in Table 3.

**Table 3. Explanation of the way each variable in Site Value is scored.**

Variable	Score in <i>BioMetric</i>			
	0	1	2	3
Native plant species richness	0	0-<50% of benchmark	50-<100% of benchmark	≥ benchmark
Native over-storey cover	0-10% or >200% of benchmark	>10-<50% or <150-200% of benchmark	50-<100% or >100-150% of benchmark	within benchmark
Native mid-storey cover	0-10% or >200% of benchmark	>10-<50% or <150-200% of benchmark	50-<100% or >100-150% of benchmark	within benchmark
Native ground cover (grasses)	0-10% or >200% of benchmark	>10-<50% or <150-200% of benchmark	50-<100% or >100-150% of benchmark	within benchmark
Native ground cover (shrubs)	0-10% or >200% of benchmark	>10-<50% or <150-200% of benchmark	50-<100% or >100-150% of benchmark	within benchmark
Native ground cover (other)	0-10% or >200% of benchmark	>10-<50% or <150-200% of benchmark	50-<100% or >100-150% of benchmark	within benchmark
Exotic plant cover (calculated in <i>BioMetric</i> as % of total ground and mid-storey cover)	>66%	<33-66%	<5-33%	0-5%
Number of trees with hollows	0 (unless benchmark includes 0)	>0-<50% of benchmark	50-<100% of benchmark	≥ benchmark
Proportion of over-storey species occurring as regeneration	0%	>0-<50%	50-<100%	≥100%
Total length of fallen logs	0-10% of benchmark	0-50% of benchmark	50-100% of benchmark	≥ benchmark

Site Value is assessed as follows:

1. Plots are established in each zone. Zones are relatively homogeneous units within the proposal. However, given there is always variation in native vegetation, plots should be established in each zone in approximate proportion to any different habitat types that occur in that zone to achieve a representative sample. It is difficult to provide hard and fast rules regarding the number of plots that must be established.

Recommended steps for establishing plots within a zone are as follows: (a) divide the zone roughly into homogeneous units (e.g. denser and sparser vegetation) using the imagery (these units do not need to be digitised or recorded); (b) roughly estimate the proportion of the zone taken up by each unit; (c) allocate a minimum of one plot to the smallest unit and then allocate plots to the remaining units in proportion to their area (e.g. if there are two units and the smallest is approximately one third of the total area of the zone then allocate one plot to the smallest unit and two plots to the larger unit). A maximum of ten plots should be



measured within a single zone. Plots should be established randomly within a zone (or within the different habitat types within a zone). This can be done by: marking points randomly on the imagery within the zone and establishing plots at all, or some, of these points or pacing a random distance into the zone, establishing a plot at this point and then repeating the process.

- The ten Site Value variables are measured in plots or across the zone, recorded on a data entry sheet in the field (sample field data sheets are available at the *BioMetric* website [http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric\\_tool](http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric_tool)) and transcribed into the *BioMetric* plot data entry sheet (“Data entry – Development site”). There is a button at the Site Value section of Step 3 that takes you to this sheet). Methods for measuring Site Value variables in the field are described in [Appendix 3](#).

**Data entry - Development site**      << Go back      To Data entry-Benchmarks      Paddock tree calculator

**Zone**      10a

**Vegetation type**      South Coast River Flat Forest (SR)

Are benchmarks available for this vegetation type?      ☐

**Plots within veg zone**

Variables	Benchmarks	1	2	3	4	5	6	7	8	9	10
Native plant species	≥ 33	36									
Native over-storey cover	35 to 60	26									
Native mid-storey cover	10 to 36	1									
Native ground cover (grasses)	5 to 10	5									
Native ground cover (shrubs)	0 to 5	1									
Native ground cover (other)	45 to 65	65									
Exotic plant cover	See Manual	1									
Number of trees with hollows	≥ 4	2									
Overstorey regeneration	See Manual	1									
Total length of fallen logs	≥ 100	97									

- Enter benchmark values for the condition variables in the data entry sheet (“Data entry – Development”). Benchmark data are available for most vegetation classes (*sensu* Keith 2004) in each CMA at [http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric\\_tool](http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric_tool). Benchmark data must be entered manually. If benchmark data are not available for a vegetation type on the site they must be obtained from reference sites of the same vegetation type in relatively unmodified condition. Methods for obtaining benchmarks from reference sites are described in [Appendix 1](#). Use the “Data entry – Benchmarks” worksheet (a link from the “Data entry – Development site” sheet is provided) to enter benchmark data obtained from plots at reference sites. This worksheet automatically calculates benchmark values, which then need to be manually transcribed by the assessor to the Development site data entry sheet.
- A score from 0-3 for each variable in each zone is generated in *BioMetric* based on the differences between observed data and benchmark data for each variable (**note that a higher score is given for low exotic plant cover and a low score for high exotic cover**). The assessor then predicts the impact of the development proposal on each condition variable in each zone using the information in [Appendix 4](#).

5. Site Value for each zone is calculated in *BioMetric* as the difference in the value of the proposal area before and after clearing multiplied by the area of the zone. The total Site Value is this figure summed across all zones.
6. The balance sheet at the top of Step 3 will indicate when an offset is required, i.e. if the proposed clearing will not improve or maintain environmental outcomes. If an offset is required then the next step is described in [Section 3.6](#). If an offset is not required then the next step is described in [Section 3.8](#). The “Next step” button on this sheet will take you to the appropriate step.

### 3.5 Step 3b - Can thinning proceed without offsets?

#### Step 3b - Can thinning proceed without offsets?

This module is only to be used where the Invasive Native Scrub guidelines do not apply. Benchmark data for stem densities are available separately.

Can thinning proceed?

Yes

Proceed to next step

<< Back to Step 1

Next step >>

*BioMetric* is used to assess only those thinning proposals that are not assessed in the *Invasive Native Scrub Tool*. Step 3b is the next step in *BioMetric* if the proposal is recorded as “Clearing (thinning only)” in Step 1. Thinning improves or maintains environmental outcomes—and does not require offsets—if, and only if, it results in: stem densities at or above a pre-defined benchmark for the vegetation type; minimal disturbance to remaining vegetation; and does not occur over more than 80% of the proposal area. If proposed thinning does not meet these criteria the assessment returns to Step 1 and must be assessed as a regular clearing application. Note that the policy position on thinning was still under discussion at the time of writing.

#### 3.5.1 Vegetation types

Record the vegetation formation and type for each zone and the area of each zone in the same way as for a regular clearing proposal [Sections 3.3.5 and 3.3.6](#).

#### 3.5.2 Zones

Diameter class (cm)		Benchmark stems (per ha)	Mean spacing between stems (m)	Will thinning result in a stem density equal to or above benchmark?
0	to 10	400	5	Yes
11	to 20	200	7	Yes
	to			
	to			
	to			

Can thinning proceed for this Zone? Yes

The assessment for each zone is the simple matter of entering relevant data for the vegetation type on: (a) the diameter classes to which the vegetation type has been divided; and (b) the benchmark stem densities by diameter class. Some benchmark data are available from [http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric\\_tool](http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric_tool), but reference sites may be required to obtain benchmark stem densities (see [Appendix 1](#)). Record whether the landholder proposes to thin to a level equal to, or above, the benchmark. No plots need to be established at the proposal to assess this. The mean spacing between stems at the benchmark stem density is calculated within *BioMetric* to assist

with this judgement. Thinning can proceed without offsets if the answer is “Yes” for all diameter classes in all vegetation zones and thinning is consistent with the other conditions listed above.

### 3.6 Step 4 - Can the impacts of clearing be offset?

**Step 4 - Can the impacts of clearing be offset?**

	Regional value	Landscape value	Site value	Improve or maintain?	
Balance	0	0	1	Yes	Go to Step 6 - Summary

<< Previous step    To Summary sheet >>

Losses of biodiversity from clearing must be offset by commensurate gains to biodiversity on other sites for the proposal to improve or maintain environmental outcomes. Offsets are based on the principle of like-for-like to ensure that any gain is comparable with any loss. Offsets can therefore only improve or maintain if:

- d) the offset is in a vegetation type of equal or greater Regional Value than the vegetation cleared;
- e) improvements in Landscape Value brought about by the offset are commensurate with losses in Landscape Value brought about by clearing; AND
- f) improvements in Site Value on the offset site are commensurate with losses in Site Value from clearing.

The impacts of the clearing and offset assessments appear in the balance section at the top of the screen in this sheet. As you fill out the relevant sections in this step the balance will be updated. Offsets can only improve or maintain environmental outcomes if the value for each component of the assessment is not negative. That is, there is no point in continuing from the Regional Value assessment to the Landscape Value assessment or from the Landscape Value Assessment to the Site Value assessment unless the balance for each of the completed assessments is greater than or equal to zero.

The negotiation of offsets could require several iterations, requiring modification of the initial development and offset proposals. This will require the assessor to go backwards and forwards in *BioMetric*. The *BioMetric* tool can be used to explore what-if scenarios based on estimated data, but the final assessment must be underpinned by adequate real field data.

#### 3.6.1 Regional Value

This is measured in the same way as described in [Section 3.4.1](#). The proposal cannot proceed if the offset returns a negative balance at the top of the worksheet. If this occurs the assessor must modify or terminate the assessment.

#### 3.6.2 Landscape Value

Landscape value			
	Current	With offsets	
% cover within 1.75km radius (1000ha)	11-30%	11-30%	
% cover within 0.55km radius (100ha)	0-10%	0-10%	
% cover within 0.2km radius (10ha)	11-30%	11-30%	
Connectivity value	Nil	Low	
Total adjacent remnant area		Large	
% within riparian area		0-25%	
Score (out of 100)	13	33	Balance 13

Landscape Value is measured in the same way as described in [Section 3.4.2](#), with an additional measure called “% within riparian area”. Offsets with >25% of their area within riparian areas (i.e. riparian zone plus buffer as defined in [Appendix 5](#)) receive an additional score (i.e. this recognises the high value of riparian areas for biodiversity (e.g. MacNally et al. 2000)). The ‘With clearing & offset’ part of the assessment is made on the assumption that the proposed clearing has occurred. The assessment cannot proceed if the offset for Landscape Value returns a negative balance in the summary at the top of the worksheet, in which case discuss options with the landholder or terminate the assessment.

### 3.6.3 Site Value

This part of the assessment can only proceed if the offset has passed the Regional Value and Landscape Value components of the assessment (recorded in the Balance at the top of the worksheet).

The ‘Current score’ is measured as described in [Section 3.4.3](#).

The ‘Score with offset’ is based on the extent to which the management actions proposed by the landholder will improve the state of each variable. Note that these do not need to be new management actions - they may include, or be confined to, actions that the landholder is already undertaking and for which further gains are expected. For example, it is quite feasible that a landholder proposes, as an offset, an area in which grazing was previously excluded and proposes to continue to exclude grazing. If the assessed gain from continuing this activity is commensurate with the loss from development assessed in [Step 3](#) then this would be an appropriate offset.

For each zone the assessor predicts the future condition of the 10 condition variables based on the proposed management actions. The predicted improvements in condition must be consistent with the duration of the offset. Guidelines for scoring management actions are provided in [Appendix 4](#). We encourage each CMA to develop guidelines specific to local conditions.

Proposed management actions can only advance the score for each variable 1 or 2 levels, depending on the variable (except tree hollows for which no improvement can be scored because of the period required for hollows to form). These limits reflect the slow rate at which restoration occurs and the inherent risk associated with achieving biodiversity outcomes in the long-term. The proposed management actions for each zone are recorded in the tick boxes (multiple actions can be ticked), but note that these tick boxes are not linked to the scoring system, i.e. the effects of management must be scored manually. There is space for recording the specific details of each management action in the next step. An example of an assessment of current and predicted Site Value is in Figure 6.

**Site value**      Go to plot data entry sheet before proceeding with this section      [Go to plot data entry sheet](#)

Zone

	Current score (0-3)	Score with offset (0-3)	Management actions for this zone
Native plant species	3	3	<input checked="" type="checkbox"/> Grazing exclusion
Native over-storey cover	3	3	<input type="checkbox"/> Strategic grazing
Native mid-storey cover	1	3	<input checked="" type="checkbox"/> Planting/direct seeding
Native ground cover (grasses)	2	3	<input checked="" type="checkbox"/> Weed control
Native ground cover (shrubs)	0	1	<input type="checkbox"/> Erosion control
Native ground cover (other)	3	3	<input type="checkbox"/> Feral herbivore control
Lack of exotic plant cover	2	3	<input checked="" type="checkbox"/> Retain dead timber
Number of trees with hollows	2	2	<input type="checkbox"/> Retain regrowth
Overstorey regeneration	3	3	
Total length of fallen logs	1	2	
<b>Total (out of 100)</b>	65	85	<b>Score</b>
<b>Total x Area</b>	154	203	61

**Figure 6. Assessing Site Value on an offset zone. Site Value with the proposed offset is determined by predicting how each site value variable will change with the agreed management actions. The maximum change for each variable is 1 or 2 levels in the score, except for tree hollows, which cannot be improved with management actions because of the long timeframe required for hollows to form.**

Note that the ‘Score’ for each zone is not simply the difference between the ‘Current score’ and the ‘Score with offset’. The extent to which the zone could be degraded over time within the minimum standards set by the NV Act (2003) is taken into account. This means that landholders will not get a better score by degrading native vegetation (within the standards of the NV Act) on the proposed offset site prior to the assessment, and equally, landholders who have managed native vegetation above the standards of the NV Act are rewarded for that management.

The Balance at the top of this sheet (Step 4) indicates whether the offset is sufficient for the proposal to pass the three components of the assessment. If none of the three balances in the summary are negative, the “Improve or maintain?” outcome is “Yes”, and the assessment may proceed to Step 6 – Summary of *BioMetric* Assessment. If the proposal does not pass, then the proposal must be modified or the assessment is terminated.

### 3.7 Step 5 – Incentives

**Step 5 - Incentives**

The incentive score is calculated first on the basis of the current value of the site and second on the value of the site after proposed management. [To Step 6: Summary](#)

	Duration of commitment	Regional value	Threatened species	Landscape value	Site value	Score per ha (out of 100)	Total (Score x Area)
<b>Summary</b>	0.5	77	50	56	24	29	295

Applications for incentive funding are assessed using the same types of data as applications for clearing (i.e., Regional Value, Landscape Value and Site Value) with the addition of a measure for the duration of management commitment, and a threatened species index for incentives taken from the *Threatened Species Tool*. The biodiversity value of management actions proposed by the landholder is predicted in a similar way as for offsets in [Step 4](#). However, there are three key differences in the way the biodiversity index for incentives is calculated compared with offsets:

1. The scores for duration of management commitment, Threatened Species, Regional Value, Landscape Value and Site Value are combined into a single

score per hectare out of 100. The total score for the incentive proposal is the per hectare score multiplied by the area of the proposal. A single metric or score enables a broad suite of policy instruments (e.g. market-based instruments such as tender schemes) to be employed to allocate incentives.

2. The duration of the management commitment is factored in as a multiplier of the incentive index. Agreements in perpetuity have greater value for biodiversity than temporary agreements.
3. The Site Value part of the index is calculated as the product of the current Site Value and the difference between the predicted Site Value with management and the predicted Site Value without management, as guided by the minimum standards for managing native vegetation in the NV Act (2003). Current management actions that enhance condition and which the landholder continues are taken into account when increases in condition with management actions are scored for incentives. This both rewards landholders who manage their land well for biodiversity and allocates priority to sites in reasonable condition that are more likely to recover with management.

### **3.7.1 Regional Value**

Regional Value for Incentives is assessed as for Clearing PVPs ([Section 3.4.1](#)).

### **3.7.2 Landscape Value**

Landscape Value is assessed as for Clearing proposals ([Section 3.4.2](#)), but only for the ‘with proposal’ component (ie. ‘current’ value is not assessed).

### **3.7.3 Site Value**

Site Value is assessed as for Clearing proposals ([Section 3.4.3](#)) although there are differences in the way the score is calculated as outlined [above](#).

### **3.7.4 Threatened Species**

A score for benefits for threatened species that must be transcribed from the *Threatened Species Tool*.

### **3.7.5 Duration of Commitment**

Management actions that last longer receive higher scores. Management actions in perpetuity result in the highest scores. Duration of commitment is calculated as a multiplier on the overall incentive score. In perpetuity agreements receive a multiplier of one (i.e. the full score contributed by threatened species score, Regional Value, Landscape Value and Site Value), while shorter agreements receive multipliers of less than one (5 years=0.1, 10 years=0.3, 15 years=0.5). Choose the appropriate duration of commitment after discussing with the landholder.

Options and methods for delivering incentive PVPs were under discussion at the time of writing.

### 3.8 Step 6 – Summary of BioMetric assessment

Step 6 - Summary of BioMetric assessment					
PVP number	1				
CMA	Murrumbidgee				
PVP type	Clearing				
Net area (ha) of proposal	26.1				
Net area (ha) of offset (where relevant)	20				
<div style="text-align: right;"> <a href="#">&lt;&lt; Previous step</a> <a href="#">Fill out summary sheet</a> </div>					
Improve or maintain (Development only)?	Yes				
Overall score (Incentives only)					
<b>Detailed description of proposal</b>					
Zone	Area (ha)	Zone type	Management action	Detailed description of agreed action	Duration
1	26.1	Development	Development	Remove all paddock trees for cropping	18/4/2005 - 16/5/2005
2	12	Offset	Grazing exclusion	Fence and remove stock grazing in perpetuity	18/4/2005 - in perpetuity
2	12	Offset	Retain dead timber	Exclude all removal of dead timber	18/4/2005 - in perpetuity
3	8	Offset	Grazing exclusion	Fence and remove stock grazing in perpetuity	18/4/2005 - in perpetuity
3	8	Offset	Planting/direct seeding	Plant Yellow Box and Grey Box seedlings sourced from local seed at a spacing of approximately 3m x 3m. Replant where gaps are 6m x 6m or more.	planting 18/4/2005 - 16/5/2005 with ongoing monitoring

The final step in *BioMetric* provides a summary of the assessment and agreed actions. It includes the following information automatically copied from the main body of the assessment:

- basic application details (e.g. PVP number, CMA);
- nature of application (i.e. PVP type); and
- results from the assessment.

This information is used in the overall PVP agreement for the site, which also includes detailed information about the proposal, soils, salinity, threatened species information and assessment, a map of the property and all proposed management actions.

#### 3.8.1 Detailed description of agreed action

The assessor must provide a description of each action within each zone. The description of each management action should include, where relevant: (a) the objective of the action; (b) a description of the action that will be undertaken; (c) when the action is to be undertaken; and (d) a monitoring and adaptive management strategy. Principles for developing management agreements are provided in separate PVP documentation.

#### 3.8.2 Duration

The starting date and finishing date for the action must be entered, with a schedule for ongoing actions if relevant.

## 4 References

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Pressey, R.L., Hagar, T.C., Ryan, K.M., Schwarz, J., Wall, S., Ferrier, S., and Creaser, P.M. (2000). Using abiotic data for conservation assessments over extensive regions: quantitative methods applied across New South Wales, Australia. *Biological Conservation* **96**, 55-82.

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## 5 Glossary

**Benchmark.** Benchmarks are quantitative measures of the range of variability in vegetation with relatively little evidence of modification by humans since European settlement. Benchmarks are defined for specified variables by vegetation community at the scale of the stand or patch. Vegetation with relatively little evidence of modification generally has minimal timber harvesting (few stumps, coppicing, cut logs), minimal firewood collection, minimal exotic weed cover, minimal grazing and trampling by introduced or over abundant native herbivores, minimal soil disturbance, minimal canopy dieback, no evidence of recent fire or flood, not subject to high frequency burning, and evidence of recruitment of native species. Benchmarks are currently available by vegetation class (*sensu* Keith 2004) at [http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric\\_tool](http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric_tool).

**Broadscale clearing.** Clearing of remnant native vegetation or protected regrowth (as defined in the NSW Native Vegetation Act 2003).

**Clearing.** Broadscale clearing of native vegetation that is not thinning to benchmark stem densities.

**Cover.** The area occupied by the periphery of vegetation, i.e. when the vegetation outline is treated as a solid object. Expressed as per cent.

**Connectivity value.** A measure of the extent to which native vegetation not in low condition is linked. Assessed as high, moderate, low, nil according to Table 1 in [Section 3.4.2](#).

**Derived vegetation type.** A vegetation type modified substantially since European Settlement and with no relatively unmodified analogue.

**Development.** Clearing or thinning of native vegetation in the context of a PVP.

**dbh.** Stem diameter at breast height, i.e., at 1.3 metres above the ground.

**Foliage Cover.** The amount of light intercepted by vegetation (leaves and branches) as if a light source were directly overhead. Expressed as a per cent.

**Low condition vegetation.** Defined in Box 1 in [Section 3.3.3](#).

**Landscape Value.** Extent of fragmentation, connectivity and adjacency of native vegetation within 1000 ha of the site being assessed.

**Listed ecological community.** Critically endangered, endangered or vulnerable ecological community listed under the NSW Threatened Species Conservation Act 1995 or the Federal Environment Protection and Biodiversity Conservation Act 1999.

**Management actions.** Actions that lead to increases (or occasionally decreases) in Site Value. Gains in biodiversity to offset loss in biodiversity from clearing are partly derived from increases in condition predicted to occur with management actions. Management actions must fall under eight broad headings - stock grazing exclusion, strategic stock grazing, planting or direct seeding of native vegetation, weed control,

erosion control, feral herbivore control, retention of all dead timber, retention of all regrowth (regrowth as defined in the NSW Native Vegetation Act 2003).

**Mitchell Landscape.** NSW is divided into 580 relatively homogeneous landscapes in terms of geomorphology, soils and broad vegetation types mapped at a scale of 1:250,000 (Mitchell 2002, 2003). These landscapes are used in parts of the assessment in *BioMetric*.

**Offset.** Actions on a site that aim to balance any losses on another site proposed for clearing.

**Overcleared landscape.** A Mitchell Landscape in which more than 70% native vegetation cover has been cleared.

**Overcleared vegetation type.** A vegetation type of which more than 70% has been cleared in the Catchment Management Area.

**Percent foliage cover.** Percent foliage cover is equivalent to the amount of shadow that would be cast on the ground if there were a light source directly overhead.

**Permitted clearing.** Broadscale clearing that is permitted as defined in Section 8 of the NV Act 2003.

**Plot.** Area in which the assessment of individual variables that make up the Site Value score are undertaken; usually 0.1 hectare or 0.04 hectare depending on the condition variable being measured.

**Proposal.** The proposed site and management actions put forward for assessment by a landholder.

**Reference site.** Relatively unmodified sites used to obtain benchmark information where the benchmarks are not already available for a vegetation type. Refer to [Appendix 1](#).

**Regional Value.** Regional Value is a measure of the conservation significance of the vegetation type at the regional scale and is measured in *BioMetric* as the percentage of the original extent that a vegetation type has been cleared in the CMA. The greater the percentage of the original extent of a vegetation type that has been cleared the higher is its Regional Value.

**Regrowth.** Any native vegetation that has regrown since 1983 in the Western Division or 1990 in the case of other land or since the date specified in a PVP (see Section 9 of NV Act).

**Riparian area.** Area in riparian zone and buffer as defined in [Appendix 5](#).

**Stem density.** Number of tree stems per hectare. Where a single tree has multiple stems then refers to the largest stem.

**Site Value.** Quantitative measure of structural, compositional and functional condition of native vegetation multiplied by the area of the zone.

**Thinning.** Removing individual trees or shrubs only to benchmark densities. Thinning to benchmark levels for stem densities improves or maintains environmental outcomes for biodiversity in its own right (no offset is required). Thinning to below benchmark levels for stem densities generally requires offsets to improve or maintain environmental outcomes for biodiversity and is assessed as clearing.

**Total adjacent remnant area.** The total remnant area of which the proposal is a part. Assessed as very large, large, medium or small using criteria in [Section 3.4.2](#).

**Vegetation Class.** An intermediate level of vegetation classification as defined in Keith (2004). There are 99 vegetation classes across NSW.

**Vegetation Formation.** A broad level of vegetation classification as defined in Keith (2004). There are 17 vegetation formations across NSW.

**Vegetation type.** The finest level of vegetation classification employed in *BioMetric*. Typologies were obtained from a number of sources across NSW, so vary in the way they were defined, but are generally at the classification level of association as defined in the Native Vegetation Information System (National Land and Water Resources Audit 2000).

**Zone.** Relatively homogenous unit within proposal area that is the same vegetation type and broad condition state. A single zone must not contain a mix of vegetation in low condition and not in low condition.

## **Appendix 1      Obtaining benchmarks from reference sites, where no data are currently available**

The Site Value score in *BioMetric* is based on a comparison between measurements of several variables on the proposal area and a benchmark for each of these variables. Benchmarks are quantitative measures of the range of variability in vegetation with relatively little evidence of modification by humans since European settlement. Benchmarks are defined for specified variables by vegetation community at the scale of the stand or patch. Benchmarks derived from quantitative data and expert knowledge are available for most vegetation classes across NSW at [http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric\\_tool](http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric_tool). However, where benchmarks do not exist for a vegetation type they must be derived from measurements taken in reference sites, that is, sites measured in the same vegetation type in relatively unmodified condition.

### **Locating reference sites**

Reference sites are required to have little modification relative to other vegetation in the region as indicated by: minimal timber harvesting (few stumps, coppicing, cut logs), minimal firewood collection, minimal exotic weed cover, minimal grazing and trampling by introduced or over abundant native herbivores, minimal soil disturbance, dieback not in excess of normal senescence, no evidence of very recent major perturbation such as fire or flood, not subject to high frequency burning, and evidence of recruitment of native species.

It may be difficult to find totally unmodified sites in a landscape, particularly in highly cleared regions. Vegetation in relatively unmodified condition can be found in some travelling stock routes and reserves, national parks and nature reserves, state forests (especially Flora Reserves), cemeteries, roadsides and commons. Appropriate reference sites may exist on the assessment property. Reference sites can occur in small remnants, such as narrow roadsides and cemeteries. Sources of local knowledge regarding the potential location of reference sites include field-based staff from: CMAs, DEC, DIPNR, Department of Primary Industries (including Forests NSW), Rural Lands Protection Boards, Greening Australia, Landcare Coordinators, field naturalist clubs and landholders. Individuals who undertook the surveys underpinning the vegetation types listed in *BioMetric* (these sources are listed with the definitions of each vegetation type) may be another potential source of information regarding potential reference site locations.

### **Numbers of reference plots**

To obtain a reasonable composite picture that encompasses the variation in condition variables, a minimum of three reference plots for each variable should be measured for each vegetation type with more plots being desirable.

### **Field methods for measuring the vegetation condition variables on reference sites**

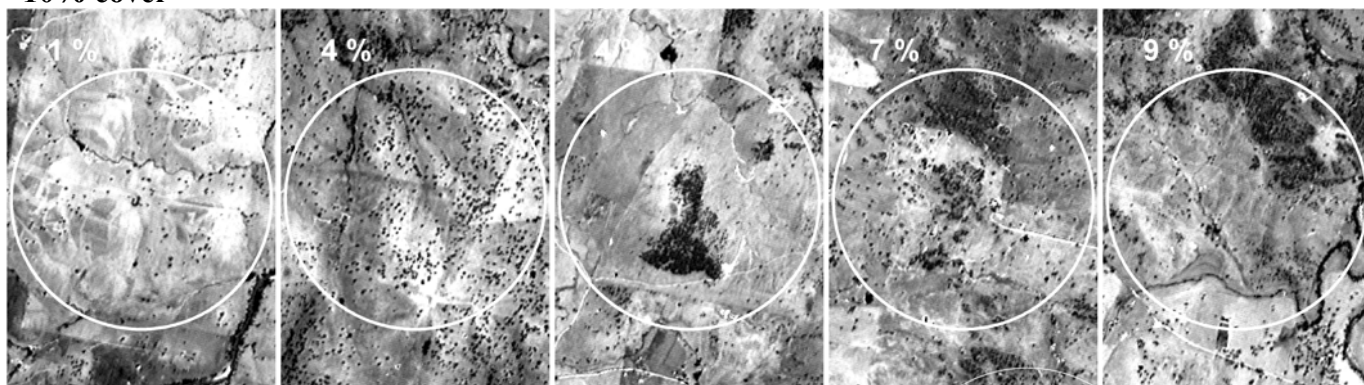
The methods for recording data from reference plots is identical to the methods for recording data for Site Value in PVPs as outlined in [Appendix 3](#). Field datasheets for reference plots are available at the *BioMetric* website ([http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric\\_tool](http://www.nationalparks.nsw.gov.au/npws.nsf/Content/BioMetric_tool)).

**Data entry**

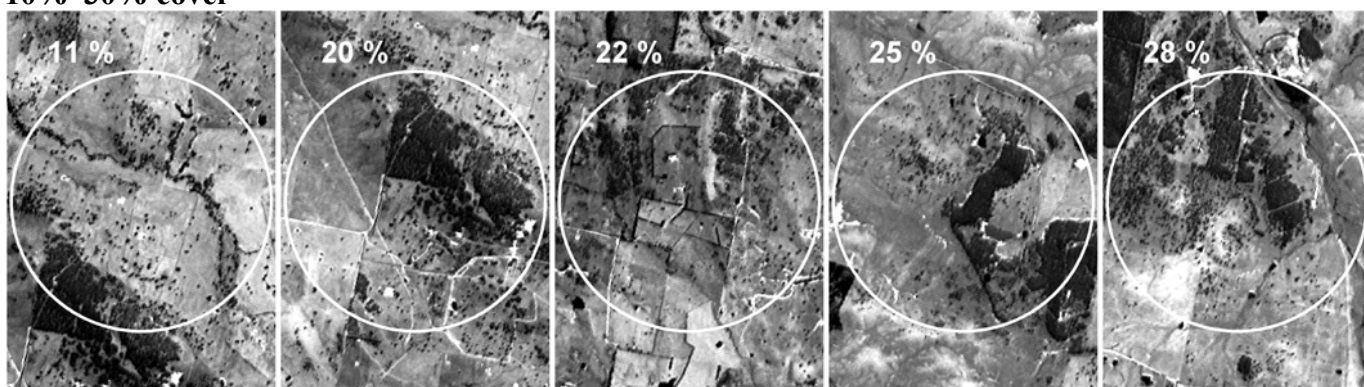
The data from all reference plots for a specific PVP assessment need to be entered into the “Data entry - Benchmarks” sheet in the *BioMetric* assessment for that property. Benchmark values are automatically calculated. These benchmarks then need to be copied by the assessor into the relevant data entry sheets (development, thinning, offset or incentive) in *BioMetric* for the Site Value assessment.

## Appendix 2 Per cent cover of native vegetation at the landscape scale

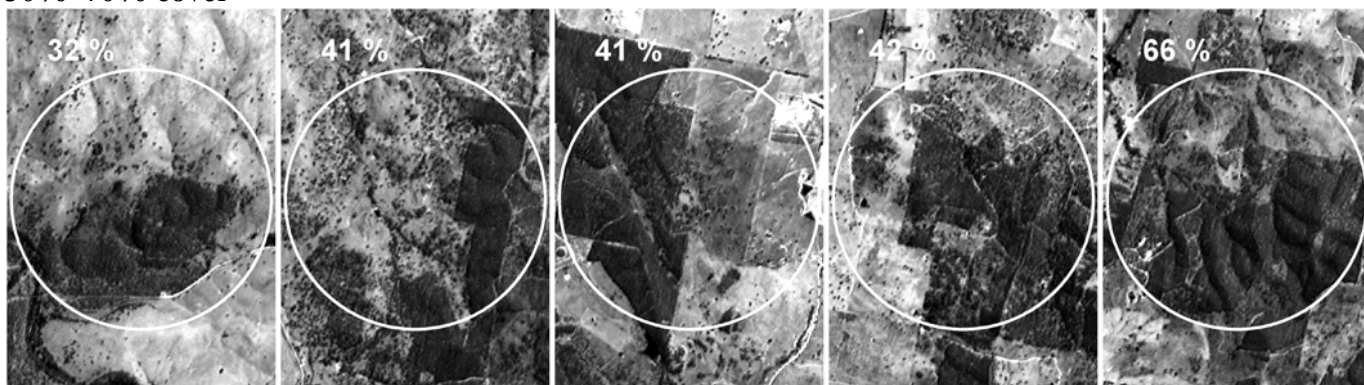
### <10% cover



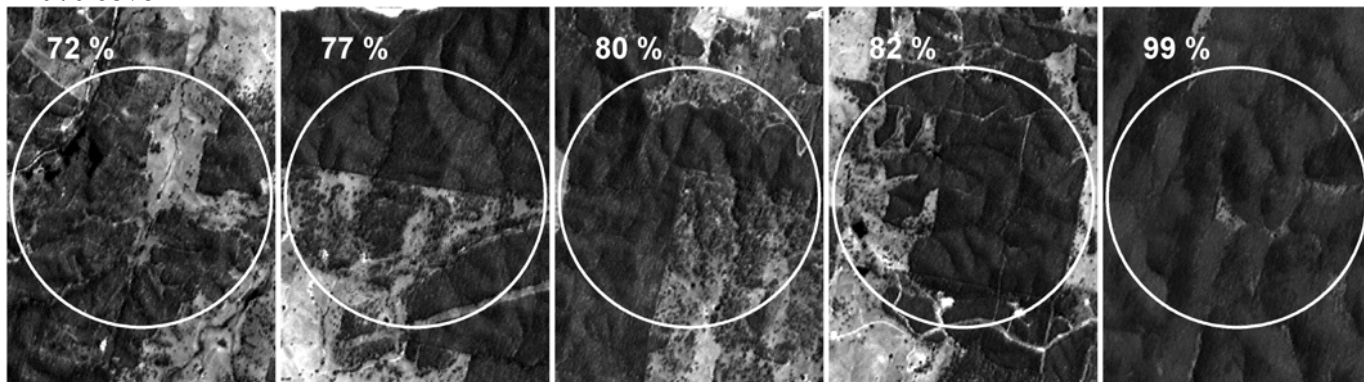
### 10%–30% cover



### 30%–70% cover



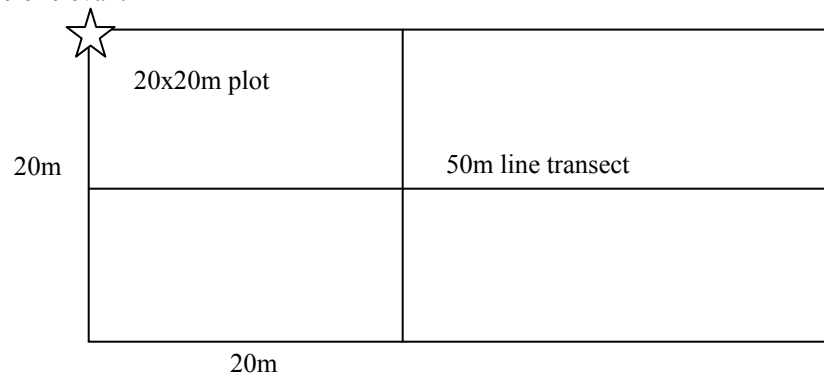
### >70% cover



## Appendix 3      Field methodology for measuring condition variables in Site Value

### Suggested plot layout

Plot marker and GPS point  
where relevant



**Figure 1. Layout of nested 20x50m and 20x20m plots used for the assessment of vegetation condition attributes.**



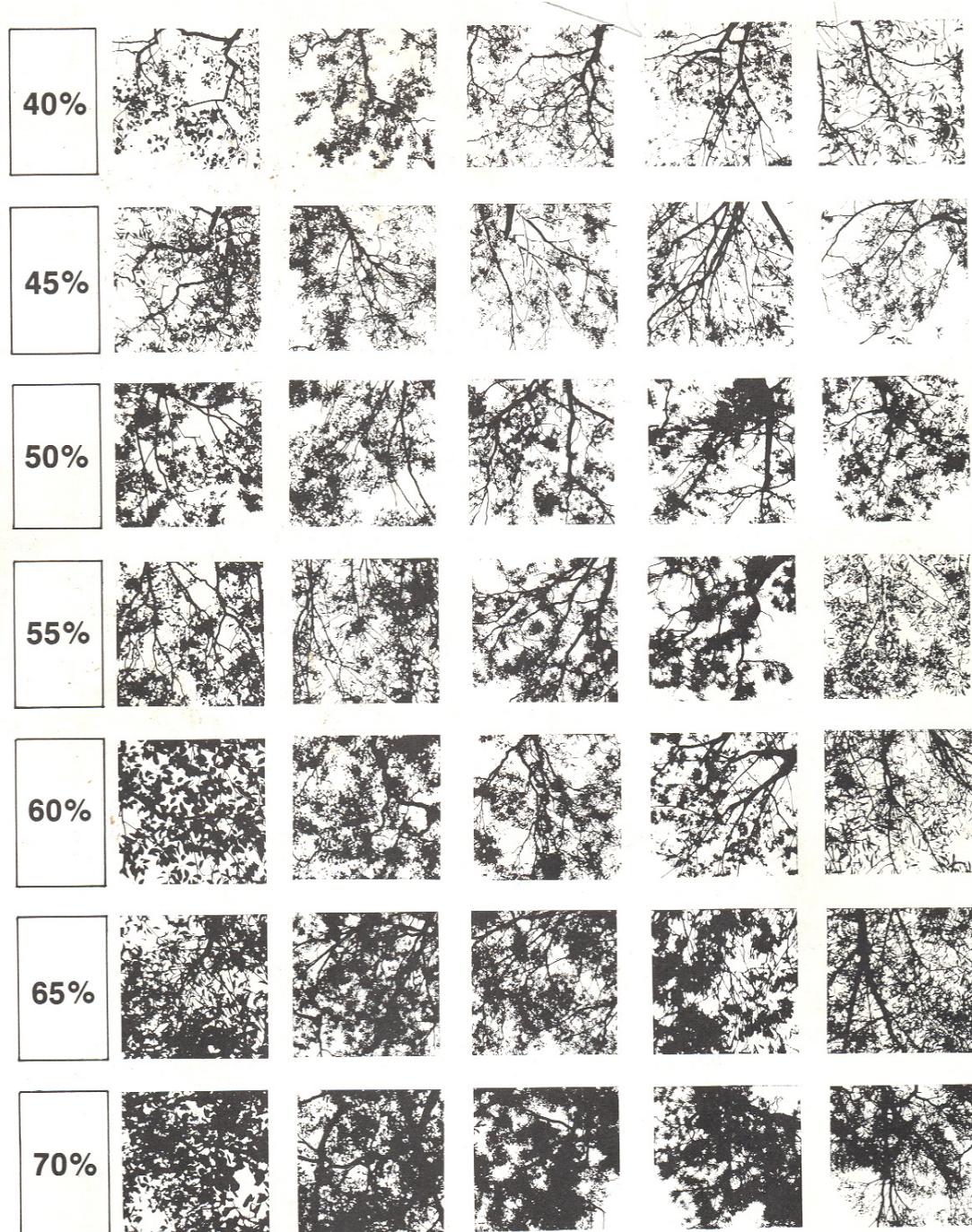
## Field methodology

**Table 1: Field methods for measuring the vegetation condition variables in Site Value. An asterisk indicates that an alternative method is provided for proposals where tree density is very low (e.g. paddock trees).**

Variable	Plot or transect type	Method
Indigenous plant species richness	20mx20m plot	Indigenous plant species refers to vascular species local to the area and, if planted, come from a local seed source. Systematically walk the plot counting the number of indigenous plant species for all vascular plants (i.e. the species do not have to be identified).
Native over-storey cover	At 10 points along a 50m transect*	<p>Native over-storey is the tallest woody stratum present (including emergents) above 1m and includes all species native to New South Wales (i.e. native species not local to the area can contribute to over-storey structure). In a woodland community the over-storey stratum is the tree layer, and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum. Over-storey cover is estimated as per cent foliage cover, which is equivalent to the amount of shadow that would be cast on the ground if there were a light source directly overhead and can be estimated using one of two methods:</p> <ol style="list-style-type: none"> <li>(1) At 10 points along the 50m transect (i.e. every 5m) estimate per cent foliage cover directly overhead using the images provided in Figure 2. Divide the total by the number of points (i.e. 10) measured along the transect (e.g. 50%, 0%, 0%, 40%, 0%, 45%, 50%, 55%, 0%, 0% = <math>240/10 = 24\%</math> foliage cover); OR</li> <li>(2) In proposals where the over-storey cover is very sparse (e.g. paddock trees), foliage cover can be estimated across the entire zone using the following steps: (a) calculate the average crown diameter of trees using the imagery in the <i>PVP Mapper</i>, (b) determine the average foliage cover of individual trees (estimated by observing several trees in the field using diagrams in Figure 2); (c) count the number of trees in a known area within the zone using the imagery and <i>PVP Mapper</i>; (d) enter these data in the Paddock Calculator in <i>BioMetric</i> (<a href="#">Appendix 7</a>) to arrive at the estimate for the entire zone. This figure must then be recorded as the over-storey cover estimate for <u>each plot</u> within the relevant zone.</li> </ol>
Native mid-storey cover	At 10 points along a 50m transect, or 20mx20m plot	<p>The mid-storey contains all vegetation between the over-storey stratum and 1m in height (typically tall shrubs, under-storey trees and tree regeneration) and includes all species native to New South Wales (i.e. native species not local to the area can contribute to mid-storey structure). Foliage cover of the mid-storey is expressed as a % and can be measured using one of two methods:</p> <ol style="list-style-type: none"> <li>(1) Visually estimate per cent foliage cover in a 20mx20m plot. The precision of the estimate can be improved if the assessment is conducted separately in each of the four 10mx10m quarters that make up the 20mx20m plot. In a 10mx10m sub-plot 1m<sup>2</sup> of foliage cover is equal to 1% of foliage cover (in a 20mx20m plot 1% of foliage cover is equal to 4 m<sup>2</sup> of foliage cover). Tally the total m<sup>2</sup> of foliage cover for each of the four 10mx10m sub-plot and average them for a per cent foliage cover estimate for the entire 20mx20m plot; OR</li> <li>(2) At 10 points along the 50m transect (i.e. every 5m) estimate per cent foliage cover in the mid-storey. Divide the total by the number of points (i.e. 10) measured along the transect (e.g. 50%, 0%, 0%, 40%, 0%, 45%, 50%, 55%, 0%, 0% = <math>240/10 = 24\%</math> foliage cover).</li> </ol>

Variable	Plot or transect type	Method
Native ground cover (grasses)	20mx20m plot, or at 50 points along a 50m transect	The ground stratum contains all native vegetation below 1m in height and includes all species native to New South Wales (i.e. is not confined to species indigenous to the area). The ground stratum (grasses) refers to native grasses (i.e. plants belonging to the family Poaceae). Foliage cover of the ground stratum (grasses) is expressed as a % and can be measured using one of two methods: (1) Visually estimate per cent foliage cover in a 20mx20m plot as described for native mid-storey cover above; OR (2) At 50 points along the 50m transect (i.e. every 1m) record whether native grass intersects that point. Divide the total of 'hits' by the number of points measured along the transect (i.e. 50).
Native ground cover (shrubs)	20mx20m plot, or at 50 points along a 50m transect	The ground stratum contains all native vegetation below 1m in height and includes all species native to New South Wales (i.e. is not confined to species indigenous to the area). The ground stratum (shrubs) refers to native woody vegetation <1m. It is measured in the same way as for native ground cover (grasses) (see above).
Native ground cover (other)	20mx20m plot, or at 50 points along a 50m transect	The ground stratum contains all native vegetation below 1m in height and includes all species native to New South Wales (i.e. is not confined to species indigenous to the area). The ground stratum (other) refers to non-woody native vegetation (vascular plants only) <1m that is not grass (e.g. herbs, ferns). It is measured in the same way as for native ground cover (grasses) (see above).
Exotic plant cover	20mx20m plot, or at 50 points along a 50m transect	Exotic plants are vascular plants not native to Australia. Exotic plant cover is measured as <u>total per cent foliage cover of all exotics</u> in all strata. Exotic cover was measured as a % of total ground cover vegetation in previous versions of <i>BioMetric</i> . This calculation is now done within <i>BioMetric</i> . If the exotics are in the over-storey then measure using the same method as native over-storey cover (see above), if exotics are in the mid-storey then measure using the same method as native mid-storey cover (see above) and if exotics are in the ground stratum then measure using the same method as described for native ground cover (grasses) (see above).
Number of trees with hollows	50mx20m plot*	This is a count of the number of living and dead trees within a 50mx20m plot with at least one hollow (note that the hollows do not have to be within the plot). A hollow is only recorded if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5cm across; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1m above the ground (this omits hollows in cut stumps or at the base of trees); and (e) the centre of the tree is within the plot. Trees should be examined from all angles.  In proposals where trees occur in very low densities (e.g. paddock trees), the number of trees with hollows per 0.1ha (equivalent to the area of a 50x20m plot) can be estimated by: (a) identifying a representative area (in hectares) over which all trees will be examined using the imagery in the <i>PVP Mapper</i> ; (b) recording the number of trees with hollows within this area; and (c) entering these data in the Paddock Calculator in <i>BioMetric</i> . This figure must then be recorded as number of trees with hollows in <u>each plot</u> within the relevant zone.
Regeneration	Entire zone	Regeneration is measured as the proportion of over-storey species present at the site that are regenerating (i.e. with dbh $\leq$ 5cm). For example if there are three tree species present at the site but only one of these species is regenerating, then the value is 0.33. The maximum value for this measure is 1.

Variable	Plot or transect type	Method
Total length of fallen logs	50mx20m plot	This is the total length of logs at least 10cm diameter and at least 0.5m long. The diameter is estimated with a measuring tape (or callipers if available) held horizontally immediately above the log and the length is estimated to the nearest metre by measuring with a tape, or pacing, along the part of the log that is at least 10cm diameter. If estimating length by pacing then the actual length of a sample of logs should be measured regularly with a tape so the assessor can calibrate their estimate derived from pacing. Only those parts of logs lying within the plot are measured.
Number of stems in specified diameter classes	50mx20m plot	<b>These data are only recorded in reference plots for thinning proposals where benchmarks do not exist.</b> This is a count of the number of stems of over-storey tree species in dbh classes relevant for the vegetation type. Record only those trees in which the centre of the stem is within the plot. Record only the largest stem for multi-stemmed trees.



**Figure 5** Crown types. Estimate the openness of individual tree or shrub crowns by matching the crown with a photograph. The rows show similar crown types for different leaf sizes (large to small, left to right); *Acacia phyllodes* are in the right hand row. Most Australian woody plants are in the range 40 per cent to 70 per cent.

**Figure 2.** Diagrams to assist with estimates of per cent foliage cover (from Walker and Hopkins 1998).



## Appendix 4      Guidelines for assessing the impacts of management actions on Site Value

This appendix provides guidelines to assess change in Site Value with proposed clearing and with proposed management actions.

Site Value is made up of 10 variables: richness, over-storey, mid-storey, ground layer (grasses, shrubs, other), exotic plant cover, trees with hollows, logs and regeneration. For the current value of the proposal site, a score between 0 and 3 is allocated to each variable based on the difference between the observed value in the proposal and the benchmark. Scores are allocated as described in [Section 3.4.3](#).

For the future value of the proposal site with management actions (i.e., clearing, offsets or incentives), the assessor must predict the loss or gain that can be feasibly expected with any proposed management actions. This appendix is a guide to doing this, but the assessor must also bring to bear informed judgement based on the local conditions to this decision. We encourage regional bodies to develop guidelines to assist assessors make transparent and consistent decisions in this regard.

### Predicting change in Site Value from clearing proposals

For proposals to clear native vegetation the assessment is based on the difference between the current value of the proposal site and the value of the proposal site were clearing to proceed. The method for assessing the current value of the proposal is explained in [Section 3.4.3](#). This process allocates a score between 0 and 3 to each variable. The assessor then assigns a score to each condition variable based on the effect of the proposed clearing. This step cannot be automated within *BioMetric* because many scenarios are possible and thus requires expert input by the assessor.

The impacts of clearing are often negative, but can vary in their effect. A proposal to clear intact woodland (e.g. to establish a crop) will generally take all condition variables down to zero (i.e. cropping does not generally include the permanent retention of any components of native vegetation). A proposal to partially clear the over-storey for grazing (i.e., where some trees will be retained for shade and other environmental services) will take the over-storey down one or two points commensurate with the level of over-storey removal. An understanding of how the Site Value score works (see [Section 3.4.3](#)) will help the assessor judge the extent of loss. For example, if the benchmark for over-storey is 20-30% cover and the site currently has 25% over-storey cover then the current score for over-storey is 3. If the proposal is predicted to result in an over-storey cover of around 5% then the score with the proposal would be 1 (i.e. the proposal results in over-storey cover that is within 10-50% of the lower benchmark), but if the proposal were to result in only few scattered trees, or a predicted over-storey cover of 1% then the score with the proposal would be 0 (i.e., 0-10% of the lower benchmark).

Some impacts of clearing can be positive. For example, the removal of over-storey and/or mid-storey without damage to the ground layer can stimulate increased cover in the ground layer. Certain rules must be observed when scoring an increase in value of a variable:

- (1) the increase in the score for each variable can generally only be by one point unless there is strong management intervention (e.g. planting or direct seeding of native pasture species) in which case the increase can be by two points;
- (2) planting or direct seeding will only result in an increase in richness if the species is indigenous to the area and the seed is sourced locally; and
- (3) where a variable is currently absent from the proposal site and adjacent area then an increase cannot generally be scored unless it is to be specifically introduced;
- (4) where an increase is not feasible because of other pressures associated with the proposal (e.g. grazing or exotic invasion) then an increase should not be scored;
- (5) an increase in some variables (e.g. ground cover) beyond the benchmark will result in a decrease in the score (e.g. if the current score for grass cover is 3 then an anticipated increase in grass cover beyond the benchmark range will reduce the score to 2).

### **Predicting change in Site Value with proposed management actions for offsets or incentives**

For proposals to manage native vegetation as part of offsets or incentive applications, the calculations of the score in *BioMetric* are based on the difference between the current Site Value of the proposal (minus any loss that is acceptable under the NV Act) and the future Site Value were the management actions implemented. Changes in the condition score with management actions is predicted for each of the 10 variables that make up Site Value. After assessing the current condition score for each variable in each zone the assessor must define the specific management actions that the landholder agrees to undertake and then estimate the future condition for each variable given these actions. Eight generic management actions listed in *BioMetric* (Table 1) are acceptable, although any combination of actions a landholder wishes to undertake that fall under these broad categories can be applied.

**Table 1. Definitions for generic management actions listed in *BioMetric*. Any combination of actions that fall under these broad headings is permitted.**

<b>Management action</b>	<b>Definition</b>
Grazing exclusion	The complete and permanent removal of grazing by all domestic stock at the site.
Strategic grazing	The implementation of a variable and adaptive stock grazing regime for enhancing biodiversity, such as for controlling exotic weeds or vegetation biomass and/or enhancing competitiveness of native perennial species. Typically involves short periods of intensive grazing between long periods of little or no grazing. Strategic grazing strategies differ with management goals, seasonal conditions and regions.
Planting/direct seeding	The direct establishment of tree, shrub or groundlayer species that are likely to have existed at the site, using species and seed sources suitable for the vegetation type and region.
Weed control	Reducing the number or cover of exotic plants using herbicides, manual or mechanical control. Stock grazing for weed management is covered by the management action 'Strategic grazing'. Landholders are required by law to 'continuously suppress and destroy' some weed species, including most Noxious Weed categories (all W1, W2, W4d and W4e weeds). Management of such species is therefore outside the definition of this management action.
Erosion control	The mitigation of mass soil movement. It can be achieved using engineering solutions, management of grazing and/or revegetation.

Management action	Definition
Feral herbivore control	Aims to eliminate or reduce to very low population densities exotic herbivores that contribute to high total grazing pressures and disturbance of areas of native vegetation. Feral herbivore species include rabbits, goats, pigs, horses, escaped domestic stock, and deer.
Retain dead timber	Means that no dead timber (i.e. logs and litter on the ground and standing dead trees) is removed from a site.
Retain regrowth	The retention of all regrowth on a site is defined as: not clearing communities of native vegetation comprising trees, under-storey and groundcover that have regrown since 1 January 1983 in the Western Division and 1 January 1990 in the case of other land.

Some general rules must be considered when scoring an expected increase in value of a variable with management:

- (1) the increase in the score for a variable can generally only be by one point unless there is strong management intervention (e.g. planting or direct seeding) in which case the increase can be by two points;
- (2) planting or direct seeding will increase the relevant cover values, but will only result in an increase in richness if the species are indigenous to the area and the seed is sourced locally;
- (3) where a variable is currently absent from the proposal site and adjacent area then an increase cannot generally be scored unless it is to be specifically introduced;
- (4) where an increase is not feasible because of other pressures associated with the proposal (e.g. grazing or exotic invasion) then an increase should not be scored;
- (5) no increase can be scored for trees with hollows because of the long period that hollows take to form (generally >100 years).

Suggested scores for different management actions in *BioMetric* are outlined in Table 2. However, when estimating the effect of management actions on the proposal site the assessor must balance the potential positive impacts of the proposed management actions with the potential negative impacts of other pressures on the same zone. For example, native ground cover is unlikely to increase with the removal of grazing alone on a site that has very high exotic ground cover. In Table 2 we have also suggested the conditions in which management actions are likely to have a positive effect. The information in Table 2 is intended as a guide only and should be informed by local conditions and professional judgement by the assessor.

**Table 2. Suggested responses to Site Value scores with different management actions. The + sign followed by a number refers to the suggested number of increments that the score should be increased with the activity and the codes (e.g. N1) refer to the conditions that should be present before such a response can be expected (see below for explanation of codes). This table is intended as a guide only and should be augmented by local knowledge.**

Variable	Grazing exclusion	Strategic grazing	Planting/ direct seeding	Weed control	Erosion control	Feral herbivore control	Retain dead timber	Retain regrowth
Indigenous plant species richness	+1 N1, E2	+1 N1, E2	+1 G1, P2	+1 N2, E2, G1, P1	+1 N2, E2, G1	+1 N1, E2, G1, F1, F2	No change	No change
Native over-storey cover	+1 E1, E2, P1, R1	+1 E1, E2, P1, R1	+2 G1, P2	+1 E2, G1, P1, R1	+1 E2, G1, R1	+1 E1, G1, F1, F2, P1, R1	No change	+1 G1
Native mid-storey cover	+1 N1, E1, E2, P1	+1 N1, E1, E2, P1	+2 G1, P2	+1 N2, E2, G1, P1	+1 N2, E2, G1	+1 N1, E1, G1, P1, F1, F2	No change	+1 G1
Native ground cover (measured separately for grasses, shrubs & other plant life forms)	+1 N1, E1, E2	+1 N1, E1, E2	+1 (+2 for grasses) G1, P2	+1 N2, E2, G1	+1 N2, E2, G1	+1 N1, G1, F1, F2	No change	No change
Exotic plant cover	+1 E2	+1 E2	+1 E2, P2	+1 E2	+1 E2	+1 E2	No change	No change
Number of trees with hollows	No change	No change	No change	No change	No change	No change	No change	No change
Over-storey Regeneration	+1 E1, E2, P1, R1, R2	+1 E1, E2, P1, R1, R2	+1 E1, E2, G1, P2	+1 E2, G1, P1, R1, R2	+1 E2, G1, P1, R1	+1 E1, E2, G1, P1, F2, R1	No change	No change
Total length of fallen logs	No change	No change	No change	No change	No change	No change	+1 T1	+1 T1

Codes for Table 2 are:

#### NATIVE SPECIES

**N1:** some palatable &/or grazing-sensitive native plant species (within relevant structural class/es) still present on site or in adjacent vegetation of same type.

**N2:** some native plant species (within relevant structural class/es) still present on site or in adjacent vegetation of same type.

#### EXOTIC PLANTS

**E1:** initial exotic ground cover on site is low.

**E2:** exotic plant species monitored and managed if cover increases.

#### GRAZING MANAGEMENT

**G1:** grazing management (exclusion or strategic stock grazing) undertaken if necessary to facilitate natural regeneration of native plant species in relevant structural class/es. Includes control of access to watering points.

#### PLANTING OR DIRECT SEEDING

**P1:** planting/seeding and follow-up management of indigenous local species relevant to vegetation type, landscape position & structural class/es if natural regeneration does not occur within three years. Seeds/seedlings to be of local provenance. Follow-



up management includes watering, grazing management, control of weeds & other competing species.

**P2:**

- appropriate site preparation prior to planting/seeding (including weed control)
- plantings restricted to indigenous local species relevant to vegetation type, landscape position & structural class/es, with seeds/seedlings of local provenance
- follow-up management of plantings for long-term survival (e.g. watering, grazing management, control of weeds & other competing species, replanting)
- planting configuration reflects natural density and patchiness
- grazing excluded until seedlings established.

**FERAL HERBIVORES**

**F1:** monitoring of specified feral herbivore species and management of populations to allow regeneration of native plant species in relevant structural class/es.

**F2:** existing (or recent) grazing pressure from feral herbivores moderate to high.

**NATURAL REGENERATION**

**R1:** nearby seed source of native over-storey species (on site or in adjacent vegetation of same type).

**R2:** site preparation for natural eucalypt regeneration, if necessary.

**FALLEN TIMBER MANAGEMENT**

**T1:** retention of all fallen timber.

## Appendix 5      Riparian zones and buffers - definitions

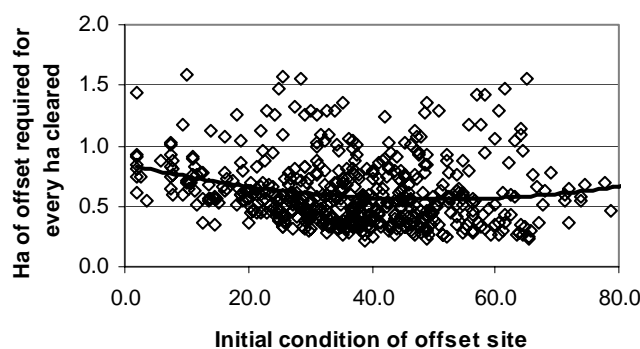
Widths of riparian zones and buffers (in parentheses). Figures are distances (m) from the top of each bank if defined, otherwise from the centre of the stream. More information is in Department of Infrastructure and Natural Resources (2005).

Location	Size of stream			
	Minor watercourses, flood runners and effluents	Minor creeks and lagoons	Minor rivers, wetlands and major creeks	Major rivers and important wetlands
Coast & tablelands	10m	20m	30m	40m
Western slopes and plains	20m	40m (+60m)	60m (+140m)	100m (+400m)
Estuarine areas	50m from the astronomical high tide mark (where no obvious bank).			

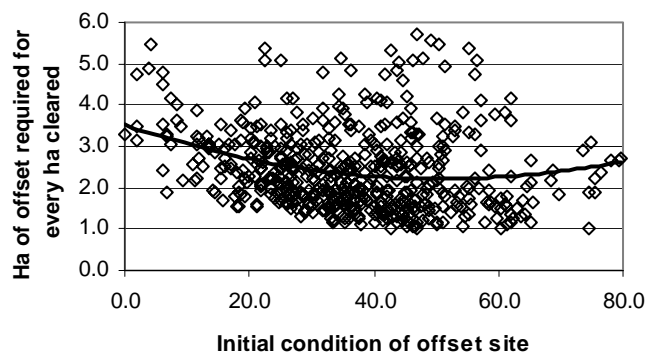
## Appendix 6 Guide to average hectares of offset required

These charts provide a guide to the mean hectares of offset required in *BioMetric* for each hectare cleared—assuming the offset has passed the Regional and Landscape components of the assessment. Each data point is a possible clearing/offset scenario derived from Monte Carlo (random) simulations. Bold lines represent the average of all scenarios. To use these charts: (a) choose the chart that approximates the condition of the vegetation to be cleared; (b) estimate the condition (with management) of the offset site on the horizontal axis; (c) where this value intersects the bold line read the mean hectares of offset required on the vertical axis. The actual area of offset required can only be determined by completing the assessment in *BioMetric*.

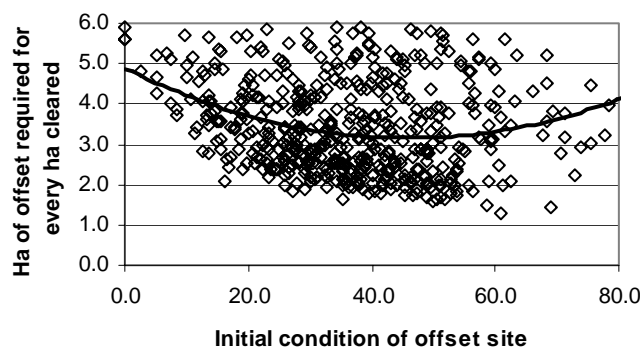
**A. Where the vegetation being cleared is in low condition (11 out of 100) (e.g. paddock trees). (Note that areas are those bounded by the outermost paddock trees in the proposal, not the total area of tree crowns).**



**B. Where the vegetation being clearing is in moderate condition (55 out of 100).**



**C. Where the vegetation being cleared is in excellent condition (82 out of 100).**



## Appendix 7 Explanation of the paddock tree calculator

In sparsely wooded vegetation (e.g. paddock trees) overstorey cover and trees with hollows can be assessed using the rectified imagery in the *PVP Mapper* combined with some simple field measurements rather than by measuring these variables in plots. In response to feedback from the trials this version of *BioMetric* includes a tool to make these calculations. The calculator for paddock trees is accessed via the plot data entry sheet.

	A	B	C
1	<b>Paddock tree calculator</b>		
2	These calculators are for estimating per cent foliage cover and numbers of trees with hollows where trees are very sparse and estimates from plots are therefore not practical. Transcribe result obtained here into EVERY plot that has been measured within the vegetation zone for which these calculations were made.		
3	<a href="#">Go back &lt;&lt;</a>		
5	<b>Per cent foliage cover of paddock trees</b>		
6	Average crown diameter of paddock trees (m)	15	
7	Average per cent foliage cover taken from a sample of paddock trees (%)	50	
8	Number of paddock trees within a sample area	10	
9	Sample area in which the number of paddock trees were counted (ha)	5	
10	<b>Per cent foliage cover (%) =</b>	<b>1.8</b>	Record this value in each plot measured within this vegetation zone
12	<b>Does the overstorey meet the low condition definition?</b>		
13	What is the lower benchmark overstorey per cent foliage cover (%)?	20	
14	<b>Is overstorey per cent foliage cover (estimated above) &lt;25% of benchmark?</b>	<b>Yes</b>	If the understorey is <50% native then this vegetation is likely to meet the low condition definition
16	<b>Average number of trees with hollows</b>		
17	Area over which ALL trees were sampled (ha)	5	
18	Number of trees with hollows within sampled area	5	
19	<b>Average number of hollow-bearing trees (per 50x20m plot) =</b>	<b>0.1</b>	Record this value in each plot measured within this vegetation zone
20			
21			
22			
23	Paddock calculator / Defn of low condition / Mitchell landscapes / Formation definitions / BRG /		

### To assess overstorey cover using the calculator

1. Enter the average crown diameter of paddock trees in the zone by measuring several crowns on the rectified imagery within the zone (using the distance tool in ArcView which is opened with the PVP Mapper) and averaging them.
2. Enter the average foliage cover by examining the crowns of several trees in the zone, assigning a % foliage cover using the diagrams in Appendix 3 and averaging these (the typical range of % cover for eucalypts in good health is 40-70%).
3. Enter the number of trees within the entire zone or a representative area within the zone.
4. Enter the area (in hectares) in which the trees were counted. This is determined using digitising tools in the PVP Mapper.
5. The paddock calculator will provide the % foliage cover of the overstorey for the whole zone.
6. Return to the plot data entry sheet and enter this figure for each plot established within the zone.

**To assess whether overstorey cover meets the low condition definition using the calculator**

Native vegetation must have an overstorey cover <25% of the lower benchmark value (as well as understorey that is <50% native) to be classed as “low condition”. The paddock calculator can be used assess whether the vegetation meets the overstorey criterion for low condition by simply entering the lower overstorey benchmark for the vegetation type. This part of the calculator will only work if the foliage cover was calculated following the above steps.

**To assess the number of trees with hollows using the calculator**

1. Enter the area (in hectares) over which hollows in trees were examined. This may be the entire zone, a representative area sampled within the zone or the same area in which trees were counted for the overstorey cover calculation (above).
2. Enter the number of trees with hollows (living and dead) observed within this area.
3. The paddock calculator will provide the average number of hollow-bearing trees (per 0.1 ha or 50x20m plot) for the zone.
4. Return to the plot data entry sheet and enter this figure for each plot established within the zone.