Native Vegetation Regulation 2012

Environmental Outcomes Assessment Methodology

Protecting and investing in healthy and productive landscapes
for the people of New South Wales

Draft for public consultation

This version was originally published in the NSW Government Gazette on 18 November 2005 and incorporates amendments published on 21 July 2006, 24 November 2006, 2 March 2007, 8 October 2010, 4 March 2011 and [Insert New Date].

© 2012 State of NSW and Office of Environment and Heritage

The State of NSW and Office of Environment and Heritage (OEH) are pleased to allow this material to be reproduced in whole or in part for educational and non-commercial use, provided the meaning is unchanged and its source, publisher and authorship are acknowledged.

The Office of Environment and Heritage has compiled this *Native Vegetation Regulation 2012 Environmental Outcomes Assessment Methodology* in good faith, exercising all due care and attention for the purposes of assessing broadscale clearing under Part 5 of the Native Vegetation Regulation 2012. No representation is made about the accuracy, completeness or suitability of the information in this publication for any particular purpose. OEH does not accept responsibility for any inaccurate or incomplete information supplied by third parties. OEH shall not be liable for any damage which may occur to any person or organisation taking action or not on the basis of this publication. Readers should seek appropriate advice when applying the information to their specific needs.

Published by:
Office of Environment and Heritage
59 Goulburn Street, Sydney NSW 2000
PO Box A290, Sydney South NSW 1232
Phone: (02) 9995 5000 (switchboard)
Phone: 131 555 (environment information and publications requests)
Phone: 1300 361 967 (national parks, climate change and energy efficiency information, and publications requests)
Fax: (02) 9995 5999
TTY users: phone 133 677 then ask for 131 555
Speak and listen users: phone 1300 555 727 then ask for 131 555
Email: info@environment.nsw.gov.au
Website: www.environment.nsw.gov.au

Report pollution and environmental incidents
Environment Line: 131 555 (NSW only) or info@environment.nsw.gov.au
See also www.environment.nsw.gov.au

ISBN 978 1 74293 539 3
OEH 2012/0178
May 2012

Contents

Note to reader:

Throughout this public consultation draft of the document we have added 'Notes to reader' in this format.

These are intended to provide some commentary on relevant aspects of this version of the Environmental Outcomes Assessment Methodology.

The 'Notes to reader' will be removed from the document prior to gazettal.

1 Introduction

An objective of the *Native Vegetation Act 2003* is to end broadscale clearing except where the clearing will improve or maintain environmental outcomes. This Environmental Outcomes Assessment Methodology (EOAM) sets out the circumstances in which broadscale clearing is to be regarded as improving or maintaining environmental outcomes. This methodology provides the science and the logic underpinning the assessment process. It will continue to be refined based on improved science and experience.

A table indicating the dates and the nature of the changes to the EOAM is available on the Office of Environment and Heritage (OEH) website.

This EOAM is applied using an objective, computer-based decision support software. This software assists accredited assessors to weigh up the positive and negative impacts of different clearing proposals and management actions to make practical decisions based on the best scientific information available. Assessments are done using site assessment, satellite imagery or aerial photography interpretation, and a wide range of reference data relevant to the site.

Notes in this document are explanatory notes and do not form part of the document for the purposes of the Native Vegetation Regulation 2012.

Unless specified otherwise, reference to the Minister is a reference to the Minister administering the *Native Vegetation Act 2003.*

1.1 PVP and DA administration standards

The *Native Vegetation Act 2003* provides for the development and approval of Property Vegetation Plans (PVPs) and also the granting of development consent for clearing.

There are a number of different types of Property Vegetation Plans:

1. **Clearing PVPs** including:
    - Invasive native species PVPs
    - Thinning to benchmark stem density PVPs
    - Pasture cropping PVPs
    - Paddock trees and small clumps in cultivation PVPs
    - Clearing of other (non-paddock tree) vegetation PVPs
    - Clause 19 PVPs

2. **Continuing use PVPs** including:
    - Regrowth identification PVPs
    - Change of regrowth date PVPs
    - PVPs that identify existing farming activities that may continue
3. **Conservation PVPs**
4. **Incentive PVPs**.

Development applications (DAs) may be submitted and approved for clearing that:

- does not include management actions on offset areas
- does not involve the clearing of invasive native species (INS) under Chapter 3, and
- does not involve thinning to benchmark stem densities under Chapter 4, and
- does not involve the clearing of native vegetation associated with pasture cropping systems under Chapter 5.

The Director General of the Department of Premier and Cabinet may define a standard for the administration of any or all of the above PVPs.

The PVP and DA Administration Standard may set out requirements such as defining:

- the corporate native vegetation database
- the certified decision support tool (see Section 2.2)
- the form and content of a PVP providing it is compliant with the requirements of Part 3 of the Native Vegetation Regulation 2012
- the storage of PVPs in corporate databases
- minimum standards for data recording
- minimum standards for document storage, and
- any other aspect related to the administration of PVPs.

Any requirements set out in the PVP and DA Administration Standard must be complied with.

2 Assessment of broadscale clearing proposals

2.1 Overview

The *Native Vegetation Act 2003* (NV Act) states that broadscale clearing proposed within a development application or as part of a Property Vegetation Plan may only be approved if the clearing will improve or maintain environmental outcomes. The environmental outcomes of clearing are highly variable and depend on a range of issues such as the type of vegetation being cleared, how the clearing will be undertaken and the existing state of the landscape in the area where the clearing is proposed.

Sections 15 and 32 of the *Native Vegetation Act 2003* allow the Native Vegetation Regulation 2012 to make provision for or with respect to 'the circumstances in which broadscale clearing is to be regarded as improving or maintaining environmental outcomes'.

This document sets out the circumstances in which clearing, and, where appropriate, associated offsets are to be regarded as improving or maintaining environmental outcomes.

This document is adopted into the Native Vegetation Regulation 2012 (as required by the *Native Vegetation Act 2003*) by clause 16 of the Native Vegetation Regulation 2012. The procedure for amending the EOAM is set out in clause 17 of the Native Vegetation Regulation 2012.

2.2 Decision support tool

To facilitate timely assessment of clearing proposals in accordance with this EOAM, the methodology has been programmed into a decision support tool. Local environmental variables, details of the clearing and any offset management actions can be entered into the support tool, and the results of the tool's calculations can be used to assist decision-making as to whether the proposed broadscale clearing is to be regarded as improving or maintaining environmental outcomes in accordance with this EOAM.

Note:

At the time of writing, the corporate native vegetation decision support system is known as Native Vegetation Assessment Tools (NVAT). This may change in the future without requirement to update this EOAM.

2.3 Certification of the decision support tool

The Minister will ensure that the decision support tool complies in all aspects with the EOAM such that a decision made in accordance with the certified decision support tool will be regarded as being in accordance with the EOAM.

The Director General of the Department of Premier and Cabinet will maintain version control of the decision support tool in accordance with amendments to the EOAM made under clause 33 of the Native Vegetation Regulation 2012. Version control is managed through the corporate native vegetation system and will also be recorded on the Office of Environment and Heritage website.

All PVPs and development approvals must comply with the requirements of the PVP and DA Administration Standard (see Section 1.1).

Note:

At the time of writing, the corporate native vegetation database or system is known as PVP Agreements Data and Customer Service (PADACS).

2.4 Environmental values

This methodology sets out the circumstances in which native vegetation clearing will improve or maintain environmental outcomes. The effect of a clearing proposal on environmental outcomes is measured separately against the following four environmental values:

- water quality
- prevention of land degradation
- prevention of salinity, and
- biodiversity.

2.5 Assessment pathways

This EOAM defines a number of different assessment pathways for the assessment of clearing depending on the condition of the vegetation, the species of the vegetation, the location of the clearing and the purpose and/or circumstances of the clearing. These different pathways are set out in Figure 2.1 below.

Streamlined assessment pathways have been developed for:

- invasive native species (Chapter 3)
- thinning to benchmark stem densities (Chapter 4)
- pasture cropping systems (Chapter 5)
- low risk categories of native vegetation clearing (Chapter 6):
  - paddock trees in cultivation (Section 6.2)
  - small clumps in cultivation (Section 6.3), and
  - very small areas (Section 6.4).

These pathways incorporate consideration of the four environmental values.

Clearing proposals that do not fit into one of the above categories must undergo full assessment. The clearing proposal must improve or maintain environmental outcomes for each of the four environmental values:

- water quality (Chapter 7)
- prevention of land degradation (Chapter 8)
- prevention of salinity (Chapter 9), and
- biodiversity (Chapter 10).

2.5.1 Invasive native species

Any part of a clearing proposal that is for clearing of invasive native species only (as defined by Chapter 3 of this EOAM), must be assessed under Chapter 3 to determine whether the proposed clearing will improve or maintain environmental outcomes. If the assessment under Chapter 3 indicates that the proposed clearing will improve or maintain environmental outcomes, then there is no need for further assessment under this EOAM.

2.5.2 Thinning to benchmark stem densities

Any part of a clearing proposal that is for thinning to benchmark stem density only (as defined by Chapter 4 of this EOAM) must be assessed under Chapter 4 to determine whether the proposed clearing will improve or maintain environmental outcomes. If the assessment under Chapter 4 indicates that the proposed clearing will improve or maintain environmental outcomes, then there is no need for further assessment under this EOAM.

2.5.3 Pasture cropping systems

Any part of a clearing proposal that is for implementing pasture cropping systems only (as defined by Chapter 5 of this EOAM) must be assessed under Chapter 5 to determine whether the proposed clearing will improve or maintain environmental outcomes. If the assessment under Chapter 5 indicates that the proposed clearing will improve or maintain environmental outcomes, then there is no need for further assessment under this EOAM.

2.5.4 Low risk categories of native vegetation clearing

Any part of the clearing proposal that is for the clearing of:

- paddock trees in cultivation only (as defined in Chapter 6 of this EOAM) must be assessed under Section 6.2 of Chapter 6 of this EOAM
- small clumps in cultivation only (as defined in Chapter 6 of this EOAM) must be assessed under Section 6.3 of Chapter 6 of this EOAM, or
- very small areas only (as defined in Chapter 6 of this EOAM) may be assessed under Section 6.4 of Chapter 6 of this EOAM or, as an alternative, they may be assessed under Chapters 7 to 10 of this EOAM (i.e. 'full assessment').

If the assessment under Chapter 6 indicates that the proposed clearing will improve or maintain environmental outcomes, then there is no need for further assessment under this EOAM.

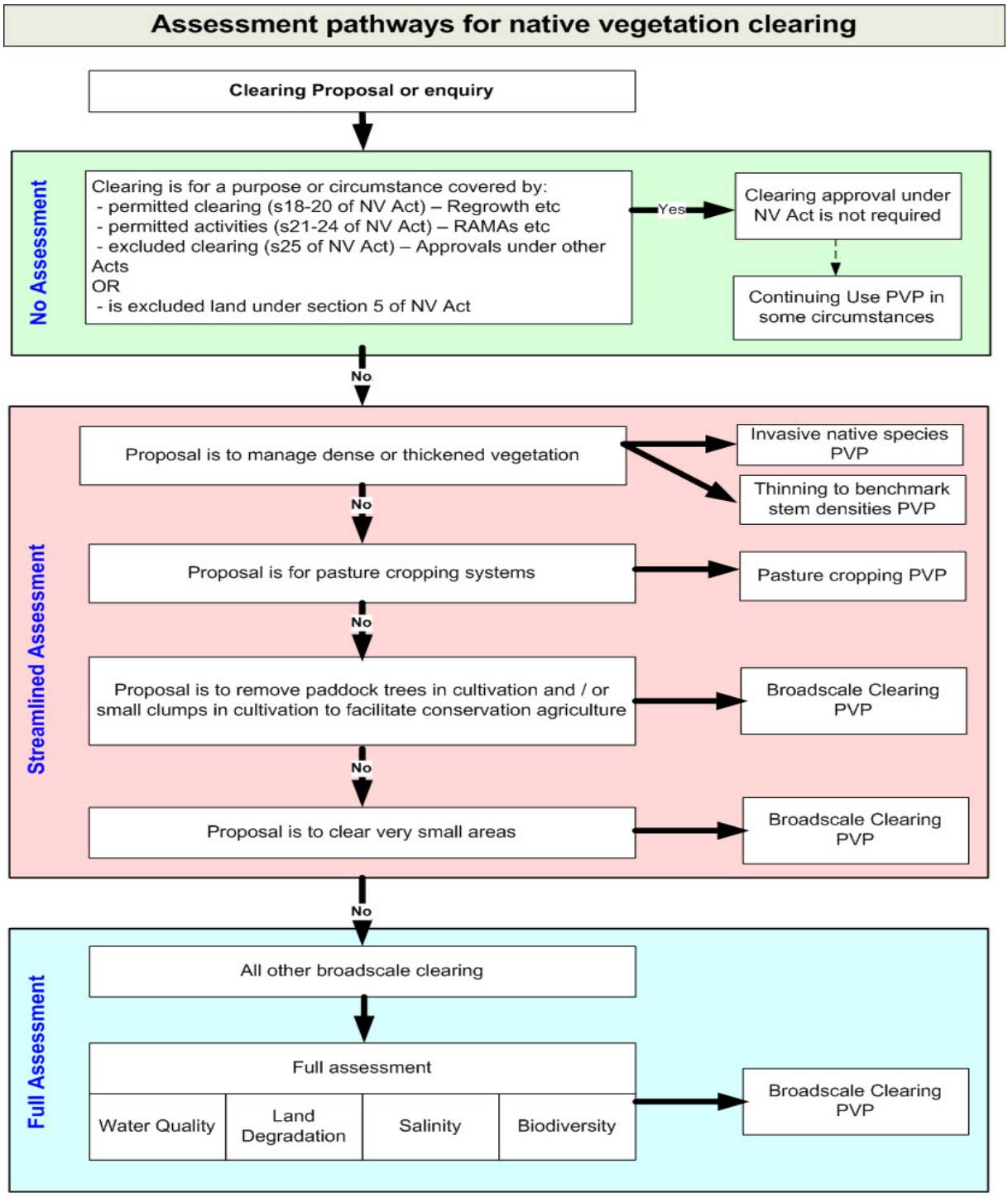
2.5.5 Full assessment

Any clearing proposal not assessed in accordance with Chapters 3, 4, 5 or 6 must be assessed against each of the relevant environmental values (i.e. water quality, prevention of salinity, biodiversity and prevention of land degradation) in Chapters 7 to 10. The clearing (with offset management actions where relevant) must improve or maintain environmental outcomes for each environmental value, according to this EOAM, in order to be regarded as improving or maintaining environmental outcomes.

Note:

Very small areas (as defined in Section 6.4) may be assessed under Section 6.4 (streamlined assessment) or under Chapters 7 to 10 (full assessment).

Figure 2.1 Assessment pathways for native vegetation clearing under this EOAM



Note

This flowchart sets out the various pathways for assessment of different categories of native vegetation clearing. Approval of any specific PVP depends on the circumstances of that PVP. The flowchart does not imply that approval of any particular PVP is assured.

The assessment of very small areas (as defined in Section 6.4) may be undertaken under the streamlined assessment pathway as defined in Section 6.4 or by full assessment under Chapters 7 to 10 of this EOAM.

2.6 The improve or maintain test

Proposed broadscale clearing is to be regarded as improving or maintaining environmental outcomes if either:

1. in relation to a development application, the impacts of the proposed clearing will improve or maintain environmental outcomes for each relevant environmental value (that is, water quality, prevention of salinity, biodiversity and prevention of land degradation), or
2. in relation to a PVP, the impacts of the proposed clearing and the benefits from any offset management actions whether at the same property or elsewhere, have been assessed and determined to improve or maintain environmental outcomes under either:
    a) Chapter 3 (Invasive native species) of this EOAM, or
    b) Chapter 4 (Thinning to benchmark stem densities) of this EOAM, or
    c) Chapter 5 (Pasture cropping systems) of this EOAM, or
    c) Chapter 6 (Low risk categories of native vegetation clearing) of this EOAM, or
    d) Chapter 7 (Water quality and aquatic biodiversity) **and** Chapter 8 (Prevention of land degradation) **and** Chapter 9 (Prevention of salinity) **and** Chapter 10 (Biodiversity values) of this EOAM.

2.7 Offsets

Where management actions that have environmental benefits (referred to as 'offsets') are proposed in a PVP, the benefits of the proposed action are to be determined by separately assessing the benefits of the offset in relation to each of the environmental values listed above.

Offsets may be on the same land as the clearing or on a different site. Offsets on the same land are often referred to as mitigation actions.

In addition to any specific requirements for offsets set out in Chapters 6, 7, 8, 9 and 10, the benefits of a proposed offset may only be taken into account when assessing whether proposed clearing will improve or maintain environmental outcomes if:

1. the benefits of the offset persist for at least the duration of the negative impact of the proposed clearing, and
2. the offset is additional to actions or works carried out using public funds or to fulfil regulatory obligations.

Offsets may only be proposed in a Property Vegetation Plan.

The acquisition and retirement of biodiversity credits from the biodiversity register established under Part 7A of the *Threatened Species Conservation Act 1995* (TSC Act) may be used to offset the impacts of clearing on biodiversity values according to the provisions of Chapter 10.

Note to reader:

The use of biodiversity credits from the register of biodiversity credits as an offset mechanism within this EOAM will require broader legislative amendment to the TSC Act. The amendment of the TSC Act is a matter for the NSW Parliament to consider and would need to be considered separately if there is appropriate support for inclusion of this mechanism in the EOAM.

The principles for the use of offsets are:

1. the benefits of the offset persist for at least the duration of the negative impact of the proposed clearing (usually in perpetuity)
2. the benefits from any offset proposed under the PVP, whether at the same property or elsewhere, will improve or maintain environmental outcomes for each relevant environmental value
3. management actions are likely to be deliverable and enforceable and must be appropriately secured in the Property Vegetation Plan
4. permanent management actions are given greater value than temporary management actions
5. the benefits of the offset are assessed using the same methodologies used to assess the impacts of the proposed clearing
6. the offset is additional to actions or works carried out using public funds or to fulfil regulatory obligations, and
7. only benefits from the management action may comprise the offset.

Offsets (that are not related to how the proposed clearing is carried out) proposed as part of development applications lack appropriate enforceability and are therefore not assessed under this EOAM.

2.8 Minor variation and more appropriate local data

This EOAM specifies the rules for assessing clearing proposals across the breadth of NSW, including a wide range of vegetation types, conditions and environmental circumstances.

To apply these rules across this broad range of circumstances the EOAM depends on detailed data about the environmental conditions in NSW. This data is contained in the approved databases referred to in Section 2.10.1 of this EOAM.

However, situations may occur in which the application of this EOAM or data contained in the databases referred to in this EOAM, results in an inaccurate assessment of the environmental impacts and benefits of a clearing proposal.

Where an assessment of proposed clearing in accordance with this EOAM using the data in the approved databases results in a determination that the proposed clearing does not improve or maintain environmental outcomes, then it is permissible under this EOAM to carry out one or both of the following actions in order to make an assessment that the proposed clearing will improve or maintain environmental outcomes:

- make a minor variation to this EOAM, in accordance with Sections 2.8.1 and 2.8.3

- substitute more appropriate local data for the data in the approved databases, in accordance with Sections 2.8.2 and 2.8.3.

A minor variation under Section 2.8 cannot be used in the assessment of clearing proposed in a development application.

2.8.1 Special provisions for minor variation

A minor variation to this EOAM may only be made where:

1. there has been an assessment in accordance with this EOAM resulting in a determination that the proposed clearing will not improve or maintain environmental outcomes

AND

2. an accredited expert certifies that in the accredited expert's opinion:
    a) the minor variation would result in a determination that the proposed clearing will improve or maintain environmental outcomes, and
    b) strict adherence to this EOAM is in the particular case unreasonable and unnecessary

AND

3. in certifying that a minor variation to this EOAM would result in a determination that the proposed clearing will improve or maintain environmental outcomes under this Section, the accredited expert:
    a) provides reasons for this opinion, and
    b) complies with any assessment protocols approved by the Minister (in relation to aspects of assessment concerned with prevention of salinity, prevention of land degradation, water quality and biodiversity) and the Minister for Primary Industries (in relation to aspects of assessment concerned with fish and marine vegetation).

AND

4. the minor variation is **not** a variation of any of the following aspects of this EOAM:
    a) Section 2.8 Minor variation and more appropriate local data
    b) classification of a plant species as a threatened species or a component of an endangered ecological community
    c) identification of an area of land as having high biodiversity conservation values under Section 10.4.1 (1.) and 10.4.1 (2.), or
    d) Section 10.5 in relation to determining whether an impact on an area of high biodiversity conservation value may be offset.

After the minor variation is made, the clearing proposal may be reassessed in accordance with this EOAM.

2.8.2 Using more appropriate local data

More appropriate local data may only be used where an accredited expert certifies that data is available that more accurately reflects local environmental conditions (compared to the data in the approved databases referred to in Section 2.10.1).

In certifying that data is available that more accurately reflects local environmental conditions (compared to the data in the approved databases), the accredited expert must:

- provide reasons for this opinion, and
- comply with any assessment protocols approved by the Minister (in relation to aspects of assessment concerned with salinity, soil, water quality, biodiversity and threatened species) and the Minister for Primary Industries (in relation to aspects of assessment concerned with fish and marine vegetation).

After the data is varied the clearing proposal may be reassessed in accordance with this EOAM.

2.8.3 Publication requirements when a PVP is approved on the basis of minor variation or more appropriate local data

If a PVP or DA that proposes broadscale clearing of native vegetation is approved on the basis of a minor variation (in accordance with Section 2.8.1) or the use of more appropriate local data (in accordance with Section 2.8.2) the Minister must:

1. publish within 10 business days after the decision the reasons for the decision to approve the PVP, and
2. make publicly available the reports of any accredited expert assessment of the clearing proposal and/or data relevant to the proposal, and
3. make a record of any variations made to the data used for the purposes of the assessment together with a record of the results of the assessment using the varied data, and
4. retain the records made under paragraph 2.8.3 (3.) for the duration of the PVP or DA.

2.8.4 Special provisions relating to use of minor variation and more appropriate local data where clearing is assessed under Chapter 6 of this EOAM

If a minor variation is made or more appropriate local data is used in the course of carrying out an assessment under Chapter 6 of this EOAM and:

1. the clearing of paddock trees in cultivation is being assessed under Section 6.2 of this EOAM and the effective clearing area under that section is:
    a) <2 ha and the vegetation type is 70% cleared in the relevant Catchment Management Authority (CMA) area of operations, or
    b) <4 ha and the vegetation type is 30–70% cleared in the relevant CMA area of operations, or
    c) <10 ha and the vegetation type is <30% cleared in the relevant CMA area of operations

OR

2. the clearing of small clumps in cultivation is being assessed under Section 6.3 of this EOAM and the area proposed to be cleared is:

    a) <2 ha and the vegetation type is 70% cleared in the relevant CMA area of operations, or

    b) <4 ha and the vegetation type is 30–70% cleared in the relevant CMA area of operations, or

    c) <10 ha and the vegetation type is <30% cleared in the relevant CMA area of operations

OR

3. the clearing of very small areas is being assessed under Section 6.4 of this EOAM

THEN:

4. the certifications referred to in Section 2.8.1 (2.) and Section 2.8.2 above may be made by an accredited assessor (Level 2a) instead of an accredited expert, and

5. the requirements to provide reasons in Section 2.8.1 (3.) and Section 2.8.2 do not need to be complied with, and

6. Section 2.8.3 (1.) and (2.) do not need to be complied with.

2.8.5 Special provisions relating to use of minor variation and more appropriate local data when assessing threatened species that cannot withstand loss

If a minor variation is made or more appropriate local data is used in the course of assessing whether threatened species that cannot withstand loss are on a proposed clearing site under Section 10.3.3 of this EOAM, then in making the minor variation or using more appropriate local data the accredited expert must also certify that in the accredited expert's opinion:

- the area of habitat, or
- the number of threatened species

in the region is such that the species would be able to bear temporary loss from the proposed clearing while gains are being achieved from the proposed management actions being carried out within the same region. For the purpose of this section, 'region' is defined as the CMA subregion where the proposed clearing is to take place.

2.9 Accredited assessors and accredited experts

The application of this EOAM and the assessment of vegetation clearing and management proposals require considerable professional knowledge, judgement and expertise. Four levels of accreditation have been developed to ensure that this high level of knowledge, judgement and expertise is applied in a consistent manner between assessments across the State.

CMAs must ensure that only those staff who have the relevant level of assessment accreditation undertake assessments under the EOAM. The roles and functions of each accreditation level are outlined in Section 2.9.2 below.

2.9.1 Accreditation levels

Level 1 – Accreditation to assess incentive PVPs

To obtain Level 1 accreditation, officers are required to:

- complete PVP Part 1 training – *Assessment methodology, PADACS and NRAT*
- complete PVP Part 2 training – *Landscape analysis, land degradation assessment, plant identification and PVP field techniques*
- complete at least three PVPs under the supervision of an accredited assessor (Level 1 or Level 2a), and
- be assessed as meeting the competencies outlined in the Australian Qualification Framework (AQF) unit – AHCLPW401A – *Process applications for changes in land use*.

A person accredited to assess incentive PVPs is referred to as an accredited assessor (Level 1).

Level 2a – Accreditation to assess clearing proposals

To obtain Level 2a accreditation, officers are required to:

- complete PVP Part 1 training – *Assessment methodology, PADACS and NRAT*
- complete PVP Part 2 training – *Landscape analysis, land degradation assessment, plant identification and PVP field techniques*
- complete at least five PVPs under the supervision of an accredited assessor (Level 2a), and
- be assessed as meeting the competencies outlined in the Australian Qualification Framework (AQF) unit – AHCLPW503A – *Assess applications for legislative compliance*.

A person accredited to assess clearing PVPs is referred to as an accredited assessor (Level 2a).

Level 2b – Accreditation to assess INS clearing proposals

To obtain Level 2a accreditation, officers are required to:

- complete PVP Part 1 training – *Assessment methodology, PADACS and NRAT*
- complete PVP Part 2 training – *Landscape analysis, land degradation assessment, plant identification and PVP field techniques*
- complete at least five INS PVPs under the supervision of an accredited assessor (Level 2a or 2b), and
- be assessed as meeting the competencies outlined in the Australian Qualification Framework (AQF) unit – AHCLPW503A – *Assess applications for legislative compliance*.

A person accredited to assess only INS clearing proposals is referred to as an accredited assessor (Level 2b).

Level 3 – Accredited expert

Some provisions within this EOAM require an appropriately qualified accredited expert. In particular: the application of minor variation and more appropriate local data provisions in Section 2.8, but also parts of the water quality and aquatic biodiversity (Chapter 7) , assessment of prevention of land degradation (Chapter 8), and biodiversity values (Chapter 10).

Within this EOAM, **accredited expert** means a person accredited by the Minister as an expert for the purposes of this EOAM, on the basis of criteria approved by the Minister (in relation to aspects of assessment concerned with prevention of salinity, prevention of land degradation, water quality, and biodiversity) and includes a person who immediately before the repeal of the Native Vegetation Regulation 2005 was accredited by the Minister under clause 27(4) of that Regulation.

Level 3 accreditation is specific to the following areas: prevention of salinity, prevention of land degradation, water quality and biodiversity. An officer may hold accredited expert status in one or more of these areas. To exercise the functions of the accredited expert the officer must hold accreditation in the appropriate areas of expertise as set out in Table 2.1 below.

To obtain Level 3 accreditation officers must:

- have a sound understanding of the native vegetation framework including minor variation and more appropriate local data provisions, and
- meet the criteria approved by the Minister for the appointment of accredited experts.

A person accredited under Level 3 is referred to as an ‘accredited expert’.

2.9.2 Roles and functions according to accreditation level

Table 2.1 Roles and functions for each accreditation level

Accreditation level		Permitted functions
Level 1 – Accreditation to assess incentive PVPs		Assessment and negotiation of incentive PVPs
Level 2a – Accreditation to assess clearing proposals		Assessment and negotiation of: a) **clearing PVPs** including: • invasive native species PVPs • thinning to benchmark stem density PVPs • pasture cropping PVPs • paddock trees and small clumps in cultivation PVPs • clearing of other (non-paddock tree) vegetation PVPs • clause 19* PVPs (formerly clause 28) b) **continuing use PVPs** including: • regrowth certification PVPs • change of regrowth date PVPs • authorisation of continuing use PVPs c) **conservation PVPs** d) **incentive PVPs**
Level 2b – Accreditation to assess INS clearing proposals		Assessment and negotiation of: a) **clearing PVPs** including: • invasive native species PVPs • clause 19 PVPs (formerly clause 28) b) **continuing use PVPs** including: • regrowth certification PVPs • change of regrowth date PVPs • authorisation of continuing use PVPs c) **incentive PVPs**
Level 3 – Accredited expert	Prevention of salinity	Expert opinion in relation to minor variation provisions (Section 2.8.1) or more appropriate local data provisions (Section 2.8.2) within Chapter 9 (Prevention of salinity) and salinity-related aspects of Chapters 3, 4, 5 and 6.
	Prevention of land degradation	Expert opinion in relation to minor variation provisions (Section 2.8.1) or more appropriate local data provisions (Section 2.8.2) within Chapter 8 (Prevention of land degradation) and land degradation-related aspects of Chapters 3, 4, 5 and 6. Defining appropriate management actions that will prevent land degradation associated with the clearing and/or ongoing management of Land and Soil Capability (LSC) Class 7 and 8 land (Section 8.2).

Accreditation level		Permitted functions
Level 3 – Accredited expert (continued)	Water quality	Expert opinion in relation to minor variation provisions (Section 2.8.1) or more appropriate local data provisions (Section 2.8.2) within Chapter 7 (Water quality and aquatic biodiversity) and water quality and aquatic biodiversity-related aspects of Chapters 3, 4, 5 and 6. Demonstrating that an alternative water quality offset approach in combination with any offset will fully offset the water quality impact (Section 7.3.7).
	Biodiversity	Expert opinion in relation to minor variation provisions (Section 2.8.1) or more appropriate local data provisions (Section 2.8.2) within Chapter 10 (Biodiversity values) and biodiversity-related aspects of Chapters 3, 4, 5 and 6. Determining that an impact on an area of high biodiversity conservation value may be offset (Section 10.5).

*clause 19 of the Native Vegetation Regulation 2012

2.10 Amending and updating databases

2.10.1 Databases containing environmental information

This EOAM specifies the circumstances in which broadscale clearing is to be regarded as improving or maintaining environmental outcomes.

To apply these circumstances accurately and meaningfully to the wide range of possible clearing and offset proposals in the diverse environments that exist throughout the State it is necessary to rely on detailed data about the state of the environment in NSW. The information is held in the following databases:

- Threatened Species Profile Database
- Vegetation Benchmarks Database
- Vegetation Types Database
- Overcleared Landscapes Database
- Important Wetlands Database
- Soil Subregions Database
- Salinity Assessment Method and Management Actions Database
- Invasive Native Species Database
- Prevention of Land Degradation Management Actions Database
- Streamlined Assessment Management Actions Database,
- Water Quality Management Actions Database.
- Thinning Genera Database
- Thinning Management Actions Database
- Pasture Cropping Systems Management Actions Database
- Geomorphology Priority Action Database

- Land and Soil Capability Management Actions Database and the
- Species Significance Score Data

Assessment under the EOAM must be done using the current version of the databases.

These databases are available from the website of the Office of Environment and Heritage.

Note to reader:

The requirement to publish databases on the OEH website is new. This new requirement will ensure the current versions of all datasets are publically available. As some of these databases are new they may not be available on the website throughout public exhibition.

2.10.2 Updating the databases

Data in the databases are updated in response to increasing knowledge about the environment and changes in the environment itself.

The databases are maintained by a range of agencies and are updated from time to time.

The current version of each database must be published on the Office of Environment and Heritage website along with a table of database versions, date of effect and a brief outline of the nature of changes made to the database.

Changes may be made to the databases subject to the process above without the requirement to gazette a new version of the EOAM.

3 Invasive native species assessment

Note to reader:

The INS management provisions have not been changed in this version of the EOAM, although there has been some editing of this chapter to make it clearer and easier to understand.

Changes include:

- slight reformatting: subheadings have been added in places and some provisions have been renumbered
- 'diameter at breast height' (DBH) has been changed to 'diameter at breast height over bark' (DBHOB) to align it with other parts of the EOAM and to clarify the meaning. There is no intention to adversely impact landholders through this change. We are seeking advice from NSW Department of Primary Industries (Forestry) in relation to whether minor changes to the INS database are required to ensure the outcome for landholders remains unchanged
- an assessment process flowchart has been added.

3.1 Introduction

This Chapter applies to the clearing of invasive native species (INS) under the *Native Vegetation Act 2003*.

Where a proposal involves clearing of invasive native species only, a shortened assessment process can be used to assess the clearing of INS. This assessment process is designed to maintain or create a mosaic of native vegetation states across the landscape and does not require offsets.

INS clearing proposals can only be approved under PVPs. That is, development applications cannot include INS clearing proposals.

Note:

Supporting science and further information about the application of the EOAM relating to the clearing/thinning of invasive native species under the *Native Vegetation Act 2003* is contained in:

- the Operational Manual for the certified INS decision support tool
- a collation of discussion paper submissions and responses from the Invasive Native Scrub Team (www.nativevegetation.nsw.gov.au/methodology/), and
- results of INS research undertaken over the past few years which is available at http://cw.cma.nsw.gov.au/OurNaturalAssets/managinginvasivenativescrub.html.

3.2 The improve or maintain test for INS proposals

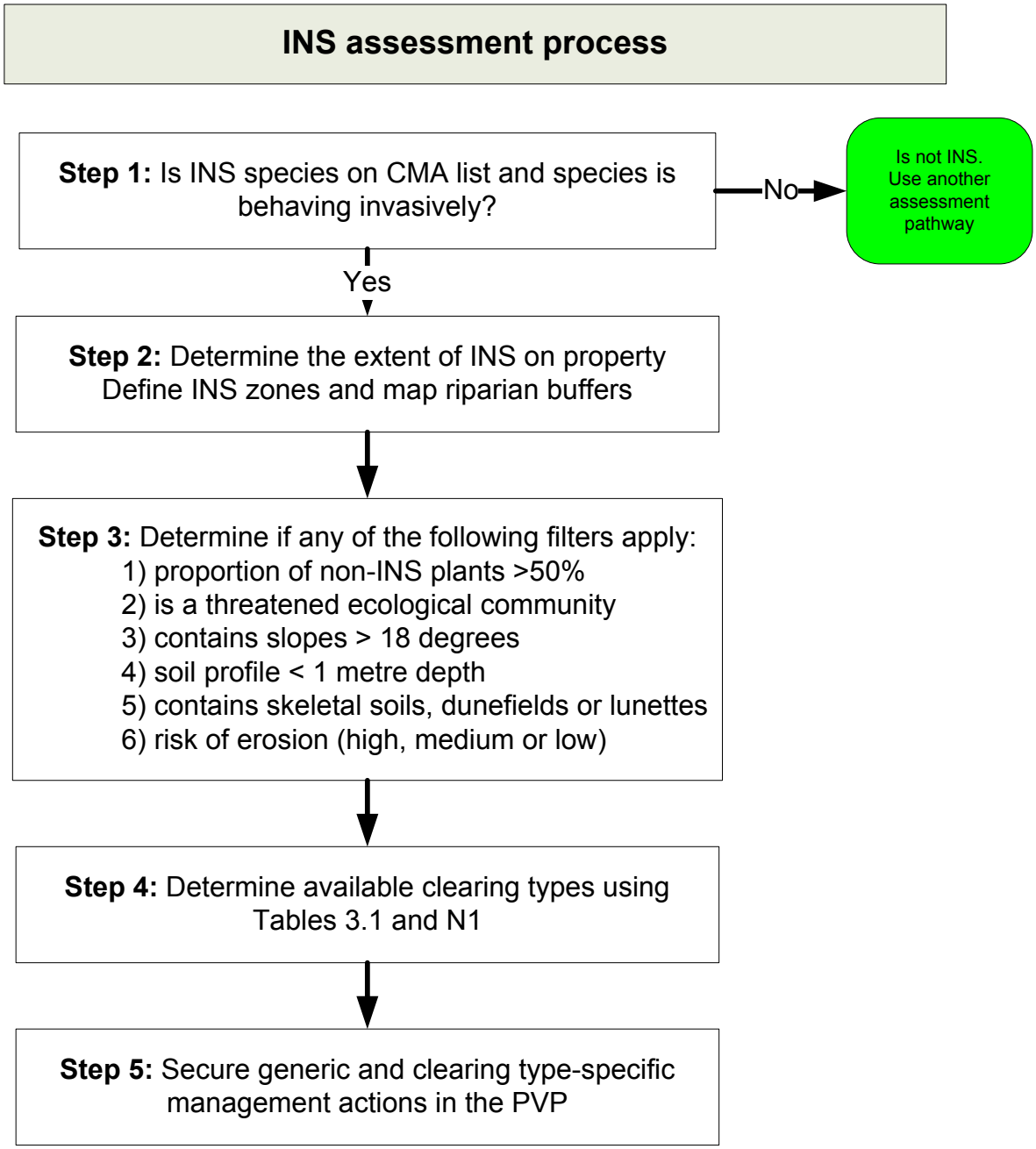
The clearing of invasive native species is to be regarded as improving or maintaining environmental outcomes if:

- the proposed clearing is for the purpose of re-establishing native vegetation or allowing natural regeneration of native vegetation species in order to maintain or create a mosaic of native vegetation states across the landscape, and
- the proposed clearing is to be undertaken on existing grazing or cultivated land, and
- the species to be cleared is listed in the INS Database, and
- the species is behaving invasively as defined in Section 3.3.1, and
- total areas for available clearing types are not exceeded as specified in Section 3.3.6, and
- clearing types as defined in Section 3.3.2 that have been restricted according to different land and vegetation characteristics as specified in Section 3.3.7 are not undertaken, and
- non-native vegetation is not introduced after the clearing, except in accordance with the specified requirements listed in Section 3.3.8, and
- the retention of native vegetation is undertaken in accordance with the specified requirements listed in Section 3.3.9, and
- clearing is carried out in accordance with the specified requirements listed in Section 3.3.10, and
- after the clearing provisions of the Property Vegetation Plan end, native groundcover on the area where the clearing took place must be maintained in perpetuity unless clearing is permitted by a Property Vegetation Plan or consent under the *Native Vegetation Act 2003*.

3.3 Assessment process for INS proposals

There are five steps in the assessment process for INS proposals. These are illustrated in Figure 3.1 below.

Figure 3.1 INS assessment process



Note:

This assessment process is provided as guidance and does not need to be rigidly adhered to by CMAs in the assessment of INS proposals.

3.3.1 Definition of invasive native species

For the purposes of this Chapter, 'invasive native species' means a plant species that satisfies the following criteria:

1. the species is listed in the INS Database in respect of the Catchment Management Authority Area or the Catchment Management Authority Area and IBRA region to which the clearing proposal relates

AND

2. in the opinion of an accredited assessor (Level 2a or 2b) the species satisfies the following criteria for acting invasively:
    a) the species is invading plant communities where it has not been known to occur previously, or the species is regenerating densely following natural or artificial disturbance, and
    b) the invasion and/or dense regeneration of the species is resulting in change of structure and/or composition of a vegetation community, and
    c) the species is within its natural geographic range.

Note:

The accredited assessor may be an accredited assessor Level 2a or 2b. Level 2b accredited assessors are accredited for a limited set of clearing proposals including INS clearing proposals.

3.3.2 Clearing types

For the purpose of assessing whether clearing for managing invasive native species will improve or maintain environmental outcomes, such clearing is divided into six clearing types which are listed in order of their relative impact on soil and groundcover. The six clearing types are listed in Table 3.1.

Table 3.1 Six clearing types used in the assessment of INS clearing proposals

	Clearing type	Example of clearing type
a)	Management burning	
b)	Clearing individual plants with no disturbance to groundcover	Chemical spot treatment or ringbarking
c)	Clearing individual plants with minimal disturbance to groundcover	Grubbing
d)	Clearing plants at paddock scale with nil to minimal disturbance to soil and groundcover	Chaining, slashing or roping
e)	Clearing plants at paddock scale with temporary disturbance to soil and groundcover	Blade ploughing
f)	Clearing plants at paddock scale with longer term disturbance to soil and groundcover	Clearing followed by short-term cropping

Note:

The examples set out in the last column of Table 3.1 are given by way of illustration only and do not limit techniques for clearing which fall within each clearing type.

Proposed invasive native species clearing assessed under this Chapter improves or maintains environmental outcomes if it meets all the following provisions. The following provisions apply to all proposed clearing, unless expressly stated to apply only to a specific type of clearing.

Note:

The following provisions are numbered for ease of cross referencing. Sub-provisions are numbered with capital letters so as not to confuse them with the six clearing types which are numbered using lowercase a) to f).

3.3.3 Calculating the area affected by the invasive native species (INS extent)

The area affected by the invasive native species (known as INS extent) on the property means the extent of the areas on the property where:

- the invasive native species being cleared are currently present, and
- areas on the property where the invasive native species being cleared do not presently occur but where management is required to prevent the spread and recurrence of the invasive native species into these areas.

Areas of non-native vegetation and areas of native vegetation not affected by the invasive native species being cleared are not included in the extent of invasive native species on the property.

3.3.4 Purpose of the clearing

1. Clearing permitted by these provisions is for the purpose of re-establishing native vegetation or allowing natural regeneration of native vegetation species in order to maintain or create a mosaic of native vegetation states across the landscape.

3.3.5 Native groundcover

2. After the clearing provisions of the Property Vegetation Plan end, native groundcover on the area where the clearing took place must be maintained in perpetuity unless clearing is permitted by a Property Vegetation Plan or consent under the *Native Vegetation Act 2003*.

3.3.6 Total areas which may be cleared

3. Total clearing of invasive native species must not exceed 80% of the extent of invasive native species on the property.
4. Where the following types of clearing are carried out:
    a) *management burning*, or
    b) *clearing individual plants with no disturbance to groundcover, or*
    c) *clearing individual plants with minimal disturbance to groundcover*

the following provision applies:

A) the clearing must not exceed 80% of the extent of the area of invasive native species on the property.

5. Where the following type of clearing is carried out:

d) *clearing plants at a paddock scale with nil to minimal disturbance to soil and groundcover*

the following provisions apply:

A) the clearing must not exceed 60% of the extent of invasive native species on the property, except as set out in 5 B) below

B) up to a further 20% of the extent of invasive native species on the property may be cleared only if the CMA is satisfied that land that was initially cleared by either of these types of clearing has achieved a groundcover of greater than 50% (or higher percentage as determined by the CMA) and the groundcover consists of greater than 75% (or higher percentage as determined by the CMA) native groundcover

C) groundcover must be maintained in perpetuity on land initially cleared by this type of clearing from the date the CMA is satisfied the land is at the groundcover percentage set out in 5 B) unless clearing is permitted by a Property Vegetation Plan or consent under the *Native Vegetation Act 2003*

D) if d) *clearing plants at paddock scale with nil to minimal disturbance to soil and groundcover* is carried out with e) *clearing plants at paddock scale with temporary disturbance to soil and groundcover* and/or f) *clearing plants at paddock scale with longer term disturbance to soil and groundcover*, the total clearing must not exceed 60% of the extent of invasive native species on the property except as set out in 5 B), and

E) the CMA must certify in writing that it is satisfied as to the matters set out in 5 B) before the further clearing referred to in that provision can take place.

Note:

Provision 5 D) means that if clearing type d) *clearing plants at a paddock scale with nil to minimal disturbance to soil and groundcover* is undertaken in combination with clearing type e) *clearing plants at paddock scale with temporary disturbance to soil and groundcover* and/or clearing type f) *clearing plants at paddock scale with longer term disturbance to soil and groundcover,* the total initial clearing cannot exceed 60% of the extent of invasive native species on the property.

Due to the other retention requirements within this Chapter, clearing by clearing types d) to f) may be limited to 72% of the extent of invasive native species on the property in total over the period of the Property Vegetation Plan.

6. Where the following type of clearing is carried out:

e) *clearing plants at a paddock scale with temporary disturbance to soil and groundcover*

the following provisions apply:

A) the clearing must not exceed 40% of the extent of invasive native species on the property, except as set out in 6 B) below

B) up to a further 40% of the extent of invasive native species on the property may be cleared only if the CMA is satisfied that land that was initially cleared by this type of clearing has achieved a groundcover of greater than 50% (or higher percentage as determined by the CMA) and the groundcover consists of greater than 75% (or higher percentage as determined by the CMA) native groundcover

C) groundcover must be maintained in perpetuity on land initially cleared by this type of clearing from the date the CMA is satisfied the land is at the groundcover percentage set out in 6 B) unless clearing is permitted by a Property Vegetation Plan or consent under the *Native Vegetation Act 2003*

D) if both e) *clearing plants at paddock scale with temporary disturbance to soil and groundcover* and f) *clearing plants at paddock scale with longer term disturbance to soil and groundcover* are to be carried out, then provision 8 also applies, and

E) the CMA must certify in writing that it is satisfied as to the matters set out in 6 B) before the further clearing referred to in that provision can take place.

7. Where the following type of clearing is carried out:

f) *clearing plants at paddock scale with longer term disturbance to soil and groundcover*

the following provisions apply:

A) the clearing must not exceed 20% of the extent of invasive native species on the property, except as set out in 7 B) below

B) up to a further 60% of the extent of invasive native species on the property may be cleared only if the CMA is satisfied that for each further 20% (up to a maximum of 80%) of the extent of invasive native species on the property, land that was initially cleared by this type of clearing has achieved a groundcover of greater than 50% (or higher percentage as determined by the CMA) and the groundcover consists of greater than 75% (or higher percentage as determined by the CMA) native groundcover

C) groundcover must be maintained in perpetuity on land cleared by this type of clearing from the date the CMA certifies in writing that the land is at the groundcover percentage set out in 7 B) unless clearing is permitted by a Property Vegetation Plan or consent under the *Native Vegetation Act 2003*

D) the clearing at any one time must not exceed 20% of the invasive native species extent on the property

E) if both e) *clearing plants at paddock scale with temporary disturbance to soil and groundcover* and f) *clearing plants at paddock scale with longer term disturbance to soil and groundcover* are to be carried out, then provision 8 also applies, and

F) the CMA must certify in writing that it is satisfied as to the matters set out in 7 B) before the further clearing referred to in that provision can take place.

8. Where both of the following types of clearing are carried out:

e) *clearing plants at paddock scale with temporary disturbance to soil and groundcover,* and

f) *clearing plants at paddock scale with longer term disturbance to soil and groundcover*

the following provisions apply:

A) the clearing must not exceed 40% of the extent of invasive native species on the property except as set out in 8 B) below

B) up to a further 40% of the extent of invasive native species on the property may be cleared only if the CMA is satisfied that land that was initially cleared by either of these types of clearing has achieved a groundcover of greater than 50% (or higher percentage as determined by the CMA) and the groundcover consists of greater than 75% (or higher percentage as determined by the CMA) native groundcover

C) groundcover must be maintained in perpetuity on land initially cleared by this type of clearing from the date the CMA is satisfied the land is at the groundcover percentage set out in 8 B) unless clearing is permitted by a Property Vegetation Plan or consent under the *Native Vegetation Act 2003*

D) the clearing at any one time must not exceed 40% of the invasive native species extent on the property, and

E) the CMA must certify in writing that it is satisfied as to the matters set out in 8 B) before the further clearing referred to in that provision can take place.

Note:

For example, using this type of clearing, if the extent of invasive native species on a property is 1000 ha, then the landholder may initially clear 20% of this area, that is, 200 ha. Once the CMA is satisfied that this 200 ha has achieved a groundcover of more than 50% cover and that cover consists of more than 75% native vegetation, then the landholder may clear a further 20% of the extent of invasive native species on the property, that is, a further 200 ha.

Once the CMA is satisfied that the second parcel of 200 ha has achieved the groundcover and percentage of native groundcover described above, then the landholder may clear a further 200 ha and so on, until the landholder has cleared 800 ha, which is the maximum area permitted to be cleared (that is, 80% of 1000 ha). In this example at any one time, no more than 200 ha may be cleared.

The landholder must not re-clear any areas cleared under these provisions that have achieved the necessary level of groundcover unless another consent or Property Vegetation Plan is obtained.

3.3.7 Restrictions on which clearing types may be used

Note:

Table N1 Summary of clearing type availability for different land and vegetation characteristics

		Clearing types available					
Filter criteria		**a)**	**b)**	**c)**	**d)**	**e)**	**f)**
Q1. Non-INS trees and shrubs represent >50% of the total number of trees and shrubs		✓	✓	✓	×	×	×
Q2. The vegetation is a threatened ecological community*		✓	✓	✓	×	×	×
Q3. The zone to be treated has slopes greater than 18 degrees		✓	✓	✓	×	×	×
Q4. The zone to be treated has skeletal/stony soils, dunefields or lunettes		✓	✓	✓	×	×	×
Q5. The zone to be treated has soils with profile less than 1 m		✓	✓	✓	✓	✓	×
Q6. What is the erosion risk?	Low	✓	✓	✓	✓	✓	✓
	Medium	✓	✓	✓	✓	✓	×
	High	✓	✓	✓	✓	×	×
Riparian zones		✓	✓	×	×	×	×
The introduction of non-native perennial vegetation listed in Table 2 of the INS Database, or non-native annual vegetation are permitted (under conditions)		×	×	×	×	✓	✓

***** Except, if the threatened ecological community is not in high condition and the clearing does not include the key species in the threatened ecological community (species in the title of the listing under the *Threatened Species Conservation Act 1995)*, then clearing type d) *clearing plants at paddock scale with nil to minimal disturbance to soil and groundcover* may also be used, but to clear the understorey or groundcover only.

9. The type of clearing used [being a type described in Section 3.3.2 (a) to (f)] must be a type that is permitted for the species being cleared according to Table 1 of the INS Database.

10. The type of clearing is limited to a) *management burning*, b) *clearing individual plants with no disturbance to groundcover* or c) *clearing individual plants with minimal disturbance to groundcover* where:

    A) non-invasive species represent more than 50% of the total number of individual trees and shrubs, or

    B) skeletal/rocky soils, dunefields or lunettes occur in the area where the proposed clearing is to take place, or

    C) vegetation is a threatened ecological community or threatened population within the meaning of the *Threatened Species Conservation Act 1995,* except: if the threatened ecological community is not in high condition and the clearing does not include the key species in the threatened ecological community (species in the title of the listing of the threatened ecological community under the *Threatened Species Conservation Act 1995*), then clearing type d) *clearing plants at paddock scale with nil to minimal disturbance to soil and groundcover* may also be used, but to clear the understorey or groundcover only.

11. For clearing types other than a) *management burning*, b) *clearing individual plants with no disturbance to groundcover* and c) *clearing individual plants with minimal disturbance to groundcover*, no land of slope greater than 18 degrees may be cleared.

12. For clearing type f) *clearing plants at a paddock scale with longer term disturbance to soil and groundcover*, no vegetation may be cleared on land with a:

    A) soil profile less than 1 m deep, or

    B) medium erosion risk, or

    C) high erosion risk.

13. For clearing type e) *clearing plants at a paddock scale with temporary disturbance to soil and groundcover*, no vegetation may be cleared on land with a high erosion risk.

14. For clearing types other than a) *management burning*, any invasive native species that has a stem or trunk with a diameter at breast height over bark (DBHOB) greater than the DBHOB specified in the column headed 'Maximum DBHOB allowed to be cleared' in Table 1 of the INS Database may not be cleared except as set out in provisions 15 and 17.

15. The relevant CMA may vary the measurement in the column 'Maximum DBHOB allowed to be cleared' in Table 1 of the INS Database by up to 5 cm if, in the judgement of the CMA, the variation is appropriate for the land to be cleared.

16. Any non-invasive native species with a stem or trunk DBHOB greater than 20 cm may not be cleared except for accidental clearing as set out in provision 17 below.

17. Total accidental clearing of vegetation in the following categories must be limited to 1% of the total number of trees and shrubs in the area to be cleared. The categories are:

    A) invasive native species with a stem or trunk DBHOB greater than the maximum DBHOB allowed to be cleared, and

    B) non-invasive native species with a stem or trunk greater than 20 cm DBHOB.

18. For clearing types other than a) *management burning*, or b) *clearing individual plants with no disturbance to groundcover*, no clearing may be undertaken within a water body (as defined in Chapter 7) or within the zones A and B, as set out in Tables 7.2, 7.3 and 7.4 of this EOAM.

3.3.8 Non-native vegetation

19. For clearing types:

    e) *clearing plants at paddock scale with temporary disturbance to soil and groundcover*, and

    f) *clearing plants at paddock scale with longer term disturbance to soil and groundcover*

    the following provision applies:

        A) the clearing may not result in the introduction into the cleared area of any non-native perennial vegetation other than the species listed in Table 2 of the INS Database (where, in the judgement of the CMA, the species listed in Table 2 of the INS Database is non-persistent in the area the species is proposed to be introduced).

20. For clearing types other than:

    e) *clearing plants at paddock scale with temporary disturbance to soil and groundcover*, and

    f) *clearing plants at paddock scale with longer term disturbance to soil and groundcover*

    the following provision applies:

        A) the clearing may not result in the introduction into the cleared area of any non-native vegetation.

3.3.9 Retention of native vegetation

21. For clearing types:

    b) *clearing individual plants with no disturbance to groundcover,* and

    c) *clearing individual plants with minimal disturbance to groundcover*

    the following provisions apply:

        A) plants of the species listed in Table 1 of the INS Database as requiring retention are to be retained at the densities specified in the INS Database, except:

            I) where the vegetation is a derived vegetation community, or

            II) as set out in 21 B)

        B) where more than one species is present, the total retention requirement for all species of less than the DBHOB specified in Table 1 of the INS Database does not exceed 20 stems per hectare. If there is more than one species present, the stems retained must reflect the proportion of total individuals for each species present and stems are to be retained for the range of size classes present less than the DBHOB specified in Table 1 of the INS Database, and

C) stems retained must represent the proportion of size classes present prior to clearing, and

D) the relevant CMA may use its judgement to vary the number of stems per hectare that must be retained as specified by the INS Database. However, the number of stems per hectare may not be varied to a ratio of less than:
1 stem under the maximum DBHOB allowed to be cleared in the INS Database to every 1 stem over the maximum DBHOB allowed to be cleared (in Table 1 of the INS Database), present per hectare for each species present to which this provision applies. Any such variation does not affect the other requirements of provision 21.

Note:

For the purposes of provision 21, the number of plants per hectare means the number of plants on a one-hectare area.

22. For clearing types:

d) *clearing plants at paddock scale with nil to minimal disturbance to soil and groundcover*

e) *clearing plants at paddock scale with temporary disturbance to soil and groundcover,* and

f) *clearing plants at paddock scale with longer term disturbance to soil and groundcover*

the following provisions apply:

A) a minimum of 20% of the native vegetation on the area to be cleared must be retained, and

B) if more than 500 ha is to be cleared, then a minimum of 20% of the native vegetation on that area must be retained on each 500-hectare area within or between cleared areas, and

C) the 20% retained native vegetation may not be cleared by any other method, and

D) the retained native vegetation may include invasive native species, and

E) the native vegetation retained for the purposes of this provision may be included in the calculation of the uncleared area extent of invasive native species on the property for the purposes of provisions 3 to 8.

Note:

The 20% retained native vegetation may be retained in patches or buffers.

The intention of this provision is that, for example, if 750 ha are to be cleared, then the 750-ha area is to be divided into a 500-ha ‘envelope’ and a 250-ha ‘envelope’. At least 100 ha must be retained on the 500-ha envelope and at least 50 ha must be retained on the 250-ha envelope. It is not permissible to retain, for example, 150 ha on the 500-ha envelope and retain nothing on the 250-ha envelope.

23. For clearing types:

    d) *clearing plants at paddock scale with nil to minimal disturbance to soil and groundcover*

    e) *clearing plants at paddock scale with temporary disturbance to soil and groundcover,* and

    f) *clearing plants at paddock scale with longer term disturbance to soil and groundcover*

    if plants of the species listed in the INS Database as requiring retention are present the following provisions apply:

        A) a minimum of 10% of the area of native vegetation on the area to be cleared must be retained in patches, and

            I) if more than 100 ha is to be cleared, then a minimum of 10% of the area of native vegetation on that area must be retained on each 100-hectare area, and

            II) the areas retained as required by this provision are additional to the areas retained for the purposes of provisions 3 to 8 and 22

    OR

        B) plants must be retained individually as specified in provision 21.

3.3.10 Requirements on how the clearing is to be carried out

The clearing must be carried out in accordance with the provisions set out below:

24. For clearing type a) *management burning*, the following provisions apply:

    A) clearing of non-invasive native species must be limited to the minimum extent necessary to clear the invasive native species, and

    B) the clearing must not result in soil surface disturbance.

25. For clearing type b) *clearing individual plants with no disturbance to groundcover*, the following provisions apply:

    A) the clearing must not result in soil surface disturbance, and

    B) non-invasive native species cleared must comprise no more than 1% of the total number of individual trees and shrubs cleared, and

    C) any clearing of groundcover must be incidental in extent, and

    D) the clearing must be limited to clearing of individual plants of invasive native species.

26. For clearing type c) *clearing individual plants with minimal disturbance to soil and groundcover*, the following provisions apply:

    A) disturbance to soil surface must be limited to the minimum extent necessary to clear individual plants of invasive native species, and

    B) non-invasive native species cleared must comprise no more than 1% of the total number of individual trees and shrubs cleared, and

    C) the clearing of groundcover must be to limited to the minimum extent necessary, and

D) the clearing must be limited to individual plants of invasive native species.

27. For clearing type d) *clearing plants at a paddock scale with nil to minimal disturbance to soil and groundcover*, the following provisions apply:

    A) disturbance to soil surface must be limited to the minimum extent necessary, and

    B) non-invasive species must comprise less than 10% of the total number of individual trees and shrubs cleared, and

    C) the clearing of groundcover must be limited to the minimum extent necessary.

28. For clearing type e) *clearing plants at paddock scale with temporary disturbance to soil and groundcover*, the following provisions apply:

    A) non-invasive species must comprise less than 10% of the total number of individual trees and shrubs cleared, and

    B) the clearing of groundcover must be limited to the minimum extent necessary, and

    C) disturbance to soil surface must be limited to the minimum extent necessary to control the invasive native species, and

    D) the introduction of non-persistent, non-native perennial vegetation listed in the INS Database (the species listed in the INS Database must also, in the judgement of the CMA, be non-persistent in the area where the species is proposed to be introduced), and annual non-native vegetation, must be limited to the clearing activity, and

    E) any non-native vegetation introduced must not be harvested.

29. For clearing type f) *clearing plants at paddock scale with longer term disturbance to soil and groundcover*, the following provisions apply:

    A) the non-invasive species must comprise less than 20% of the total number of individual trees and shrubs cleared, and

    B) the clearing of groundcover must be limited to the minimum extent necessary to control the invasive native species, and

    C) the preparation and sowing of land with annual non-native vegetation and/or non-persistent, non-native perennial vegetation listed in the INS Database (the species listed in the INS Database must also, in the judgement of the CMA, be non-persistent in the area where the species is proposed to be introduced) must be limited to three (or fewer) occasions in 15 years from the date of granting of consent or approval of the Property Vegetation Plan.

3.4 Define and apply management actions to INS zones in a PVP

Any PVP approving the clearing of invasive native species must include the management actions set out in Table 3 of the INS Database, or management actions may be in the form of a Code of Practice developed by the CMA to reflect the management requirements.

The CMA may use its judgement to vary the application of the management actions in the INS Database to individual Property Vegetation Plans to ensure the purpose of the clearing (as defined in Section 3.3.4 above) is met.

Note:

Varying management actions using judgement does not remove the need to use minor variation if changing any other provision of this Chapter (other than the management actions).

Purpose of clearing is defined in Section 3.3.4 as:
Clearing permitted by these provisions is for the purpose of re-establishing native vegetation or allowing natural regeneration of native vegetation species in order to maintain or create a mosaic of native vegetation states across the landscape.

3.5 Definitions

In Chapter 3 the following definitions apply:

Density or densities means the number of plants per hectare.

Derived vegetation community (for the purposes of this Chapter) means a vegetation community which has changed from a structurally different vegetation community; for example, shrubland that has encroached into open woodland or grassland areas. Vegetation communities with mature trees of the same species as younger trees in the community are generally not derived communities.

Diameter at breast height over bark (DBHOB) means the diameter over the bark of the stem at 1.3 m above the ground.

Erosion risk means the intrinsic susceptibility of a parcel of land to the prevailing agents of erosion. It is dependent on a combination of climate, landform and soil factors (Houghton & Charman 1986).

Extent of invasive native species on the property means the extent of the areas on the property (as mapped by the accredited assessor of the relevant CMA) where:

- invasive native species are currently present, and
- areas on the property where they may not presently occur but where invasive native species management is required to prevent their spread or recurrence.

Areas of non-native vegetation and areas of native vegetation not impacted by invasive native species are not included in the extent of invasive native species on the property.

Groundcover means any type of herbaceous vegetation, native and non-native, living or dead.

High condition means all attributes of Site Value are within benchmark for the vegetation type which corresponds to the threatened ecological community. Site Value, site attributes and benchmarks are described in Chapter 10.

Management burning is planned and controlled burning that is conducted for the purpose of managing invasive native species.

Native groundcover means living, native herbaceous vegetation.

Non-invasive native species means any native species that are not invasive native species, as defined in Section 3.3.1 above.

Reference:

Houghton, P.D. and Charman, P.E.V. (1986), *Glossary of terms used in soil conservation*. Soil Conservation Service of New South Wales, Sydney.

4 Thinning to benchmark stem densities

4.1 Introduction

The purpose of thinning to benchmark is to reduce competition between trees or shrubs to allow growth and maturation of the remaining trees and shrubs; regeneration of trees, shrubs and groundcover; and growth of groundcover; thus improving or maintaining vegetation composition and structure.

Thinning to benchmark stem density clearing proposals can only be approved under Property Vegetation Plans. That is, development applications cannot include thinning to benchmark stem density clearing proposals.

4.2 The improve or maintain test for thinning to benchmark

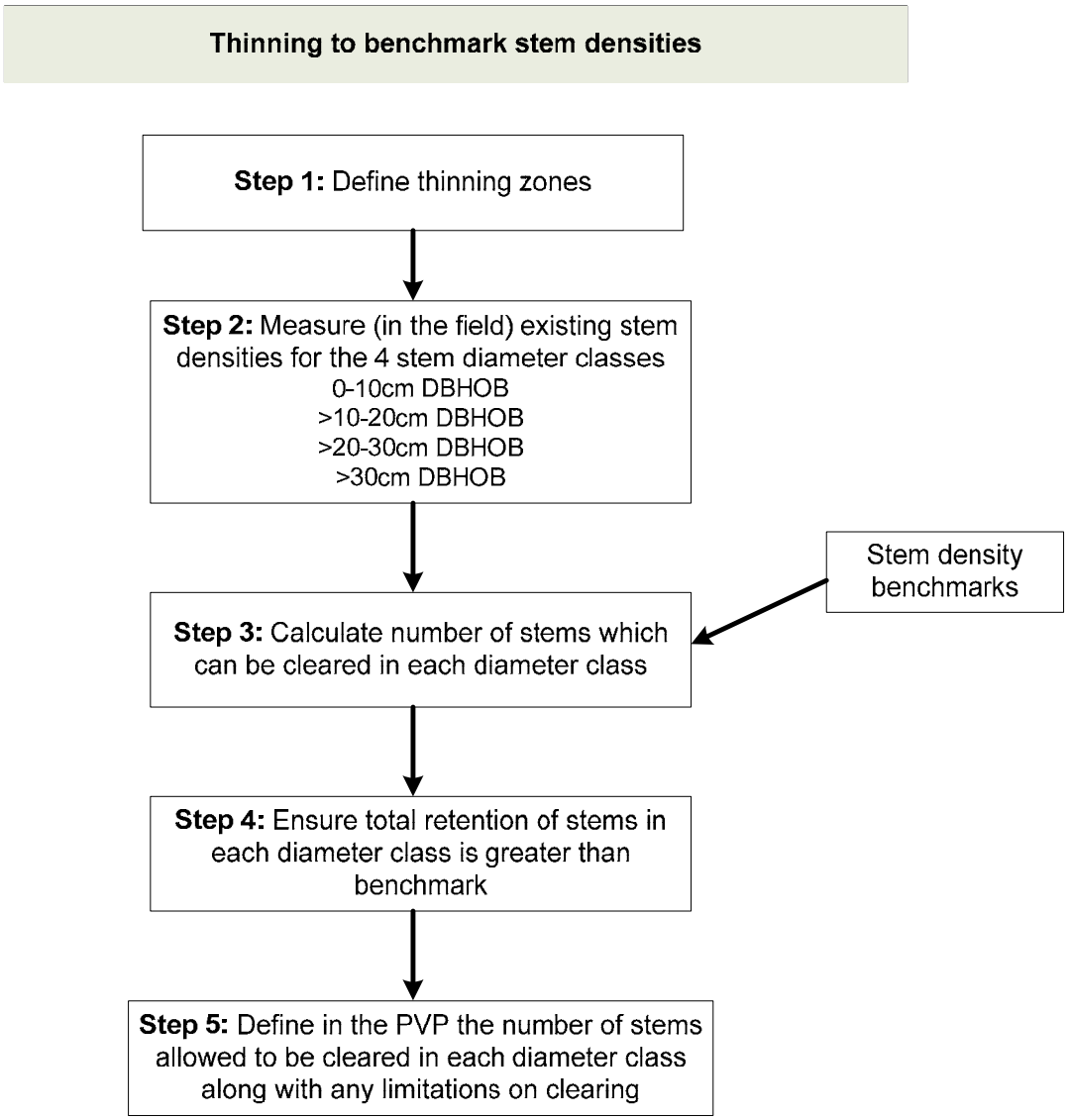
Thinning to benchmark is to be regarded as improving or maintaining environmental outcomes if, in relation to each thinning zone:

- no stems >30 cm DBHOB are thinned (or other DBHOB limits as listed in the Thinning Genera Database), and
- the area over which thinning to benchmark takes place is no more than 80% of the area of each thinning zone, and
- the total number of retained stems is greater than the total number of benchmark stems for all stem diameter classes except where permitted by Section 4.3.5 and 4.3.6 below, and
- thinning to benchmark is only undertaken by removing individual trees and shrubs with no or minimal disturbance to native groundcover, soil and non-target plants (e.g. by means such as chemical treatment of individual plants, ringbarking or grubbing), and
- when within 30 m of a water body (as defined in Chapter 7), thinning to benchmark is only undertaken by removing individual trees and shrubs with no disturbance to native groundcover, soil and non-target plants (e.g. by means such as chemical treatment of individual plants or ringbarking), and
- the numbers of stems retained for each stem diameter class are retained at that density on each one-hectare area of the proposal area, and
- thinning to benchmark is not undertaken in patches of less than one hectare in areas that are not linked to adjoining vegetation (linked means within 100 m of other vegetation).

Assessment of water quality and aquatic biodiversity (Chapter 7), land degradation (Chapter 8), salinity (Chapter 9) and biodiversity (Chapter 10) are not required for thinning to benchmark stem density clearing proposals.

4.3 Assessment process for thinning to benchmark proposals

Figure 4.1 Assessment process for thinning to benchmark stem densities



Note:
This assessment process is provided as guidance and does not need to be rigidly adhered to by CMAs in the assessment of thinning proposals

4.3.1 Defining thinning zones

A 'thinning zone' is defined as an area of one or more vegetation types in similar condition with the same stem density benchmarks.

Multiple vegetation types in similar condition with the same stem density benchmarks can be assessed as one thinning zone.

The stem diameter benchmarks for each thinning zone are the stem diameter benchmarks for its constituent vegetation type(s).

Vegetation types with different stem density benchmarks must be assessed separately.

Each thinning zone must be assessed separately.

4.3.2 Measuring the stem diameter of individual trees or shrubs

The stem diameter of an individual tree or shrub is the diameter at breast height over bark (DBHOB). DBHOB is measured at 1.3 m above ground level.

The stem diameter of a multi-stemmed tree or shrub is the DBHOB of the stem with the largest DBHOB.

4.3.3 Determining stem densities

Stem densities must be assessed in each thinning zone. To assess stem densities, 20 m x 50 m plots are placed in each thinning zone. A minimum of one plot is required in each zone, up to a maximum of 10 plots per zone (depending on size).

In each plot, the stems are classified into one of the four stem diameter classes (defined in Section 4.5). The number of stems per plot in each stem diameter class is recorded.

The numbers of stems per plot is used to calculate the number of existing trees or shrubs in each stem diameter class in the thinning zone.

Plotless methods of assessing the number of stems in each stem diameter class, such as nearest neighbour techniques, may be used instead of plots.

4.3.4 Calculating the number of stems that can be thinned

The maximum number of existing stems in each stem diameter class ≤ 30 cm DBHOB (0–10 cm DBHOB, >10–20 cm DBHOB, and >20–30 cm DBHOB) that can be removed is calculated by comparing the number of stem densities in each diameter class with the benchmark stem densities for each diameter class.

That is, for each stem diameter class:

the number of stems that can be removed = *observed stems – benchmark stems*

subject to the provisions set out in Sections 4.3.5, 4.3.6, 4.3.7, 4.3.8 and 4.3.9

4.3.5 Calculating the total number of stems to be retained

The total number of stems to be retained is as follows;

Total retained stems	>=	Total benchmark number of stems across all four stem diameter classes

The total number of stems to be removed from each stem diameter classes ≤ 30 cm DBOHB must not reduce the total number of retained stems to below the total of benchmark stem densities for all four stem diameter classes in any thinning zone, except as specified in Sections 4.3.6, 4.3.7 or 4.3.8 or limited by Section 4.3.9.

4.3.6 Shortfall of stems to be retained in one class must be made up from adjacent class

If the number of stems in a stem diameter class is fewer than the number of benchmark stems for that stem diameter class, then the shortfall number(s) of stems must be retained in

the adjacent smaller or larger stem diameter class in addition to the required benchmark number of stems for that stem diameter class.

If there are insufficient stems within the adjacent stem diameter class, then any remaining shortfall must be retained in the next smaller or larger stem diameter class. The number of retained stems for each stem class must never be less than the total number of benchmark stems for all stem diameter classes.

4.3.7 Combining stem diameter classes

If two or three stem diameter classes (≤30 cm DBHOB) are in the same age cohort, then one density benchmark for the combined stem diameter classes in that age cohort can be calculated from the sum of the density benchmarks for the stem diameter classes in the age cohort.

The stem retention requirements can then be met by retaining more larger stems and clearing more smaller stems in the combined stem diameter class, provided the total number of stems retained is greater than or equal to the benchmark number of stems for the combined stem diameter classes for the thinning zone.

4.3.8 Dealing with an excess number of stems in the >30 cm DBHOB class

Subject to the limitations imposed by Section 4.3.9, if there is an excess number of stems in the >30cm DBHOB stem diameter class, then additional stems may be thinned to below benchmark levels. These additional stems to be thinned must be spread evenly across the stem diameter classes below 30 cm DBHOB, so long as the total number of stems to be removed does not reduce the total number of retained stems to below the total of benchmark stem densities for all four stem diameter classes.

4.3.9 Thinning Genera Database

The Thinning Genera Database may set limits on the maximum DBHOB that may be cleared for some genera in various parts of the State.

Note:

At the time of writing, the Thinning Genera Database proposed to limit the maximum DBHOB for genera listed in the table below. The listings in the database may change from time to time subject to the database review process outlined in Chapter 2.

Table N2: Thinning Genera Database

Genus	Maximum DBHOB that may be thinned
Melaleuca	20
Casuarina	20
Allocasuarina	20
Callitris	20
Acacia	20

4.4 Define and apply management actions to thinning zones in a PVP

Required management actions for thinning zones differ from site to site. Standard management actions must be applied to all thinning zones, where relevant. Other management actions may be required depending on the site attributes.

The standard management actions are specified in the Thinning Management Actions Database (TMA Database). The database may also specify circumstances when the management actions must be applied and specific requirements for applying each management action and where it is appropriate for the accredited assessor (Level 2a) to apply judgement in the application of the management actions.

Management actions may be in the form of a Code of Practice developed by the CMA to reflect the management requirements.

The thinning zone management actions must be clearly defined in the PVP to ensure the environmental gains will be achieved.

4.5 Definitions

Diameter at breast height over bark (DBHOB) means the diameter over the bark of the stem at 1.3 m above the ground.

Thinning to benchmark means the clearing of individual trees or shrubs less or equal to 30 cm diameter that are above benchmark stem densities.

Stem diameter classes: the following four stem diameter classes are used to assess thinning to benchmark proposals:

- 0–10 cm DBHOB
- >10–20 cm DBHOB
- >20–30 cm DBHOB, and
- >30 cm DBHOB.

Reference:

Kerle, Dr J.A. (2005), *Collation and review of stem density data and thinning prescriptions for the vegetation communities of New South Wales*. Report prepared for the Department of Environment and Conservation (NSW), Policy and Science Division.

5 Pasture cropping systems

5.1 Introduction

Across large areas of NSW, native groundcover has been degraded since European settlement. There has been a reduction in the extent and condition of native groundcover and a decline in soil condition resulting in a loss of biodiversity and increased susceptibility to wind and water erosion.

Where existing native groundcover is in relatively poor condition, pasture cropping systems can, in combination with conservation grazing practices, improve the condition of native groundcover and prevent further long-term degradation. In particular, pasture cropping systems can result in:

- long-term improvement in the condition and perenniality of native groundcover
- improved water-use efficiency resulting in an increase of native groundcover that is sustainable in the long-term
- improved filtration of water
- rehabilitation of the land by creating soil conditions for seed recruitment to re-establish native groundcover naturally
- prevention of long-term degradation of native groundcover, and
- maintenance of native vegetation on the land in the long term.

Where pasture cropping systems are applied to areas of relatively poor condition native groundcover these environmental benefits outweigh the short-term environmental impacts of the clearing, and, as a result, offsets are not required for clearing for pasture cropping systems where the requirements of Section 5.2 are satisfied.

In this chapter, pasture cropping systems include ‘pasture cropping’ and ‘no kill cropping’. These terms are defined in Section 5.5.

Pasture cropping systems clearing proposals can only be approved under Property Vegetation Plans. That is, development applications cannot include pasture cropping systems clearing proposals.

Note to reader:

'Pasture cropping' and 'no kill cropping' proposals were previously assessed under clause 28 of the Native Vegetation Regulation 2005. Clause 28 contains special assessment provisions for minor clearing for long-term environmental benefits.

Pasture cropping systems proposals are being included in this EOAM as a way of simplifying and streamlining the assessment of these proposals. The remaining provisions in the existing clause 28 policy will be allowed for under an environmental works routine agricultural management activity (RAMA) (clause 35 of the Native Vegetation Regulation 2012).

This chapter of the EOAM differs from the clause 28 policy:

- The clause 28 policy sets a threshold of 90% of the benchmark for native species richness for the vegetation type for both types of pasture cropping systems techniques (pasture cropping and no kill cropping). Under this chapter, the threshold is also set at 90% for both techniques, but different thresholds may also be permitted. Different thresholds may be appropriate due to different levels of risk associated with the different techniques.
- There are a number of reasons why these thresholds may be set at a lower level. These include:
  - the risk of damage from herbicide application is greater for very good condition grasslands, and
  - where benchmark values might be understated for the relevant vegetation type (believed to be common in some CMAs) these benchmarks can be varied on a case-by-case basis using the more appropriate local data provisions until such time as the benchmarks are updated. These provisions were not available under the clause 28 policy and as a result the threshold was set at a higher level.
- Public comment is specifically invited on whether 90% is the appropriate threshold or whether some other threshold is more appropriate for both pasture cropping and no kill cropping.
- In addition, it may be that native species richness is not the best way to define grasslands where pasture cropping systems should or should not be allowed. The method set out in Chapter 10 (biodiversity values) to determine when a grassland is in low condition could potentially be extended to identify 'poorer condition grasslands' where pasture cropping systems should be allowed and also the 'better condition grasslands' to be avoided in the application of pasture cropping systems. This issue will be given further consideration following public consultation. Your comments are most welcome.
- Assessment for prevention of land degradation is not required in this chapter but is for the clause 28 policy. Instead safeguards are put in place based on slope. These safeguards are:
  - where the slope is greater than 8% but less than 25%, direct drilling with machinery designed to function with negligible soil and groundcover disturbance, such as inline discs, is permitted; drilling must be across the contour rather than up and down slope, and
  - where the slope is greater than 25% this pasture cropping systems cannot be approved under this chapter.
- Pasture cropping systems cannot be applied where average annual rainfall is <400 mm.

- This chapter can be applied statewide, whereas the clause 28 policy was limited to Lachlan, Central West, Border Rivers Gwydir and Southern Rivers CMA areas.
- This chapter uses only two categories (annual rainfall greater than or less than 500 mm) for total minimum groundcover requirements. The clause 28 policy uses three categories.
- Minimum total groundcover is set at 70% where rainfall is greater than 500 mm to align with the water erosion critical threshold of 70%. The clause 28 policy set this at 80%.
- A standard 50 m exclusion from any water body is included rather than referring to the water quality chapter (the clause 28 policy is excluded from any areas 'within the riparian buffer distances in Table 3.1 of the EOAM').
- Formatting and layout is different.

5.2 The improve or maintain test for pasture cropping systems

Proposed broadscale clearing directly associated with the use of pasture cropping systems is to be regarded as improving or maintaining environmental outcomes if:

1. a) the vegetation to be cleared is less than 90% of the benchmark for native species richness for the vegetation type where pasture cropping is used, and

   b) clearing of native vegetation only involves the incidental clearing of native groundcover species as a result of applying sub-lethal doses of a selective broadleaf herbicide immediately prior to drilling or as a result of drilling the annual crop using machinery designed to have minimal impact on the native groundcover

OR

2. a) the vegetation to be cleared is less than 90% of the benchmark for native species richness for the vegetation type where no kill cropping is used, and

   b) clearing of native vegetation only involves the incidental clearing of native groundcover species as a result of drilling the annual crop with inline disc type machinery designed to have negligible impact on the soil and native groundcover

AND

3. the clearing site is not cultivated other than the negligible or minimal tillage required to plant the annual crop, and
4. clearing native vegetation is not undertaken on more than three occasions in 15 years, and
5. the clearing is limited to the smaller of the following areas except where permitted by Section 5.3.7:

   i. 500 ha of native groundcover, or

   ii. 20% of the extent of native groundcover on the property, and
6. the clearing is not within 30 m of any water body, and
7. the clearing is not undertaken on slopes greater than 25%, and
8. where the slope is greater than 8% and less than or equal to 25% the clearing is only undertaken with direct drilling machinery designed to function with negligible soil and

groundcover disturbance, such as inline discs; the drilling must be across the contour rather than up and down slope, and

9. the clearing is not undertaken where average annual rainfall is <400 mm, and
10. the clearing does not result in the introduction of any non-native annual vegetation other than the vegetation specifically sown as part of the pasture cropping system (usually annual winter cereal species), and
11. the clearing does not result in the introduction of non-native perennial vegetation, and
12. management requirements in accordance with Section 5.4 are implemented on the clearing site.

Assessment of water quality and aquatic biodiversity (Chapter 7), prevention of land degradation (Chapter 8), prevention of salinity (Chapter 9), and biodiversity values (Chapter 10) are not required for pasture cropping systems clearing proposals.

Note:

In Chapter 8 (Prevention of land degradation), in most catchment hazard areas:

- 8% slope is the point at which water erosion hazard moves from class 3 to class 4, and
- 25% slope is the point at which water erosion hazard moves from class 5 to class 6.

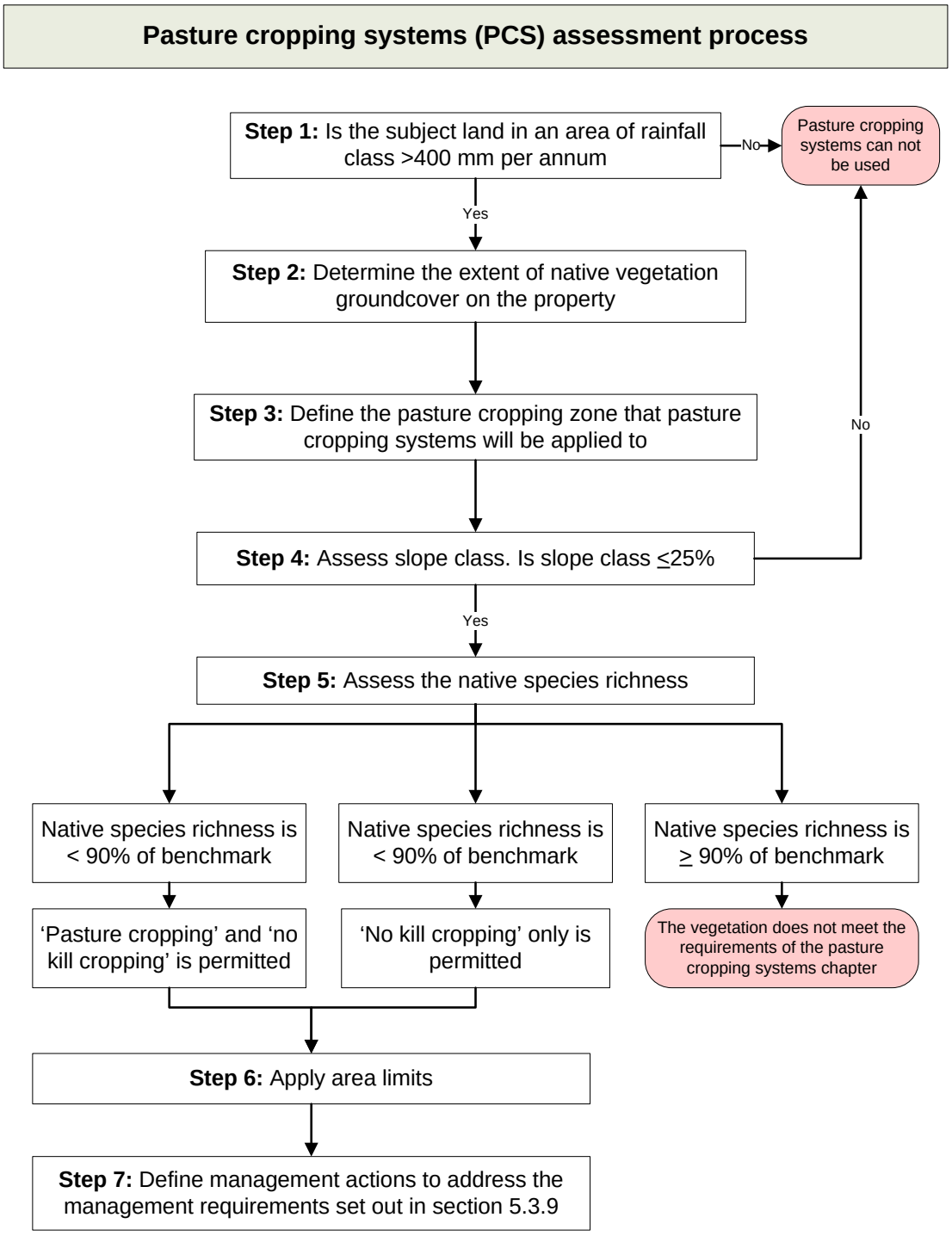
Therefore these slopes are considered the appropriate points to restrict the various types of pasture cropping systems activities.

Note to reader:

There are currently no restrictions on the application of fertilisers. Should fertiliser application be restricted?

5.3 Assessment process for pasture cropping systems

Figure 5.1 Pasture cropping systems assessment process



Note:

This assessment process is provided as guidance and does not need to be rigidly adhered to by CMAs in the assessment of pasture cropping systems proposals.

5.3.1 Determination of average annual rainfall

Pasture cropping systems are not permitted where average annual rainfall is less than 400 mm per year. In addition the minimum groundcover targets are also defined according to rainfall. Average annual rainfall is determined for the clearing site based on the Australian Bureau of Meteorology average annual rainfall map located at www.bom.gov.au/jsp/ncc/climate_averages/rainfall/index.jsp.

Note to reader:

The incorporation of a standard set of long-term rainfall data, that may replace the link provided above, is being investigated. This standard data is expected to be a national long-term data standard that will be adopted for modelling purposes such as Murray–Darling Basin salinity modelling, climate change impact modelling and various other purposes.

5.3.2 Determine the extent of native groundcover on the property

The extent of native groundcover on the property means the extent of the areas on the property where the groundcover is generally native.

In practice this is determined as the total area of the property less any areas of exotic pastures or crops.

5.3.3 Define the pasture cropping zone for the subject area that pasture cropping is to be applied to

A pasture cropping zone is mapped for each different vegetation type within the area proposed to be cleared, except if this will create a zone that is less than 0.25 ha in area. Any area of a vegetation type that is less than 0.25 ha should be added into the next most similar zone.

If the total area of the clearing proposal is less than 0.25 ha then just one zone should be used and the vegetation type that is most dominant in the clearing area should be assigned to the vegetation zone.

The vegetation type is determined from the Vegetation Types Database.

If there are multiple vegetation types included in the proposal and they are all of the same class, and the benchmark for native species richness is the same for all vegetation types, then one zone can be used.

5.3.4 Determine average slope

Pasture cropping systems are not permitted where average slope is greater than 25%.

If the steeper land can be easily excluded from the subject area, then the area should be redefined and mapped according to Section 5.3.3.

If the steeper land is too difficult to exclude from the subject area by way of mapping, then the steeper areas can be excluded via management actions in the PVP.

If average slope is greater 8% and less than or equal to 25% the use of pasture cropping systems can only undertaken using the no kill cropping technique defined in Section 5.5. The drilling must be across the contour rather than up and down slope.

Average slope can be measured using the techniques outlined in Section 8.3.4.

5.3.5 Assess native species richness

To assess native species richness 20 m x 20 m plots must be set out within the pasture cropping zone. Plots must be placed on average at least every two ha to achieve a representative sampling of the vegetation to be cleared, with a minimum of one plot and a maximum of 10 plots per pasture cropping zone.

Systematically walk the plot counting the number of indigenous plant species for all vascular plants. Species do not need to be indentified, only counted.

The number of native species must then be compared to the benchmark native species richness for the vegetation type being cleared.

- If native species richness is ≤40% of benchmark then pasture cropping and no kill cropping as defined in Section 5.5 can be used on that area.
- If native species richness is between >40% and ≤70% of benchmark then no kill cropping as defined in Section 5.5 can be used on that area.
- If native species richness is >70% of benchmark then pasture cropping systems cannot be used on that area.

5.3.6 Apply area limits to the pasture cropping zones

The use of pasture cropping systems is limited to the smaller of the following areas in any one landholding except where permitted by Section 5.3.7:

- 500 ha of native groundcover, or
- 20% of the extent of native groundcover on the property.

5.3.7 Additional areas may be managed by pasture cropping systems

The improve or maintain test in Section 5.2 limits the area that can be managed by pasture cropping systems. If an accredited assessment officer (Level 2a or 2b) is satisfied and certifies in writing that the minimum total groundcover targets (as defined in Section 5.3.8 below), of which greater than 75% is native groundcover, have been achieved on all areas already managed by pasture cropping systems then additional areas may be cleared through the application of pasture cropping systems. These additional areas are limited to the smaller of the following areas:

- 500 hectares of native groundcover, or
- 20% of the extent of the native groundcover on the property.

Additional areas may be authorised in accordance with the requirements above up to a maximum of 80% of the extent of native groundcover on the property.

5.3.8 Minimum total groundcover targets

The minimum total groundcover targets on areas subject to the pasture cropping system can vary according to average annual rainfall and are defined as:

- 70% where average annual rainfall is greater than 500 mm, and
- 50% where average annual rainfall is 500 mm or less.

5.4 Define and apply management actions to pasture cropping zones in a PVP

Management actions must be included in any Property Vegetation Plan approving clearing for pasture cropping systems to ensure the following management requirements are met. Management actions may be in the form of a Code of Practice developed by the CMA to reflect the management requirements.

The CMA may include additional management actions at the time of assessing and approving a PVP on a case-by-case basis where necessary to ensure the proposed clearing improves or maintains environmental outcomes.

Clearing provisions

Where pasture cropping is permitted, clearing is limited to incidental clearing of native groundcover as a result of applying sub-lethal doses of a selective broadleaf herbicide immediately prior to drilling, or as a result of drilling, the annual crop using machinery designed to have minimal impact on the native groundcover.

Where no kill cropping is permitted, clearing is limited to incidental clearing of native groundcover species as a result of drilling an annual crop with inline disc type machinery designed to have negligible impact on the soil and native groundcover.

Restoration requirements

All reasonable steps must be taken to achieve the minimum total groundcover targets (as defined in Section 5.3.8), of which greater than 75% is native groundcover, within five years of the planting of an annual crop into the native pasture. 'All reasonable steps' includes (but is not limited to) domestic stock grazing exclusion if necessary to achieve the minimum total groundcover levels.

Native species richness prior to the commencement of the pasture cropping treatment must be maintained or increased within 5 years of the last incidence of pasture cropping.

Landholder monitoring requirements

The landholder must monitor groundcover each year following clearing through application of pasture cropping systems as follows:

- the monitoring is to be undertaken using a method approved by the relevant CMA, and
- the monitoring of groundcover and native species richness is to be conducted in a scientific and objective manner that is appropriate to the area subject to the clearing and the species of vegetation that are present, and
- the monitoring must be at the time of year when the proportion of the amount of indigenous vegetation to the amount of non-indigenous vegetation in the area is likely to be at its maximum, and
- monitoring records must be retained by the landholder for the duration of the PVP.

Ongoing management

The ongoing management requirements are defined in the Pasture Cropping Systems Management Actions Database. The database may also specify circumstances when the management actions must be applied and specific requirements for applying each

management action. In each case the management actions that must be implemented will be set out in the PVP.

Note:

The following set of management requirements will be defined in the Pasture Cropping Systems Management Actions Database and may be required where clearing is approved for pasture cropping systems. These requirements may be changed from time to time following the process outlined in Chapter 2 for the updating of databases.

Clearing provisions

Where pasture cropping is permitted, clearing is limited to incidental clearing of native groundcover as a result of applying sub-lethal doses of a selective broadleaf herbicide immediately prior to drilling, or as a result of drilling, the annual crop using machinery designed to have minimal impact on the native groundcover.

Where no kill cropping is permitted, clearing is limited to incidental clearing of native groundcover as a result of drilling an annual crop with inline disc type machinery designed to have negligible impact on the soil and native groundcover.

Restoration requirements

All reasonable steps must be taken to achieve a minimum total groundcover of 70% or 50% (depending on the site), of which greater than 75% is native groundcover, within 5 years of the planting of an annual crop into the native pasture. 'All reasonable steps' includes (but is not limited to) domestic stock grazing exclusion if necessary to achieve the minimum total groundcover levels.

Ongoing management requirements

The following set of ongoing management requirements will be defined in the Pasture Cropping Systems Management Actions Database and may be required where clearing is approved for pasture cropping systems.

- **Conservation grazing management:** Grazing must be managed in such a way (including timing of stocking, stocking rates) as to; a) permit native groundcover to flower and set seed, and b) to prevent damage to the structure of the soil surface.
- **Groundcover is to be maintained** at or above the following minimum groundcover levels (depending on the site):
  - 70% where average annual rainfall is greater than 500 mm, and
  - 50% where average annual rainfall is 500 mm or less.
- **Soil ameliorant is to be applied where necessary:** Where the soil conditions will limit the growth of native groundcovers and the non-native annual vegetation sown as part of the pasture cropping system to such an extent that the minimum groundcover levels will not be met, then application of an appropriate soil ameliorant may be required.
- **Introduction of non-native perennial species is not permitted:** The clearing must not result in the introduction of non-native perennial species.
- **Introduction of non-native annual species is limited:** The clearing must not result in the introduction of non-native annual species except for those non-native annual species specifically planted as part of the pasture cropping system.

- **Clearing is limited to three occasions in 15 years:** The clearing must not be undertaken on more than three occasions in 15 years.
- **Landholder monitoring of groundcover:** The landholder must monitor groundcover each year following clearing by application of pasture cropping systems as follows:
  - the monitoring is to be undertaken by a method approved by the relevant CMA, and
  - the monitoring of groundcover is to be conducted in a scientific and objective manner that is appropriate to the area subject to the clearing and the species of vegetation that are present, and
  - the monitoring must be at the time of year when the proportion of the amount of indigenous vegetation to the amount of non-indigenous vegetation in the area is likely to be at its maximum, and
  - monitoring records must be retained by the landholder for at least the duration of the PVP.
- **Exclusion of RAMAs:** The landholder must not clear native vegetation for routine agricultural management activities (RAMAs) in map unit XXX on map XX except when the landholder is clearing native vegetation for the following RAMAs:
  - the operation and maintenance only of permanent fences only [as permitted by s. 22 and s. 11(1)(a) of the *Native Vegetation Act 2003* and clause 26 or 28 of the Native Vegetation Regulation 2012]
  - the removal of noxious weeds under the *Noxious Weeds Act 1993* [as permitted by s. 22 and s. 11(1)(b) of the *Native Vegetation Act 2003*]
  - the control of noxious animals under the *Rural Lands Protection Act 1998* [as permitted by s. 22 and s. 11(1)(c) of the *Native Vegetation Act 2003*]
  - the clearing of feral native plant species (as permitted by s. 22 of the *Native Vegetation Act 2003* and clause 33 of the Native Vegetation Regulation 2012)
  - any activity reasonably considered necessary to remove or reduce an imminent risk of serious personal injury or damage to property [as permitted by s. 22 and s. 11(1)(i) of the *Native Vegetation Act 2003*].

5.5 Definitions

Terms used in this chapter have the following meanings:

Benchmark for native species richness means native species richness in the relevant vegetation type which has had relatively little disturbance or modification since European settlement.

Conservation grazing means the use of domestic livestock as a management tool to improve the percentage of native groundcover.

No kill cropping means direct drilling of annual crops into living, perennial native pasture using zero till soil disturbance techniques with inline disc type machinery designed to have negligible impact on the soil and native groundcover and without using knock-down herbicides. The crops grow with the pastures.

Pasture cropping means direct drilling of annual crops into living perennial native pasture using zero till soil disturbance techniques and knock-down herbicides at sub-lethal rates. The crops grow with the pastures.

Soil ameliorant means one or more materials applied to alter adverse soil chemistry to create suitable growing conditions for vegetation.

Water body is defined in Section 7.5.

Zero till means drilling of seed with minimal (less than 5%) disturbance to topsoil.

6 Streamlined assessment of low risk categories of native vegetation clearing

6.1 Introduction

Three categories of native vegetation clearing are considered as low risk and have predictable offset requirements. These three categories of native vegetation clearing are assessed using streamlined assessment methods.

The streamlined assessment method for these categories operates by switching on and off and/or modifying components of the full environmental assessment according to the relevance and level of risk for that category of clearing.

This chapter:

- defines the categories of native vegetation clearing that are considered low risk, and
- specifies the details of the assessment method for those categories to determine if a proposal to clear native vegetation improves or maintains environmental outcomes.

The low risk categories of clearing that are assessed using a streamlined assessment method are:

- paddock trees in cultivation
- small clumps in cultivation, and
- very small areas.

The following sections in this Chapter define the assessment process for each of these three categories of native vegetation clearing and the circumstances in which proposed clearing improves or maintains environmental outcomes.

6.2 Clearing of paddock trees in cultivation

Vegetation meets the definition of paddock trees in cultivation if it:

- has an over-storey percent foliage cover less than 25% of the lower percent foliage cover benchmark for the vegetation type, and
- the groundcover is either crop, ploughed, fallow or almost exclusively perennial or annual exotic pasture (90% or more of cover is exotic species).

Any vegetation that does not meet this definition of paddock trees in cultivation cannot be assessed using the streamlined assessment method in this Chapter.

6.2.1 Improve or maintain test for paddock trees in cultivation

Proposed broadscale clearing is to be regarded as improving or maintaining environmental outcomes for paddock trees in cultivation (as defined in Section 6.2) if:

1. a) management actions consistent with the conservation agriculture principle defined in Section 6.5 are included in the PVP that approves the broadscale clearing, or

   b) the proposed broadscale clearing improves or maintains environmental outcomes in accordance with Chapter 8 (Prevention of land degradation)

AND

2. the clearing is not within 30 m of streams of stream orders 3 and above,

AND

3. the clearing does not result in the loss of important habitat features for threatened species predicted to be present that cannot withstand loss

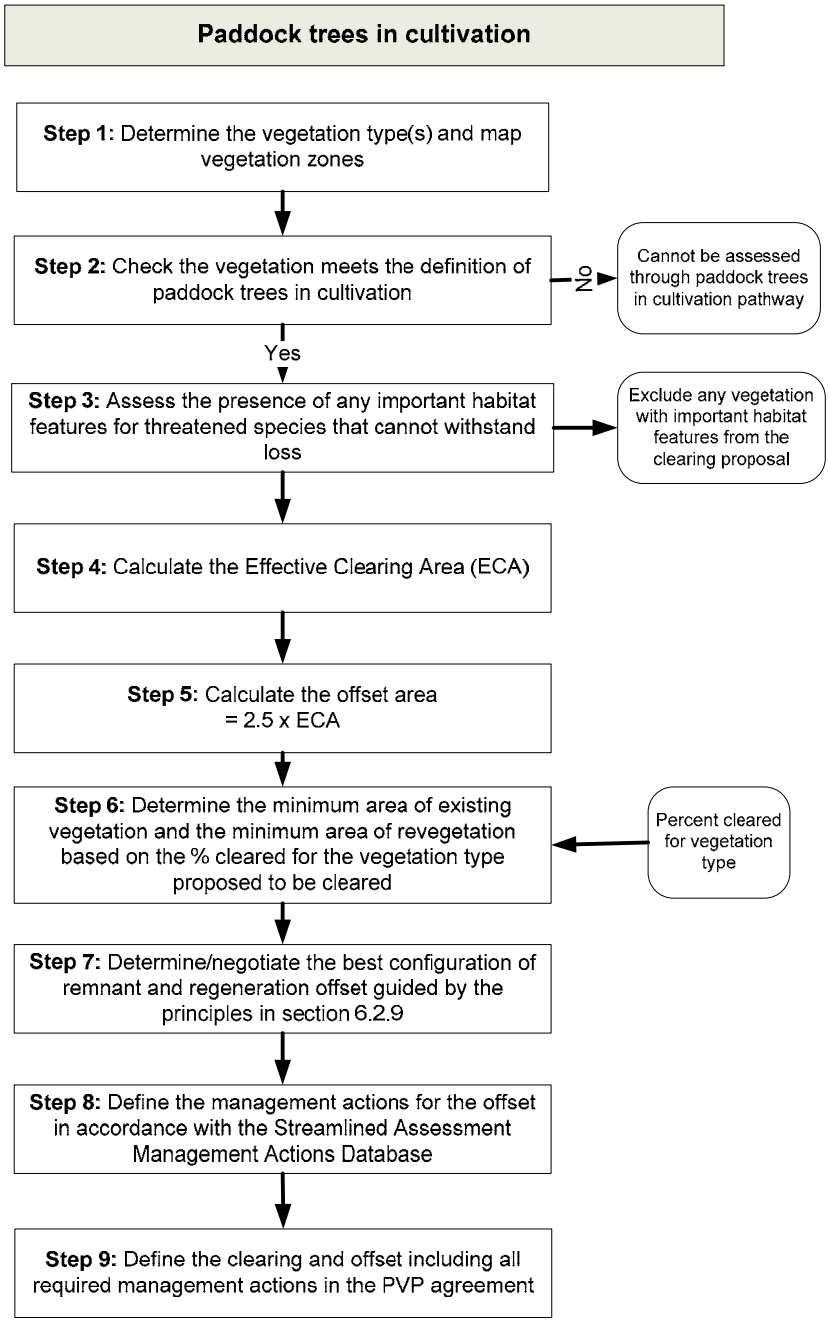
AND

4. the offset requirements in accordance with section 6.2 are complied with.

6.2.2 Assessment process for paddock trees in cultivation

The assessment process for paddock trees in cultivation clearing proposals is set out in Figure 6.1.

Figure 6.1 Assessment process for paddock trees in cultivation



Note:

This assessment process is provided as guidance and does not need to be rigidly adhered to by CMAs in the assessment of paddock trees in cultivation proposals.

Note:

The offset area may in some circumstances be 1.25 x the ECA. See Section 6.2.8

The assessment of paddock trees in cultivation is undertaken in accordance with the requirements summarised in Table 6.1 below.

Table 6.1 Summary of assessment requirements for paddock trees in cultivation compared with the assessment requirements in Chapters 7 to 10 of this EOAM

Component of EOAM		Assessment and offset requirement
Water quality and aquatic biodiversity (Chapter 7)		Clearing of paddock trees in cultivation is permitted within areas (including zone A) for streams of stream orders 1 and 2 and unmapped streams. No assessment of water quality and aquatic biodiversity is required for streams of stream orders 1 and 2 or for unmapped streams. Clearing of paddock trees in cultivation is not permitted within zone A (Table 7.1) of streams of stream orders 3 and above. If paddock trees in cultivation are cleared within zone B for streams of stream orders 3 and above, then zone A (and any remaining zone B) must be managed as a zone in accordance with Section 7.3.4 and the clearing must be carried out in accordance with Section 7.3.5.
Prevention of land degradation (Chapter 8)		No assessment of land degradation is required if the clearing is to facilitate conservation agriculture, and management actions consistent with the conservation agriculture principle set out in Section 6.5 are included in the PVP.
Prevention of salinity (Chapter 9)		Salinity assessment is not required for paddock trees in cultivation clearing proposals because paddock trees have negligible impact on dryland salinity, and the inclusion of revegetation as part of the offset balances any impact on salinity that may occur.
Biodiversity (Chapter 10)	Site and Site Value assessment	Assessment of Site Value, as set out in Section 10.2.3, is not required for paddock trees in cultivation. Instead the Effective Clearing Area (ECA) is calculated for the trees to be cleared. Calculation of ECA is detailed in Section 6.2.6 below.
	Landscape Value assessment	Assessment of Landscape Value, as set out in Section 10.2.6, is not required because the clearing of paddock trees in cultivation has negligible impact on Landscape Value, and the inclusion of revegetation as part of the offset balances any impact on Landscape Value that may occur.
	Calculation of ecosystem credits	The calculation of ecosystem credits in accordance with Section 10.6.2 is not required. The offset requirement for paddock trees in cultivation is calculated in accordance with Section 6.2.8, below.
	Threatened species assessed for species credits	The clearing site is assessed to determine the presence of any important habitat for species that cannot withstand loss of that habitat.
CMA discretion		The minor variation and more appropriate local data provisions set out in Chapter 2 (Section 2.8) have been streamlined for certain proposals to clear paddock trees in cultivation.

6.2.3 Determine the vegetation types and map vegetation zones

A vegetation zone is mapped for each different vegetation type in the paddock trees in cultivation clearing proposal. The vegetation type is determined from field inspection and the Vegetation Types Database.

The following are ascertained for each vegetation type:

- the percent cleared for the vegetation type (Vegetation Types Database), and
- the lower over-storey benchmark (Vegetation Benchmarks Database).

The vegetation type is also used to predict which threatened species are assessed according to Section 6.2.5 below.

The vegetation type is recorded in the decision support tool and the native vegetation system.

6.2.4 Check the vegetation in the zones meets the definition of paddock trees in cultivation

Paddock trees in cultivation are defined at the start of Section 6.2. Any vegetation that does not meet this definition of paddock trees in cultivation cannot be assessed as paddock trees in cultivation using the streamlined assessment method in this Chapter.

6.2.5 Assess the presence of any important habitat for threatened species that cannot withstand loss

The threatened species that are predicted to occur on the clearing site are determined from the Threatened Species Profile Database (TSPD) based on:

- vegetation type
- whether they are likely to use paddock trees, and
- CMA subregion.

The suite of threatened species that is predicted to occur is then filtered to determine the list of species that cannot withstand loss.

For paddock trees in cultivation, zones are visually assessed in the field to determine whether they contain important habitat features for any threatened species that cannot withstand loss using data from the TSPD.

Paddock trees in cultivation cannot be cleared if threatened species that cannot withstand loss are predicted to be present and their important habitat features are also present.

6.2.6 Calculate the Effective Clearing Area

The Effective Clearing Area (ECA) is the area covered by the total percent foliage cover in the vegetation zone when it is proportioned across the area at 25% of lower benchmark percent foliage cover. The effective clearing area is used to calculate the offset requirement and is used to record the clearing area in the public register. ECA is calculated according to Equation 6.1 below.

Equation 6.1 Effective Clearing Area

$$ECA = (\pi \times ((0.5*CD)^2/10{,}000) \times \#\ Trees \times pfc)/0.25 \times LBO$$

Where:

ECA = Effective Clearing Area for the trees to be cleared (ha)

π = Pi

CD = average crown diameter of the trees to be cleared (m)

Trees = the number of trees to be cleared in the vegetation zone (except where the trees are assessed as being of negligible biodiversity value under Section 6.2.7)

pfc = average % foliage cover of the trees to be cleared

LBO = Lower benchmark of % foliage cover of the over-storey cover for the vegetation type to be cleared.

The result of the equation is rounded up as follows:

- to one decimal place if the result is between 0 and 1, or
- to the next whole number if the result is greater than 1.

Note: Example calculation for Effective Clearing Area

Sample data:

- Average crown diameter (CD) = 14 m
- Average % foliage cover (pfc) = 35%
- Number of trees (# Trees) = 46
- Lower benchmark for over-story (LBO) = 15%

Calculation of effective clearing area:

1. Effective Clearing Area (ha) = (Pi x $((0.5*CD)^2/10{,}000)$ x # Trees x pfc)/(0.25 x LBO)

   Effective Clearing Area (ha) = 3.1415 x $(7^2/10{,}000)$ x 46 x 35%/(0.25 x 15%)= 6.609

2. Round **up** the result to the next whole number

   Round up 6.609 to next whole number = 7 ha

6.2.7 Paddock trees with negligible biodiversity value

In a very limited set of circumstances some paddock trees may be assessed by an accredited assessor (Level 2a) as having negligible biodiversity value and therefore do not need to be included in the Effective Clearing Area calculation. These trees must be assessed by the accredited assessor (Level 2a) as having negligible biodiversity value and must also meet the following criteria:

1. the vegetation type is less than 30% cleared in the CMA area, and
2. the individual property concerned has greater than 70% coverage of native vegetation that is not in low condition remaining on the property, and
3. there is >70% coverage of native vegetation in a 100,000-ha circle (radius of 17.841 km) centred on the proposal, and
4. the trees proposed to be cleared that are assessed as having negligible biodiversity value do not exceed on average 250 trees per 1000 ha of cultivation area from which the paddock trees will be removed, and

5. the total number of trees proposed to be cleared assessed to be of negligible biodiversity value does not exceed 1500 for the property, and
6. the trees proposed to be cleared are completely surrounded by cultivation, and
7. the trees are:
    a) of the species Western Rosewood (*Alectryon oleifolius subsp, canescens)* and are no greater than 3 m in height, or
    b) of the Mallee species *Eucalyptus dumosa, Eucalyptus socialis or Eucalyptus oleosa* that have been cut for firewood or other similar purpose in the past and have coppiced following that cutting and as a result have a stem diameter not exceeding 10 cm DBHOB.

6.2.8 Calculate the offset area

The offset area is calculated according to Equation 6.2 below.

Equation 6.2 Paddock trees in cultivation offset

Offset = ECA x 2.5

Where:

Offset = offset area required for the clearing of paddock trees in cultivation

ECA = Effective Clearing Area for the trees to be cleared (ha)

An accredited assessor (Level 2a) may determine that a smaller offset is required if a significant proportion of the trees proposed to be cleared do not contain key threatened species habitat (as indicated by the absence of hollows >5 cm diameter). In order to determine the smaller offset an assessment of the number of trees without hollows >5 cm in diameter must be undertaken, and those trees without hollows >5 cm in diameter may be offset at 1.25 times the ECA.

6.2.9 Determine the minimum amount of existing vegetation and revegetation, and any other offset requirements

Minimum amount of existing vegetation and revegetation

The minimum amount of existing vegetation and revegetation required in the offset area varies according to the percent cleared of the vegetation being cleared. These minimum levels are defined in Table 6.2 below.

Table 6.2 Minimum proportions of existing vegetation and revegetation components of offsets

Percent cleared of vegetation type being cleared	Minimum existing vegetation area required in offset (% of offset requirement)	Minimum revegetation area required in offset (% of offset requirement)
0–30%	25%	0%
>30–70%	25%	25%
>70–100%	25%	50%

Note: Example of determining the minimum existing vegetation area and minimum revegetation area required in offset

For a clearing proposal where the percent cleared for the vegetation type is greater than 70%, the following minimum areas are required in the offset:

- the minimum area of existing vegetation would be 25% of the required offset area
- the minimum area of revegetation would be 50% of the required offset area.

If the required offset area was 4 ha, then:

- the minimum area of existing vegetation would be 25% of 4 ha = 1 ha
- the minimum area of revegetation would be 50% of 4 ha = 2 ha
- The remaining 1 ha of required offset can be either existing vegetation or revegetation.

Relative value of existing vegetation to revegetation value of existing vegetation

Where the existing vegetation being used for the offset is below 75% of benchmark over-storey cover it is possible to undertake some or all of the revegetation by allowing and/or promoting regeneration of vegetation within that existing vegetation.

The relative value of existing vegetation varies according to the over-storey cover, compared to the lower over-storey benchmark for the vegetation type.

Table 6.3 below defines the relative value of existing vegetation and relative value for revegetation according to over-storey cover relative to the lower benchmark for % foliage cover of over-storey.

Table 6.3 Relative existing vegetation value and revegetation value of vegetation in various over-storey conditions

Over-storey % foliage cover of existing vegetation component of offset	Relative value of existing vegetation	Relative value of revegetation
<10% of lower benchmark	0%	100%
10–25 % of lower benchmark	25%	75%
>25–50% of lower benchmark	50%	50%
>50–75% of lower benchmark	75%	25%
>75–100% of lower benchmark	100%	0%

Note: Example of application of Table 6.3

Scenario: The offset required for a particular paddock tree clearing proposal is 4 ha, 50% of which must be revegetation and 25% of which must be existing vegetation (the remaining 25% can be either revegetation or existing vegetation). For this example assume the make-up of the offset will be 50% revegetation and 50% existing vegetation.

Interpretation: This offset requirement could be achieved in several ways. Two examples include:

1. 2 ha of revegetation of an un-vegetated site and 2 ha of existing vegetation at 80% of benchmark over-storey condition. Since the relative value of existing vegetation is 100%

if the vegetation is >75–100% of benchmark then 2 ha existing vegetation at 100% of lower benchmark = 2 x 100 % = 2 ha

OR

2. 4 ha of existing vegetation that has an over-storey cover 50% of the lower benchmark and the revegetation is undertaken between the existing trees etc. within that 4 ha. Since the relative value of existing vegetation is 50% if the vegetation is >25–50% of benchmark then 4 ha existing vegetation at 50% of lower benchmark = 4 x 50% = 2 ha.

Percent cleared requirement of offset

The offset vegetation type must meet the following requirements:

- at least 50% of the total offset area must be of a vegetation type that has an equal or greater percent cleared in the CMA area than the vegetation to be cleared, or
- where the vegetation type proposed for clearing is less than or equal to 70% cleared in the CMA area, offsets may be in vegetation types with percent cleared values up to 10% lower than the vegetation proposed for clearing, or
- where the vegetation type proposed for clearing is less than or equal to 30% cleared in the CMA area, offsets may be in vegetation types with percent cleared values up to 30% lower than the vegetation proposed for clearing.

Offset requirements for threatened species

Offset sites must be predicted to support the same suite of threatened species that was predicted to occur on the clearing site in Section 6.2.5. In addition, the existing native vegetation component of the offset must contain the key habitat features or components that are contained in the Threatened Species Profile Database for the individual species predicted to occur on the clearing site.

Note:

As a means of further streamlining assessment, refining of the threatened species list should only be undertaken where the proposed offset meets all other offset requirements but not the predicted suite of threatened species. The certified decision support tool should be used to determine which species are associated with the clearing vegetation but are not predicted to occur in the offset vegetation. This process can be used to focus the assessment on the habitat features that will have the greatest effect on the assessment outcome.

6.2.10 Determine or negotiate the best configuration of existing vegetation and revegetation for the offset

The ideal configuration of the offset and the proportion of existing vegetation to revegetation will vary from property to property and region to region.

The most effective configuration, location and proportion of existing native vegetation to revegetation is determined by the accredited assessor (Level 2a), in negotiation with the landholder, within the limits defined in Table 6.2 above and according to the following principles:

1. *Revegetation amongst existing vegetation in low to moderate condition will be more effective and provide greater environmental benefit than revegetation on fully cleared cultivated sites.*

2. *Wider is better.*
3. *Re-establishing connectivity between existing vegetation is desirable.*
4. *Natural regeneration (if conditions are right for it to occur) will usually be more effective than replanting.*

Note to reader:

The principles highlighted above (*in italic burgundy text)* have not been properly defined at this stage. These principles are provided here as an initial indication of what we anticipate will be included. These principles will be further defined with expert input and public comment following the public consultation process.

6.2.11 Define and apply management actions in a PVP

Management actions required for offsets differ from site to site and between the existing vegetation and revegetation components of the offset. Standard management actions must be applied to all offset sites, where relevant. Other management actions may be required depending on the condition of the site and the likelihood that natural regeneration will occur.

The management actions are specified in the Streamlined Assessment Management Actions Database (SAMA Database). The database may also specify circumstances when the management actions must be applied and specific requirements for applying each management action.

The management actions applied to the land to be cleared must include management actions for conservation agriculture consistent with the conservation agriculture principle defined in Section 6.5. If management actions consistent with the conservation agriculture principle defined in Section 6.5 are not included in the PVP then the prevention of land degradation (Chapter 8) assessment must be undertaken and the management requirements from that assessment included in the PVP.

The offset area and management actions must be clearly defined in the PVP to ensure the requisite environmental gains will be achieved.

Note:

The following set of standard management actions may be required on sites used to offset clearing paddock trees in cultivation and small clumps in cultivation.

Standard management actions

- Retention of regrowth and remnant native vegetation (provision may be made in the PVP to allow thinning of regrowth or remnant vegetation in offset areas to benchmark stem densities where dense regeneration occurs in the offset area)
- Management of human disturbance
- Grazing management: the default grazing management is grazing exclusion however wherever a strategic livestock grazing regime provides a better biodiversity outcome, then a strategic livestock grazing management action should be used
- Retention of all dead timber (standing and fallen)
- Weed control
- Erosion control

- Replanting and/or supplementary planting of native over-storey species or native mid-storey species where natural regeneration will not be sufficient to achieve benchmark cover
- Replanting and/or supplementary planting of native groundcover where natural regeneration will not be sufficient to achieve 70% groundcover
- Retention of rocks
- Management of fire for conservation (or fire exclusion); the PVP must define the appropriate fire regime for the offset area
- Exclusion of all routine agricultural management actions (RAMAs) except routine agricultural management actions for:
  – the control of feral native species
  – the control of noxious weeds
  – the control of noxious animals
  – traditional cultural activities
  – maintenance of public utilities
  – operation and maintenance (but not construction) of rural infrastructure, and
  – imminent risk of serious injury or damage.

Additional management actions to be applied where necessary

Examples of additional actions that may be required for relevant species as identified in the Threatened Species Profile Database are:

- Control of feral herbivores, and/or overabundant native herbivores
- Thinning of remnant or regrowth vegetation to stem density benchmarks
- Vertebrate pest management – pigs
- Vertebrate pest management – foxes and/or miscellaneous species
- Nutrient control
- Control of exotic fish species (within dams)
- Maintenance or reintroduction of natural flow regimes to wetlands (where possible)
- Exclusion of commercial apiary sites from the property.

Note:

The minor variation and more appropriate local data provisions set out in Section 2.8 have been streamlined for proposals to clear paddock trees in cultivation where the Effective Clearing Area is:

- <2 ha and the vegetation type is >70% cleared in the CMA area
- <4 ha and the vegetation type is 30–70% cleared in the CMA area, or
- <10 ha and the vegetation type is <30% cleared in the CMA area.

6.3 Clearing of small clumps in cultivation

6.3.1 Improve or maintain test for small clumps in cultivation

Proposed broadscale clearing is to be regarded as improving or maintaining environmental outcomes for small clumps in cultivation (as defined in Section 6.3.4) if:

1. a) management actions consistent with the conservation agriculture principle defined in Section 6.5 are included in the PVP, or

   b) the proposed broadscale clearing improves or maintains environmental outcomes under Chapter 8 (Prevention of land degradation)

AND

2. the proposed broadscale clearing improves or maintains environmental outcomes under Chapter 7 (Water quality and aquatic biodiversity)

AND

3. if the clearing is proposed to be carried out in an area for which hydrogeological landscape (HGL) data is available, Section 6.3.8 is complied with

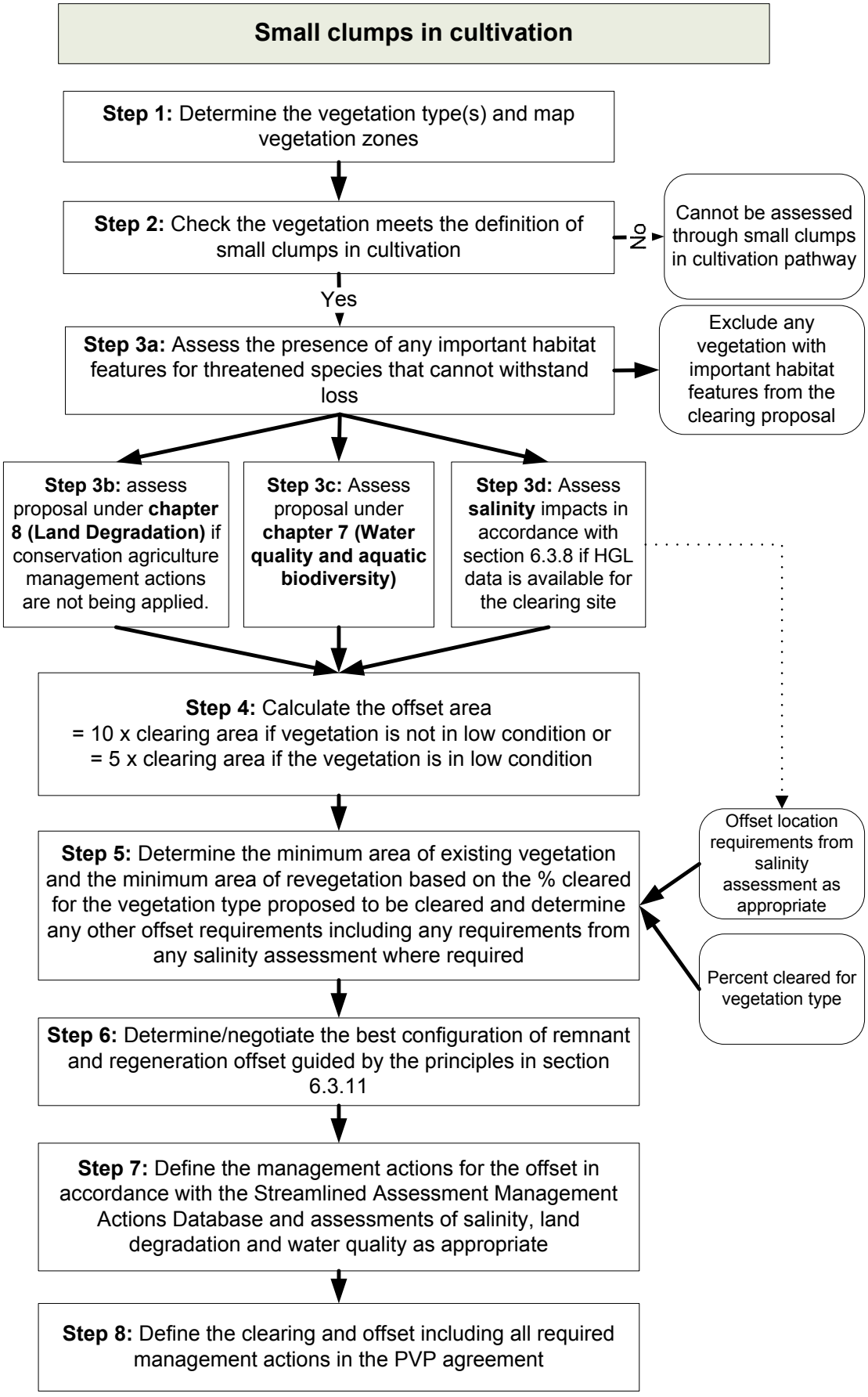
AND

4. Section 6.3 of this EOAM is complied with.

6.3.2 Assessment process for small clumps in cultivation

The assessment process for small clumps in cultivation clearing proposals is shown in Figure 6.2.

Figure 6.2 Assessment process for small clumps in cultivation



Note:

This assessment process is provided as guidance and does not need to be rigidly adhered to by CMAs in the assessment of small clumps in cultivation.

The assessment of small clumps in cultivation is undertaken in accordance with the requirements summarised in Table 6.4 below.

Table 6.4 Summary of assessment requirements for small clumps in cultivation compared with assessment requirements in Chapters 7 to 10 of this EOAM

Component of EOAM		Assessment requirement
Water quality and aquatic biodiversity (Chapter 7)		Clearing of small clumps in cultivation requires normal assessment under Chapter 7 (Water quality and aquatic biodiversity).
Prevention of land degradation (Chapter 8)		No assessment of land degradation is required if the clearing is being proposed to facilitate conservation agriculture, and practices consistent with the conservation agriculture principle set out in Section 6.5 are included in the PVP.
Prevention of salinity (Chapter 9)		Salinity assessment is not required for proposals to clear small clumps in cultivation if hydrogeological landscape (HGL) data is not available for the area. This is because small clumps in cultivation will, in most circumstances, have negligible impact on dryland salinity, and the inclusion of revegetation as part of the offset balances any impact on salinity that may occur. Where HGL data is available salinity is assessed according to Salinity Assessment Method 1 in Chapter 9. Method 1 is undertaken with the following modifications: • any salinity offset requirements may be satisfied by the revegetation component of the offset calculated under Section 6.3.9 below, and • the offset location requirements outlined in Section 9.4.6 must be adhered to in designing the revegetation component of the offset for clearing of small clumps in cultivation, and • the revegetation component of the offset calculated in Section 6.3.9 below must be greater than or equal to the offset required under Method 1 in Chapter 9.
Biodiversity (Chapter 10)	Site Value Assessment	Assessment of Site Value, as set out in Section 10.2.3, is not required for small clumps in cultivation except where required to determine whether the vegetation is in low condition.
	Landscape Value assessment	Assessment of Landscape Value, as set out in Section 10.2.6, is not required because the clearing of small clumps in cultivation has a relatively small impact on Landscape Value, and the inclusion of revegetation as part of the offset balances any impact on Landscape Value that may occur.
	Calculation of ecosystem credits	The calculation of ecosystem credits in accordance with Section 10.6.2 is not required. The offset requirement for small clumps in cultivation is calculated in accordance with Section 6.3.9 below.

Component of EOAM		Assessment requirement
	Threatened species assessed for species credits	Clearing sites are assessed to determine the presence of any important habitat for threatened species that cannot withstand loss of that habitat.
CMA discretion		The minor variation and more appropriate local data provisions set out in Section 2.8 have been streamlined for certain proposals to clear small clumps in cultivation.

6.3.3 Determine the vegetation types and map vegetation zones

A vegetation zone is mapped for each different vegetation type within the small clumps in cultivation clearing proposal. The vegetation type is determined from the Vegetation Types Database.

The following are ascertained for each vegetation type:

- the percent cleared for the vegetation type (Vegetation Types Database), and
- the lower over-storey benchmark (Vegetation Benchmarks Database).

The vegetation type is also used to predict which threatened species are assessed according to Section 6.3.5 below.

The vegetation type is recorded in the decision support tool and the native vegetation system.

6.3.4 Check the vegetation in the zones meets the definition of small clumps in cultivation

Vegetation falls within this category if:

1. a) it is less than 2 ha in area and is not in low condition, or

   b) it is less than 4 ha in area and is in low condition,

AND

2. a) it is greater than 100 m from remnant vegetation >2 ha in area, and

   b) it is not within a water body as defined in Chapter 7 or within zone A defined in Table 7.1, and

   c) the vegetation type is not greater than 90% cleared, and

   d) the vegetation is completely surrounded by cultivation.

Any vegetation that does not meet this definition of small clumps in cultivation cannot be assessed as small clumps in cultivation using the streamlined assessment method in this Chapter.

6.3.5 Assess the presence of any important habitat for threatened species that cannot withstand loss

The threatened species that are predicted to occur on the clearing site are determined from the Threatened Species Profile Database (TSPD) based on:

- vegetation type
- vegetation condition, and

- CMA subregion.

The suite of threatened species that is predicted to occur is then filtered to determine the list of species that cannot withstand loss.

The zones with small clumps in cultivation are visually assessed in the field to determine whether they contain important habitat features for any threatened species that cannot withstand loss using data from the TSPD.

Small clumps in cultivation cannot be cleared if threatened species that cannot withstand loss are predicted to be present and their important habitat features are also present.

Note:
As a means of further streamlining assessment, refining of the threatened species list should only be undertaken where the proposed offset meets all other offset requirements but not the predicted suite of threatened species. The certified decision support tool should be used to determine which species are associated with the clearing vegetation but are not predicted to occur in the offset vegetation. This process can be used to focus the assessment on the habitat features that will have the greatest effect on the assessment outcome.

6.3.6 Assess the proposal under Chapter 8 (Prevention of land degradation) if conservation agriculture management actions are not being applied

The proposal must be assessed in accordance with Chapter 8 (Prevention of land degradation) if the clearing is not being undertaken to facilitate conservation agriculture and thus the PVP does not apply management actions consistent with the conservation agriculture principle set out in Section 6.5.

6.3.7 Assess the proposal under Chapter 7 (Water quality and aquatic biodiversity)

Water quality and aquatic biodiversity assessment in accordance with Chapter 7 must be undertaken for all proposals to clear small clumps in cultivation.

6.3.8 Assess salinity impacts if HGL data is available for the clearing site

Salinity assessment is only undertaken for proposals to clear small clumps in cultivation if hydrogeological landscape (HGL) data is available for the area. Where HGL data is available salinity is assessed according to Salinity Assessment Method 1 in Chapter 9 with the following modifications:

- any salinity offset requirements may be satisfied by the revegetation component of the offset calculated under Section 6.3.9 below, and
- the offset location requirements outlined in Section 9.4.6 must be adhered to in designing the revegetation component of the offset for clearing of small clumps in cultivation, and
- the revegetation component of the offset calculated under Section 6.3.9 below must be greater than or equal to the offset required under Method 1 in Chapter 9.

6.3.9 Calculate the offset area

The offset area is calculated according to Equations 6.3 or 6.4 below depending on the condition of the vegetation to be cleared.

Equation 6.3 Small clumps in cultivation offset calculation, where vegetation to be cleared is not in low condition

SCOA = CA_Not Low Condition x 10

Where:

SCOA = offset area required for the small clumps in cultivation clearing

CA_Not Low Condition = the total area of small clumps in cultivation being cleared that are not in low condition (ha).

Equation 6.4 Small clumps in cultivation offset calculation, where vegetation to be cleared is in low condition

SCOA = CA_Low Condition x 5

Where:

SCOA = offset area required for the small clumps in cultivation clearing

CA_Low Condition = the total area of small clumps in cultivation being cleared that are in low condition (ha).

An accredited assessor (Level 2a) may determine that a smaller offset is required if a significant proportion of the trees proposed to be cleared does not contain key threatened species habitat (as indicated by the absence of hollows >5 cm in diameter). In order to determine the smaller offset, an assessment of the trees without hollows >5 cm in diameter must be undertaken, and that vegetation without hollows >5 cm in diameter may be offset at 5 times the clearing area if the vegetation is not in low condition or 2.5 times the clearing area if the vegetation is in low condition.

6.3.10 Determine the minimum amount of existing vegetation and revegetation, and any other offset requirements

Minimum amount of existing vegetation and revegetation

The minimum amount of existing vegetation and revegetation required in the offset area varies according to the percent cleared of the vegetation being cleared. These minimum levels are defined in Table 6.2 above.

Relative value of existing vegetation to regeneration value of existing vegetation

Where the existing vegetation being used for the offset is below 75% of benchmark over-storey cover it is possible to undertake some or all of the revegetation by allowing and/or promoting regeneration of vegetation within that existing vegetation.

The relative value of existing vegetation varies according to the over-storey cover compared to the lower over-storey benchmark for the vegetation type.

Table 6.3 above defines the relative value of existing vegetation and relative value for revegetation according to over-storey cover relative to the lower benchmark for % foliage cover of over-storey vegetation.

Percent cleared requirement of offset

The offset vegetation type must meet the following requirements:

- at least 50% of the total offset area must be of a vegetation type that has an equal or greater percent cleared in the CMA area than the vegetation to be cleared, and
- where the vegetation type proposed for clearing is less than or equal to 70% cleared in the CMA area, offsets may be in vegetation types with percent cleared values up to 10% lower than the vegetation proposed for clearing, or
- where the vegetation type proposed for clearing is less than or equal to 30% cleared in the CMA area, offsets may be in vegetation types with percent cleared values up to 30% lower than the vegetation proposed for clearing.

Offset requirements for threatened species

Offset sites must be predicted to support the same suite of threatened species that was predicted to occur on the clearing site in Section 6.3.5. In addition, the existing native vegetation component of the offset must contain the key habitat features or components that are contained in the Threatened Species Profile Database for the individual species predicted to occur on the clearing site.

Note:

As a means of further streamlining assessment, refining of the threatened species list should only be undertaken where the proposed offset meets all other offset requirements but not the predicted suite of threatened species. The certified decision support tool should be used to determine which species are associated with the clearing vegetation but are not predicted to occur in the offset vegetation. This process can be used to focus the assessment on the habitat features that will have the greatest effect on the assessment outcome.

6.3.11 Determine or negotiate the best configuration of existing vegetation and revegetation for the offset

The ideal configuration of the offset and the proportion of existing vegetation to revegetation will vary from property to property and region to region.

The most effective configuration, location and proportion of existing native vegetation to revegetation, must be determined by the accredited assessor (Level 2a) in negotiation with the landholder within the limits defined in Table 6.2 and according to the following principles:

1. *Revegetation amongst existing vegetation in low to moderate condition will be more effective and provide greater environmental benefit than revegetation on fully cleared cultivated sites.*
2. *Wider is better.*
3. *Re-establishing connectivity between existing vegetation is desirable.*
4. *Natural regeneration (if conditions are right for it to occur) will usually be more effective than replanting.*

Note to reader:

The principles highlighted above (*in italic burgundy text)* have not been properly defined at this stage. These principles are provided here as an initial indication of what we anticipate will be included. These principles will be further defined with expert input and public comment following the public consultation process.

6.3.12 Define the management actions for the offset

Management actions required for offsets differ from site to site and between the existing vegetation and revegetation components of the offset. Standard management actions must be applied to all offset sites, where relevant. Other management actions may be required depending on the condition of the site and the likelihood that natural regeneration will occur.

The management actions are specified in the Streamlined Assessment Management Actions Database (SAMA Database). The database may also specify circumstances when the management actions must be applied and specific requirements for applying each management action.

Note:

The following set of standard management actions may be required on sites used to offset clearing paddock trees in cultivation and small clumps in cultivation.

Standard management actions

- Retention of regrowth and remnant native vegetation (provision may be made in the PVP to allow thinning of regrowth or remnant vegetation in offset areas to benchmark stem densities where dense regeneration occurs in the offset area)
- Management of human disturbance
- Grazing management: the default grazing management is grazing exclusion however wherever a strategic livestock grazing regime provides a better biodiversity outcome, then a strategic livestock grazing management action should be used
- Retention of all dead timber (standing and fallen)
- Weed control
- Erosion control
- Replanting and/or supplementary planting of native over-storey species or native mid-storey species where natural regeneration will not be sufficient to achieve benchmark cover
- Replanting and/or supplementary planting of native groundcover where natural regeneration will not be sufficient to achieve 70% groundcover
- Retention of rocks
- Management of fire for conservation (or fire exclusion); the PVP must define the appropriate fire regime for the offset area
- Exclusion of all routine agricultural management actions except routine agricultural management actions for:
  - the control of feral native species
  - the control of noxious weeds
  - the control of noxious animals
  - traditional cultural activities
  - maintenance of public utilities
  - operation and maintenance (but not construction) of rural infrastructure, and
  - imminent risk of serious injury or damage.

Additional management actions to be applied where necessary

Examples of additional actions that may be required for relevant species as identified in the Threatened Species Profile Database are:

- Control of feral herbivores, and/or overabundant native herbivores
- Thinning of remnant or regrowth vegetation to stem density benchmarks
- Vertebrate pest management – pigs
- Vertebrate pest management – foxes and/or miscellaneous species
- Nutrient control
- Control of exotic fish species (within dams)
- Maintenance or reintroduction of natural flow regimes to wetlands (where possible)
- Exclusion of commercial apiary sites from the property.

6.3.14 Secure the offset and the offset management actions in the PVP

The offset area and management actions must be clearly defined in the PVP to ensure the environmental gains will be achieved.

Note:

The minor variation and more appropriate local data provisions set out in Section 2.8 have been streamlined for proposals to clear small clumps in cultivation where the clearing area is:

- <2 ha and the vegetation type is >70% cleared in the CMA area
- <4 ha and the vegetation type is 30–70% cleared in the CMA area, or
- <10 ha and the vegetation type is <30% cleared in the CMA area.

6.4 Clearing of very small areas

A clearing proposal is for 'a very small area' if the vegetation that is proposed to be cleared is:

1. not in low condition as defined in Section 10.4.2, and is not an endangered ecological community (EEC) and the area to be cleared is:
    a) <1 ha in area, and is a vegetation type that is ≥ 70% cleared in the CMA area, or
    b) <2 ha in area, and a vegetation type that is ≥ 30% cleared in the CMA area and <70% cleared in the CMA area, or
    c) <5 ha in area, and a vegetation type that is <30% cleared in the CMA area

OR

2. in low condition as defined in Section 10.4.2 and the area to be cleared is:
    a) <2 ha in area, and is a vegetation type that is either ≥ 70% cleared in the CMA area or is an endangered ecological community, or
    b) <4 ha in area, and a vegetation type that is ≥ 30% cleared in the CMA area and <70% cleared in the CMA area, and is not an endangered ecological community, or

c) <10 ha in area, and a vegetation type that is <30% cleared in the CMA area and is not an endangered ecological community.

Very small areas of vegetation can be contiguous with other vegetation, except in the case of 1.a).

A clearing proposal may have vegetation in more than one of the above categories, however the vegetation cannot exceed the limits for any individual category (combination of vegetation condition and percent cleared or EEC status) and the total area of vegetation to be cleared cannot exceed 5 ha of vegetation not in low condition and 10 ha total amount of vegetation per landholding, except in the case of 1.c).

Any vegetation that does not meet this definition of very small areas cannot be assessed using the streamlined assessment method in this Chapter.

Note: Example of determination of whether a proposal meets the small area definition where there are multiple zones of different percent cleared and vegetation condition:

Scenario: A landholder proposes to clear 8 ha as follows:

- **Zone 1**:1.9 ha is in low condition and is an EEC
- **Zone 2**: 3 ha is in low condition and has a percent cleared for the vegetation type <70 % but >30%
- **Zone 3**: 3 ha is not in low condition and has a percent cleared <30 %.

Interpretation:

Zone 1 satisfies the limit for criteria 2.a). above, and is therefore within the limits of very small areas.

Zone 2 satisfies the limit for criteria 2.b) above and the total area of zone 1 and 2 do not exceed 10 ha of vegetation in low condition.

Zone 3 satisfies the limit for criteria 1.c). above, and the total area for zones 1, 2, and 3 does not exceed 10 ha of vegetation and the total area of vegetation not in low condition does not exceed 5 ha. Therefore the total proposal meets the definition of very small areas.

6.4.1 Improve or maintain test for the clearing of very small areas

Proposed broadscale clearing of very small areas is to be regarded as improving or maintaining environmental outcomes (as defined in Section 6.4) if:

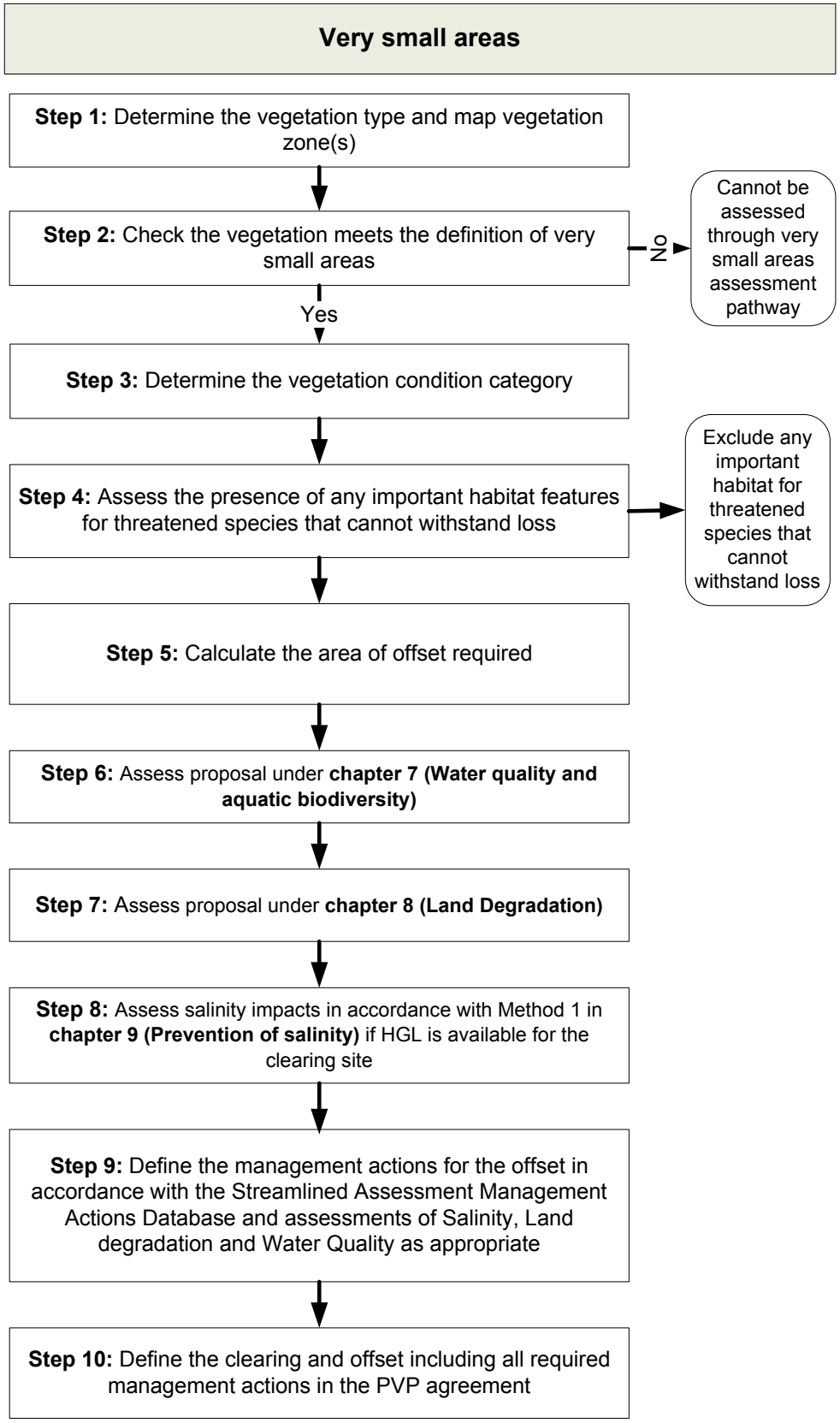
1. the proposed broadscale clearing improves or maintains environmental outcomes under Chapter 7 (Water quality and aquatic biodiversity) and Chapter 8 (Prevention of land degradation) of this EOAM, and
2. if the clearing is proposed to be carried out in an area for which HGL data is available, then the proposed broadscale clearing improves or maintains environmental outcomes under Chapter 9 (Prevention of salinity) of this EOAM, and
3. the proposed broadscale clearing improves or maintains environmental outcomes for biodiversity values if the number of ecosystem credits generated at the offset site (as determined by Equation 6.6) is equal to or greater than the number of ecosystem credits required to offset the clearing (the loss) (as determined by Equation 6.5), and

4. if threatened species that cannot withstand loss are not predicted to be present and the habitat component or habitat feature is not present.

6.4.2 Assessment process for very small areas

A guide to the assessment process for very small areas is set out in Figure 6.3. Where appropriate the accredited assessor (Level 2a) may undertake the assessment in a different order.

Figure 6.3 Assessment process for very small areas



The assessment of very small areas is undertaken in accordance with the requirements summarised in Table 6.5 below.

Table 6.5 Summary of assessment requirements for very small areas compared with assessment requirements in Chapters 7 to 10 of this EOAM

Component of EOAM		Assessment and offset requirement
Water quality and aquatic biodiversity (Chapter 7)		Clearing of very small areas requires assessment under Chapter 7 (Water quality and aquatic biodiversity).
Prevention of land degradation (Chapter 8)		Assessment of land degradation in accordance with Chapter 8 is required.
Prevention of salinity (Chapter 9)		Salinity assessment is not required for proposals to clear very small areas if hydrogeological landscape (HGL) data is not available for the area. This is because very small areas will, in most circumstances, have negligible impact on dryland salinity. Where HGL data is available salinity is assessed according to Salinity Assessment Method 1 in Chapter 9.
Biodiversity (Chapter 10)	Site and Site Value Assessment	Condition class of the vegetation on both the clearing and the offset sites is assessed visually for each of the ten condition variables set out in Table 10.1. For each variable a score of 3, 2, 1, or 0 is given based on the visual assessment of that variable on site. These results are weighted and then summed to give a total score for the site.
	Landscape Value assessment	Assessment of Landscape Value (Section 10.2.6) is not required because the clearing of very small areas has a negligible impact on Landscape Value.
	Calculation of ecosystem credits	A simplified ecosystem credit calculation as outlined in the Appendix to Chapter 6 is undertaken to determine loss on the clearing site and credits generated on the offset site.
	Threatened species assessed for species credits	Clearing sites are assessed to determine the presence of any important habitat for threatened species that cannot withstand loss of that habitat.
Offset requirements		The offset requirements for the clearing of very small areas are as defined for each of the assessments outlined above.
CMA discretion		The minor variation and more appropriate local data provisions set out in Section 2.8 have been streamlined for certain proposals to clear very small areas.

6.4.3 Determine the vegetation type and map vegetation zones

A vegetation zone is mapped for each different vegetation type within the area proposed to be cleared, except if this will create a vegetation zone that is less than 0.25 ha in area. Any area of a vegetation type that is less than 0.25 ha should be added into the next most similar vegetation zone. If the total area of the clearing proposal is less than 0.25 ha then just one vegetation zone should be used and the vegetation type that is most dominant in the clearing area should be assigned to the vegetation zone.

The vegetation type is determined from the Vegetation Types Database.

6.4.4 Check the vegetation in the zones meets the definition of very small areas

Very small areas are defined in Section 6.4.Any vegetation that does not meet this definition of very small areas cannot be assessed as very small areas using the streamlined assessment method in this Chapter.

6.4.5 Determine the condition category of the vegetation

Condition category within each vegetation zone on both the clearing and the offset sites is assessed visually (rather than by data collected from transects/plots) for each of the ten site attributes set out in Table 10.1. For each site attribute a score of 3, 2, 1, or 0 is given based on the visual assessment of that site attribute for the vegetation zone. These results are then used to calculate the Site Value score according to Equation 10.1.

Vegetation condition is classified as being in high, medium or low condition depending on the Site Value score. These categories are based on the upper and lower Site Value thresholds shown in Table 6.6.

Table 6.6 Upper and lower thresholds for high, medium and low vegetation condition categories

Category	Lower site value threshold for category	Upper site value threshold for category
High	>60	100
Medium	>34	60
Low	0	34

6.4.6 Assess the presence of any important habitat for threatened species that cannot withstand loss

The threatened species that are predicted to occur on the clearing site are determined from the Threatened Species Profile Database (TSPD) based on:

- vegetation type
- vegetation condition
- patch size
- fragmentation, and
- CMA subregion.

The suite of threatened species that is predicted to occur is then filtered to determine the list of species that cannot withstand loss.

Each of the vegetation zones within the very small areas clearing proposal are visually assessed in the field to determine whether they contain the habitat component or habitat feature for any threatened species that cannot withstand loss using data from the TSPD.

Very small areas cannot be cleared if threatened species that cannot withstand loss are predicted to be present and the habitat component or habitat feature is also present.

6.4.7 Calculating the area of offset required

The offset area required depends on:

- the area of vegetation being cleared
- the condition category of the vegetation being cleared, and
- the condition category of the vegetation in the offset area.

As such, offset area required = clearing area x standard offset ratio

Where:

Clearing area = area of the clearing (ha)

Standard offset ratio = relevant condition category of clearing and offset type from Table 6.7 below.

The standard S_{loss} and S_{gain} (See Appendix to Chapter 6) allow the calculation of the range of offset ratios that will occur for different combinations of vegetation condition being lost and gained. These ratios are shown in Table 6.7 below.

Table 6.7 Standard offset ratios for small area clearing proposals

		Clearing vegetation condition		
		Low	**Medium**	**High**
Offset vegetation condition	**Low**	4.0	6.5	8.8
	Medium	3.0	4.9	6.7
	High	3.8	6.1	8.3

6.4.8 Determining the type of offset required

The offset vegetation type must meet the following requirements:

- the offset sites must be predicted to support the same suite of threatened species that is predicted to occur on the clearing site

AND

- at least 50% of the total offset area must be of a vegetation type that has an equal or greater percent cleared in the CMA area than the vegetation to be cleared

OR

- where the vegetation type proposed for clearing is less than or equal to 70% cleared in the CMA area, offsets may be in vegetation types with percent cleared values up to 10% lower than the vegetation proposed for clearing

OR

- where the vegetation type proposed for clearing is less than or equal to 30% cleared in the CMA area, offsets may be in vegetation types with percent cleared values up to 30% lower than the vegetation proposed for clearing.

6.4.9 Assess the proposal under Chapter 7 (Water quality and aquatic biodiversity)

All proposals to clear a very small area must be assessed in accordance with Chapter 7 (Water quality and aquatic biodiversity).

6.4.10 Assess the proposal under Chapter 8 (Prevention of land degradation)

All proposals to clear a very small area must be assessed in accordance with Chapter 8 (Prevention of land degradation).

6.4.11 Assess salinity impacts if HGL data is available for the clearing site

Salinity assessment is only undertaken for proposals to clear very small areas if hydrogeological landscape (HGL) data is available for the area. Where HGL data is available salinity is assessed according to Salinity Assessment Method 1 in Chapter 9 (Prevention of salinity).

6.4.12 Define and apply management actions in a PVP

Management actions required for offsets differ from site to site and between the existing vegetation and revegetation components of the offset. Standard management actions must be applied to all offset sites, where relevant. Other management actions may be required depending on the condition of the site and the likelihood that natural regeneration will occur.

The management actions are specified in the Streamlined Assessment Management Actions Database (SAMA Database). The database may also specify circumstances when the management actions must be applied and specific requirements for applying each management action.

The offset area and management actions must be clearly defined in the PVP to ensure the environmental gains will be achieved.

Note:

The following set of standard management actions may be required on sites used to offset clearing of very small areas.

Standard management actions

- Retention of regrowth and remnant native vegetation (provision may be made in the PVP to allow thinning of regrowth or remnant vegetation in offset areas to benchmark stem densities where dense regeneration occurs in the offset area)
- Minimise human disturbance
- Grazing management: the default grazing management is grazing exclusion however wherever a strategic livestock grazing regime provides a better biodiversity outcome, then a strategic livestock grazing management action should be used.
- Retention of all dead timber (standing and fallen)
- Weed control
- Erosion control
- Replanting and/or supplementary planting of native over-storey species or native mid-storey species where natural regeneration will not be sufficient to achieve benchmark cover

- Replanting and/or supplementary planting of native groundcover where natural regeneration will not be sufficient to achieve 70% groundcover
- Retention of rocks
- Management of fire for conservation (or fire exclusion); the PVP must define the appropriate fire regime for the offset area
- Exclusion of all routine agricultural management actions except routine agricultural management actions for:
  – the control of feral native species
  – the control of noxious weeds
  – the control of noxious animals
  – traditional cultural activities
  – maintenance of public utilities
  – operation and maintenance (but not construction) of rural infrastructure, and
  – imminent risk of serious injury or damage

Note:

The minor variation and more appropriate local data provisions set out in Section 2.8 have been streamlined for proposals to clear very small areas in cultivation where the clearing area meets the definition of very small areas in Section 6.4.

6.5 Definitions

Conservation agriculture promotes a series of principles to achieve conservation objectives, rather than a particular technology. This is because agriculture is practised in many different ecosystems, and technologies have to be carefully tailored to be successful (Dumanski *et al.* 2006).

Dumanski *et al.* define one primary principle and six specific principles of conservation agriculture. For the purpose of this EOAM the primary principle is of greatest relevance. That is:

> *Maintaining permanent soil cover and promoting minimal mechanical disturbance of soil through zero tillage systems, to ensure sufficient living and/or residual biomass to enhance soil and water conservation and control soil erosion.*

Assessment of the clearing under Chapter 8 (Prevention of land degradation) is not required for proposals to clear paddock trees in cultivation or small clumps in cultivation if the land on which the paddock trees in cultivation and/or small clumps in cultivation will be managed in accordance with this principle and the proposed management is secured in the PVP.

Revegetation requires the implementation of appropriate management actions to ensure the restoration of the over-storey, mid-storey and groundcover vegetation to benchmark condition over the medium to long term.

Revegetation must be undertaken where possible in accordance with best practice for revegetation in the local area. The principles for best practice revegetation include:

- *seed should be locally native to the revegetation site*

- *species should be appropriate for the vegetation type and landscape position*
- *etc.*

Note to reader:

The principles highlighted above (*in italic burgundy text)* have not been properly defined at this stage. These principles are provided here as an initial indication of what we anticipate will be included. These principles will be further defined with expert input and public comment following the public consultation process.

Appendix to Chapter 6

Calculate the Site Value loss on the clearing site

Loss for each vegetation zone on the clearing site is calculated based on the area of the vegetation zone and the condition category of the vegetation within the zone. The number of ecosystem credits required to offset the clearing is calculated for each zone.

A standard loss per hectare is defined for each zone based on the vegetation condition category of the vegetation being cleared as shown below in Table 6.8.

Table 6.8 Standard loss in Site Value for each category

Vegetation condition category	Standard loss in Site Value per hectare
High	75
Medium	55
Low	34

A standard species offset multiplier of 4 is applied to calculate the number of ecosystem credits required according to Equation 6.5.

Equation 6.5 Ecosystem credits required to offset the clearing

Ecosystem credits required = $S_{loss\ std}$ x species offset multiplier x clearing area

Where:

Ecosystem credits required = the loss on the clearing site expressed as the number of ecosystem credits required to offset the clearing

$S_{loss\ std}$ = the loss in Site Value based on vegetation condition (high, medium or low from Table 6.8 above)

Species offset multiplier = 1/Tg = 1/0.25 where a standard Tg is used.
A Tg of 0.33 may be used in the circumstances outlined below

Clearing area = area of the clearing (ha)

The species offset multiplier is set at 4 (equals 1/Tg where the standard Tg value is 0.25) to make allowance for species credit species not being assessed and offset.

However, an accredited assessor (Level 2a) may determine that a Tg value of 0.33 may be used instead of 0.25 where an assessment of species credits is undertaken in accordance with Section 10.3.3 and the required species credits are offset in conjunction with or additional to the ecosystem credits required to offset the proposal.

Note:

In practice, this means that if there are no species credit species to be assessed, the Tg can be changed to 0.33 and therefore the species offset multiplier changed to 3 instead of 4.

Determine number of ecosystem credits created by the offset site

Gain at the offset site is calculated based on the area of the proposed offset and the condition category of the vegetation. Gain is defined in terms of the number of ecosystem credits generated at the offset site.

A standard gain Site Value score is defined based on the vegetation condition category of the vegetation in the proposed offset.

Table 6.9 Standard Site Value gains on the offset site

Vegetation condition category	Standard gain site value
High	36
Medium	45
Low	34

Equation 6.6 Ecosystem credits generated by the offset site

Credits generated at the offset site = $S_{gain\ std}$ x offset area

Where:

$S_{gain\ std}$ = the standard gain in Site Value based on vegetation condition (high, medium or low from Table 6.9 above)

Offset area = area of the offset (ha).

Standard offset ratios for very small area clearing

To improve or maintain environmental outcomes for biodiversity values the number of ecosystem credits generated at the offset site (as determined by Equation 6.6) must be equal to or greater than the number of ecosystem credits required to offset the clearing (the loss) (as determined by Equation 6.5). Combining Equation 6.5 and 6.6 allows the calculation of the size of the offset area required to offset the proposed clearing.

The acquisition and retirement of biodiversity credits from the biodiversity register established under Part 7A of the TSC Act may be used to offset the impacts of clearing assessed under the *Native Vegetation Act 2003*.

Note to reader:

The TSC Act will require amendments to permit the use of biodiversity credits created under the NSW Biodiversity Banking and Offsets Scheme to offset the impacts of clearing under the *Native Vegetation Act 2003*. However, this provision has been included here for public exhibition to invite comments and feedback from the community in relation to this provision.

Equation 6.7 Area of offset required to offset the clearing

Area of offset required = ($S_{loss\ std}$ x species offset multiplier x clearing area)/ $S_{gain\ std}$

Where:

$S_{loss\ std}$ = the loss in Site Value based on vegetation condition (high, medium or low from Table 6.8 above)

Std species offset multiplier = 1/Tg = 1/0.25 = 4 (standard Tg value of 0.25 is applied for very small area proposals)

Clearing area = area of the clearing (ha)

$S_{gain\ std}$ = the standard gain in Site Value based on vegetation condition (High, Medium or Low from Table 6.9 above)

Area of offset required = area of the offset (ha).

Reference:

Dumanski, J., R. Peiretti, J. Benetis, D. McGarry, and C. Pieri. 2006. The paradigm of conservation tillage. *Proc. World Assoc. Soil and Water Conserv.*, P1: 58-64.

7 Water quality and aquatic biodiversity

7.1 Introduction

This chapter of the EOAM defines the circumstances in which broadscale clearing is to be regarded as improving or maintaining environmental outcomes for the protection of water quality and aquatic biodiversity under the *Native Vegetation Act 2003*.

Both native and exotic vegetation in riparian areas provide benefits for water quality, due to filtering and slowing of overland water flow, and by providing shade. Native vegetation in riparian areas has more aquatic biodiversity benefits than exotic vegetation.

Vegetation in riparian areas can provide a range of benefits in addition to water quality and aquatic biodiversity, such as terrestrial native biodiversity habitat. Assessing and managing the impacts of broadscale clearing on terrestrial biodiversity, erosion and salinity are dealt with in other chapters.

Vegetation in riparian areas provides a wide range of water quality benefits, including:

- filtering and trapping pollutants, such as sediments, nutrients, pathogens, and toxicants from surface run-off
- storing nutrients, preventing them from entering the waterway (e.g. absorption by plant roots and sequestering into plant tissue, denitrification, or adsorption)
- reducing run-off velocity, allowing sediments to settle out of water and be deposited on land (this includes sediments previously suspended in the river that are borne onto riparian land during floods)
- stabilising stream banks, preventing channel erosion
- moderating stream flow during floods, reducing bed scour
- contributing large woody debris (snags) to streams, which can trap sediment, at least temporarily
- removing pollutants from the groundwater system through evapotranspiration, and
- providing shade to moderate and/or lower water temperature; this can also affect dissolved oxygen.

Vegetation in riparian areas also provides a wide range of important benefits for aquatic biodiversity, including:

- improving water quality via shading and removal of sediment and other pollutants from overland flow
- providing spawning sites for several native fish species during flood events
- providing a source of carbon and nutrients when inundated during floods, which assists in food chain productivity
- protecting floodplains from erosion which has water quality benefits and protects habitat
- allowing for the expansion and contraction of water bodies in response to natural ‘boom and bust’ wet and dry cycles that are particularly significant in Australia

- providing a source of future in-stream snags which provide habitat for a range of aquatic biodiversity
- providing a source of insects as a food source for aquatic biodiversity, and
- providing an ongoing seed bank as a source of biodiversity for the riparian area to continue to regenerate on site and downstream over time.

7.2 The improve or maintain test for water quality and aquatic biodiversity

Clearing improves or maintains environmental outcomes for water quality and aquatic biodiversity in the following circumstances.

Note to reader:

Zone A and zone B are defined in Section 7.6

7.2.1 Clearing outside the water body and the zones A and B

A clearing proposal improves or maintains environmental outcomes for water quality and aquatic biodiversity if:

- the clearing is not within a water body, and
- the clearing is not within the zone A or zone B as defined in Tables 7.2, 7.3 and 7.4 below.

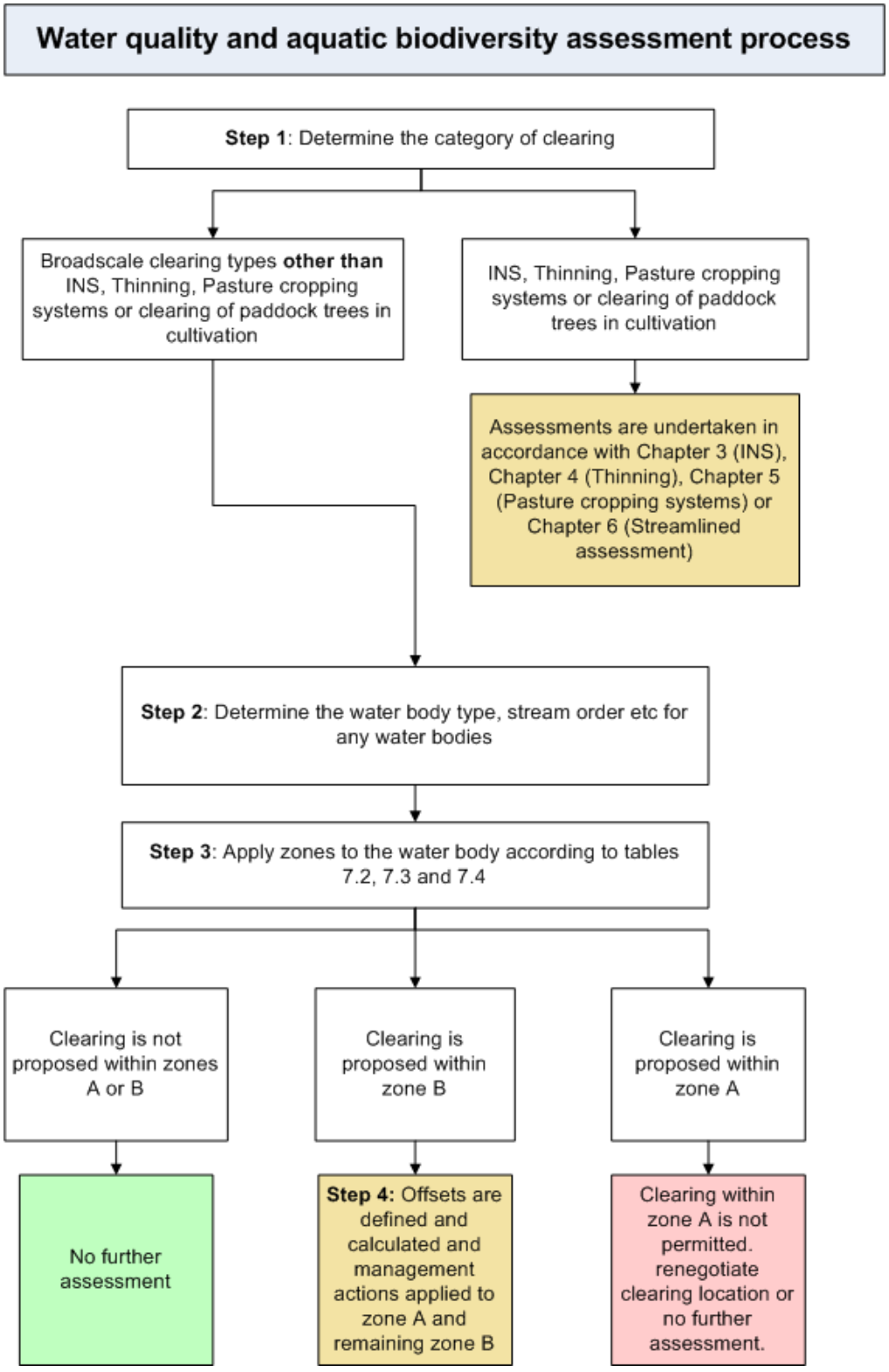
7.2.2 Broadscale clearing within zone B

A clearing proposal improves or maintains environmental outcomes for water quality and aquatic biodiversity if:

- the clearing is within the zone B as defined in Tables 7.1, 7.2, and 7.3 below, and
- clearing is not undertaken within zone B if the slope of the land on which the clearing is proposed exceeds 25% (14 degrees), and
- clearing is not undertaken within zone B if the slope of the land on which the clearing is proposed exceeds 3% and the soil type of the land to be cleared is silt or clay, and
- clearing is not undertaken within zone B if it is located adjacent to a priority protection waterway (see definition in Section 7.5), and
- any other clearing proposed within the zone B is:
  - undertaken in accordance with the requirements of Section 7.3.5 below, and
  - is offset in accordance with the requirements of Section 7.3.6 below, and
  - any remaining zone B and zone A must be managed in accordance with the requirements of Section 7.3.4 below (Management of zones to maximise effectiveness).

7.3 Assessment process for water quality and aquatic biodiversity

Figure 7.1 Assessment process for water quality and aquatic biodiversity



Note:
This assessment process is provided as guidance and does not need to be rigidly adhered to by CMAs in the assessment of broadscale clearing proposals

7.3.1 Determine the category of clearing type

The category of clearing being undertaken determines the type of water bodies to be assessed and the restrictions on clearing and management of offset requirements according to the water body or zone.

Table 7.1 Summary of improve or maintain requirements for water quality and aquatic biodiversity

Category of clearing	Water body type	Restrictions on clearing and management of offset requirements according to water body or zone		
		Within water body	Zone A	Zone B
Thinning to benchmark	All	Clearing is permitted providing it is undertaken with no disturbance to soil or groundcover		
Invasive Native Species	All	Clearing types *a) management burning* and *b) clearing of individual plants with no disturbance to groundcover*, are permitted in zone A and B		
Pasture Cropping Systems	All	Clearing is not permitted within 30 m of any water body		
Paddock trees in cultivation	Unmapped streams	No restriction in any zone		
	Streams with stream order 1 and 2	No restriction in any zone		
	Streams with stream order 3 and above	Clearing not permitted		Clearing permitted in zone B with management of zone A but there is no specific water quality offset
Other broadscale clearing	All	Clearing not permitted		Clearing permitted with a water quality offset and management of remainder of zones A and B. Clearing not permitted if: • land is >25% slope, or • land is >3% slope and soil is silt or clay, or • clearing is adjacent to a priority protection waterway.

7.3.2 Determine the category of water body

All water bodies contained within the clearing zone need to be assigned a category. Water bodies can be categorised as:

- streams as defined in Section 7.5
- estuaries as defined in Section 7.5, or
- wetlands as defined in Section 7.5.

7.3.3 Apply zones to the water body

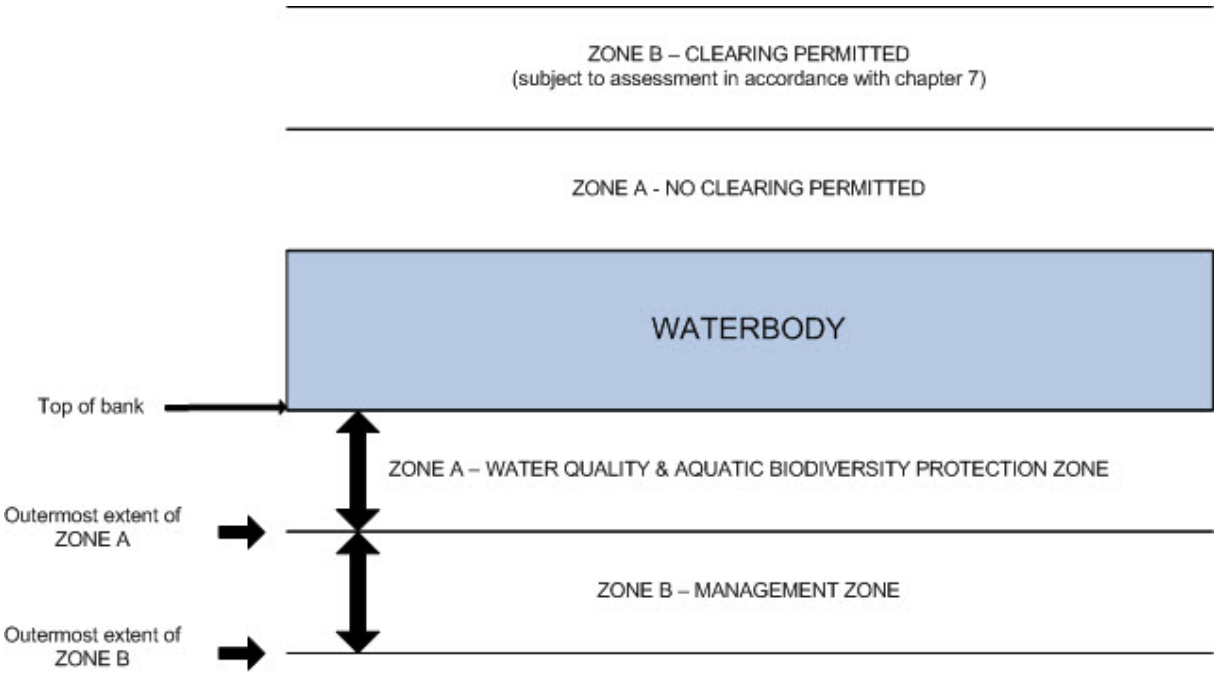
For the purposes of Chapter 7, zones are defined according to stream order, wetland category or estuarine area.

Zone distances in Tables 7.2, 7.3 and 7.4 are measured as follows:

- **Water Quality and Aquatic Biodiversity Protection Zone A** (zone A) – from the top of the bank to the outermost extent of zone A. This zone needs to be retained for water quality and aquatic biodiversity protection
- **Management Zone B** (zone B) – from the outermost extent of zone A to the outermost extent of zone B. Clearing in this zone could improve or maintain water quality or aquatic biodiversity if offsets are provided and management actions are implemented.

This is illustrated in Figure 7.2 below.

Figure 7.2 Extent of the zones



Measuring zone distances

Zones for streams are measured on both sides of the stream from top of bank (see definition in Section 7.5).

Zones for wetlands are measured on all sides from the wetland limit. Where a wetland has more than one bank, the bank furthest from the wetland area should be used. The wetland

limit is defined as the larger of the current saturated zone, or the outer edge of where the vegetation type indicates a wetter micro-environment than the surrounding country.

The zone distance for estuaries is measured from the astronomical high tide mark, where there is no obvious bank.

When marking zones on a map in the PVP, the zone should be measured from the on-ground location of the water body.

Zone distances

Table 7.2 Stream zones

Stream order	Zone A (m)	Zone B (m)
unmapped	10	10
1	10	10
2	10	10
3	20*	10
4 & 5	20*	10
6, 7, 8, 9	40*	10

Table 7.3 Wetland zones

Category	Zone A (m)	Zone B (m)
Lagoons	20	10
Minor wetlands	30*	10
Important wetlands	40*	10

Table 7.4 Estuarine zones

	Zone A (m)	Zone B (m)
Estuarine areas	30	10

*** Note:**

In these cases, aquatic biodiversity considerations require a larger distance than water quality considerations.

7.3.4 Management of zones to maximise effectiveness

If clearing is undertaken within zone B as defined by Tables 7.2, 7.3 and 7.4 then careful management of the zone A and any remaining zone B is required to ensure it is functioning effectively to remove sediment and nutrients and to adequately maintain the function of the remaining zone for aquatic biodiversity purposes.

The management actions that must be applied to the zone A and any parts of zone B that are not cleared if clearing is undertaken in zone B are specified in the Water Quality Management Actions Database (WQMA Database). The WQMA Database may also specify circumstances when the management actions must be applied, specific requirements in the application of each management action and where it is appropriate for the accredited assessor to apply judgement in the application of the management actions.

Note to reader:

The following set of relatively passive management actions are proposed to be implemented on the remaining zone A and/or zone B (between the clearing and the stream) when clearing is taking place within zone B:

- manage human disturbance (e.g. no installation of infrastructure such as roads or drainage, terraces, retaining walls, or pathways unless positioned and designed to minimise water quality and aquatic biodiversity impact)
- retain regrowth and remnant native vegetation (provision may be made in the PVP to allow thinning to benchmark in circumstances where dense regeneration occurs in the zone)
- maintain overall groundcover density (Both exotic and native vegetation can be effective in protecting water quality. The EOAM recommends revegetation with, and retention of, native vegetation. This is because native vegetation provides more aquatic biodiversity benefits than exotic vegetation. This approach is consistent with other aspects of the EOAM)
- exclude fertiliser application
- retain all dead timber (standing and fallen)
- retain rocks
- exclude all RAMAs except RAMAs for: control of feral native species, control of noxious weeds, control of noxious animals, traditional cultural activities, maintenance of public utilities, operation and maintenance of rural infrastructure (but not construction) and imminent risk of serious injury or damage
- exclude domestic livestock grazing to maximise groundcover and reduce the impact of grazing on riparian vegetation except where strategic grazing will give a better outcome for water quality and aquatic biodiversity
- exclude fire except where ecological burning will give a better outcome for water quality and aquatic biodiversity
- provide alternative stock watering points away from the waterway if applicable
- prohibit stock mustering across the waterway, except where a designated, properly designed, fish-friendly stock crossing is used, and
- undertake contour works, where necessary, to ensure even spread of flow from zone B across the length of the zone A, thereby avoiding creating flow paths.

Note to reader:

The strip of land immediately adjacent to streams is often Crown land. This can complicate the application of management actions to these areas. OEH plans to consult with the Department of Primary Industries (Catchments and Land) on this issue prior to any gazettal of provisions such as these.

7.3.5 Conditions on clearing within zones

Any clearing undertaken within zone B must be undertaken in such a way so as to minimise any likelihood of sediment being washed from the site during and/or after clearing operations.

Mitigation actions must be included in the PVP in order to minimise risk of sediment being washed from the site during clearing. The mitigation actions that must be applied are specified in the Water Quality Management Actions Database (WQMA Database). The WQMA Database may also specify circumstances when the mitigation actions must be applied, specific requirements in the application of each management action and where it is appropriate for the accredited assessor (Level 2a) to apply judgement in the application of the mitigation actions.

Note to reader:

The following set of mitigation actions are proposed to be required in the clearing site (where appropriate) to minimise the risk of sediment being washed from the site:

- minimise ground disturbance and establish groundcover immediately following clearing
- use sediment control techniques during the clearing and groundcover establishment phase to capture sediment before it leaves the clearing site
- do not clear during a rainfall event, or when rainfall is predicted within two days
- do not clear while the soil is saturated
- minimise the skewing of machinery tracks to the greatest extent practicable, and
- operate any blades and other attachments in a position that does not disturb the ground surface, where possible.

7.3.6 Zone offset requirements

Any clearing within zone B as defined in Tables 7.2, 7.3 and 7.4 must have an offset area to improve or maintain environmental outcomes for water quality and aquatic biodiversity. The offset must be established before clearing is started. The offset requirements including the type, size, location and management of the offset area are set out in the following sections.

The zone offset may also be used as the offset required by other chapters of this EOAM (e.g. for biodiversity, streamlined assessment and/or prevention of salinity) providing the requirements and management of each chapter are satisfied.

Location of zone offsets

Offsets must be located within the zones (as defined in Tables 7.2, 7.3 and 7.4 above) of either:

- the same stream, wetland or estuary as where the clearing is taking place, or
- upstream of the clearing stream, wetland or estuary within the same CMA subregion, or

- a sister stream within the same CMA subregion, or
- a higher order stream downstream of the stream upon which the clearing is taking place, within the same CMA subregion.

Where possible the zone offset should be located adjacent to a priority restoration waterway (see definition in Section 7.5).

Size of zone offsets

The offsets must include the re-establishment and ongoing management of previously missing vegetation (zone A and/or zone B) covering at least two times the area of clearing being undertaken (except where provided under Section 7.3.7 below). Any existing vegetation along the streams where the offset is located must be managed along with the revegetation offset to ensure water quality and aquatic biodiversity outcomes are maximised.

7.3.7 Special provisions for alternative offsets

In some circumstances it may be appropriate to consider alternative offsets for water quality and aquatic biodiversity.

An offset less than two times the clearing area may be established if other water quality and aquatic biodiversity management approaches are implemented to offset impacts on water quality and aquatic biodiversity. Specific requirements for alternative zone offsets are outlined below.

Water quality

Alternative offsets and/or mitigation actions for water quality must meet the following criteria:

- an accredited expert (water quality) as defined in Chapter 2 must demonstrate that the alternative approach, in combination with any offset, will fully offset the water quality impact resulting from clearing within zone B. The calculations that inform this assessment must assume best land management practices are implemented at the clearing site and at the offset location (to ensure the offset is not managing water quality impacts that would be better managed through improved on-site practices), and
- the alternative approach must be designed to offset all types of water quality impacts (e.g. increased loads of sediments, nutrients, chemicals etc.) that result from clearing with zone B, and
- ongoing management and reporting requirements must be included in the PVP, where ongoing management is fundamental to the water quality outcomes being achieved.

Note:
Examples of alternative water quality mitigation and/or offset management approaches include engineering solutions such as sediment basins, stabilisation of actively eroding stream banks or gullies and provision of grass filter strips.

Aquatic biodiversity

Alternative offsets for aquatic habitat must be developed and defined in conjunction with the Department of Primary Industries (Fishing and Aquaculture).

Note:

Examples of alternative aquatic biodiversity offset approaches include, but are not limited to:

- in-stream re-snagging or stabilisation of existing snags in accordance with Department of Primary Industries (Fishing and Aquaculture) guidelines
- stock exclusion from the zone at an additional site (i.e. an additional site to the PVP site and the water quality offset site)
- removal of redundant in-stream barriers to enhance connectivity for aquatic biodiversity, and
- modification and rehabilitation of in-stream barriers where they are still required, to enhance connectivity for aquatic biodiversity.

7.4 Define and apply management actions to zones in a PVP

Impacts on water quality and aquatic biodiversity as a result of clearing within zone B as defined in Tables 7.2, 7.3 and 7.4 are offset by undertaking management actions to improve the condition of another area.

The management actions that must be applied to the zone offsets are specified in the WQMA Database. The WQMA Database may specify circumstances when the management actions must be applied, specific requirements in the application of each management action and where it is appropriate for the accredited assessor (Level 2a) to apply judgement in the application of the management actions.

The zone management actions must be clearly defined in the PVP to ensure the protection of water quality and aquatic biodiversity.

Note to reader:

The following set of management actions are proposed for zone offsets where appropriate:

- actions referred to in Section 7.3.4 (Management of zones to maximise effectiveness), plus
- control and remediation of existing erosion
- stabilisation of existing gullies within zones A and B
- weed control
  (Weed control will have greater benefit in regard to aquatic biodiversity protection than for water quality. Weed control will also complement other aspects of the EOAM, by supporting healthy native vegetation growth.)
- replanting and/or supplementary planting of native groundcover where natural regeneration will not be sufficient to achieve at least 70% groundcover; during revegetation works, minimise ground disturbance and undertake monitoring to ensure successful establishment of groundcover
  (Both exotic or native vegetation can be effective in protecting water quality. The EOAM recommends revegetation with, and retention of native vegetation. This is because native vegetation has more aquatic biodiversity benefits than exotic vegetation. This approach is consistent with other aspects of the EOAM.)

- replanting and/or supplementary planting of native over-storey where natural regeneration will not be sufficient to achieve benchmark over-storey cover
  (Over-storey cover provides aquatic biodiversity benefits and helps maintain water temperature to a more natural range. Both exotic and native vegetation can be effective as over storey. The EOAM recommends revegetation with, and retention of native vegetation. This is because native vegetation has more aquatic biodiversity benefits than exotic vegetation. This approach is consistent with other aspects of the EOAM.)

7.5 Definitions

Stream means any river, creek, or natural watercourse, whether artificially modified or not, in which water flows, regardless of flow regime, in a defined flow path, bed or channel.

Streams are classified according to their stream order. For most streams the stream order is available in the Hydrology layer in the certified decision support tool. Where this data is not available manual interpretation of the stream order may be necessary for the clearing stream in order to determine the appropriate zone widths and rules to apply.

'Clearing stream' means the stream in which the clearing is proposed in the zone. The definition of Strahler stream order provides further details on how to determine the stream order for a particular stream.

Estuary means a semi-enclosed body of water having an open or intermittently open connection with the ocean, in which water levels do not vary with the ocean tide (when closed to the sea) or vary in a predictable, periodic way in response to the ocean tide at the entrance (when open to the sea).

Wetland means areas of land that are wet by surface water or groundwater, or both, for long enough periods that the plants and animals in them are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water. Examples include lakes, lagoons, swamps, bogs, billabongs, marshes, floodplain areas that pond with water, saltmarshes and mangrove forests. To determine the location and extent of a wetland in its dry phase, vegetation type, soil properties (including egg and seed banks) and records of flooding can be used.

Wetlands are classified into lagoons, minor wetlands and important wetlands according to the following definitions:

> **Lagoon** means a wetland, either in its wet or dry state, that may or may not be marked on a 1:25,000 topographic map, is not listed in the Important Wetlands Database, is not a State Environmental Planning Policy (SEPP) 14 Wetland and is not shown on the map of wetlands in the certified decision support tool.
>
> **Important wetland** means a wetland that is listed in the Important Wetlands Database or is a SEPP 14 wetland.
>
> **Minor wetland** means a wetland that is shown on the map of wetlands in the certified decision support tool but is not listed in the Important Wetlands Database and is not a SEPP 14 wetland.

Note to reader:

OEH is considering whether an additional column is required in the following table, to further define 'water body'. The additional column would include Vegetation Community Associations (or similar).

Water body means any river, stream or estuary, or a wetland that is of any of the Keith Vegetation Classes listed in Table 7.5.

Table 7.5 Keith Vegetation Classes

Vegetation formation	Vegetation class
Freshwater wetlands	Coastal Heath Swamps
	Montane Bogs and Fens
	Coastal Freshwater Lagoons
	Montane Lakes
	Inland Floodplain Swamps
	Inland Floodplain Shrublands
Forested wetlands	Coastal Swamp Forests
	Coastal Floodplain Wetlands
	Eastern Riverine Forests
Saline wetlands	Mangrove Swamps
	Saltmarshes
	Seagrass Meadows
	Inland Saline Lakes

Note:

The wetland vegetation formations Inland Riverine Forests, Inland Floodplain Woodlands, and North-West Floodplain Woodlands are assessed under Chapter 10 (Biodiversity values).

The absence of these vegetation formations on the ground at the time of inspection does not mean the site is not a wetland. It may be in a dry phase. To determine the location and extent of a wetland in its dry phase vegetation type, soil properties (including egg and seed banks) and records of flooding can be used.

Priority protection waterway means a waterway defined as:

- 'very high', 'high' or 'medium' priority protection on a Geomorphology Priority Action Map in the Geomorphology Priority Action Database, or
- 'catchment protection priority' or 'conservation priority' on a 'Freshwater Biodiversity Action Priority Map where there is no Geomorphology Priority Action Map for the site, or
- a waterway identified by the CMA as a priority for protection.

Priority restoration waterway means a waterway defined as:

- 'very high', 'high' or 'medium' priority for restoration on a Geomorphology Priority Action Map in the Geomorphology Priority Action Database, or

- ‘catchment restoration priority’ on a Freshwater Biodiversity Action Priority Map where there is no Geomorphology Priority Action Map for the site, OR
- a waterway identified by the CMA as a priority for restoration.

SEPP 14 wetland means a wetland that is shown on the map of SEPP 14 wetlands in the certified assessment tools.

Sister stream means a stream that is of the same stream order as the ‘clearing stream’ and is a tributary of the stream for which the ‘clearing stream’ is a tributary.

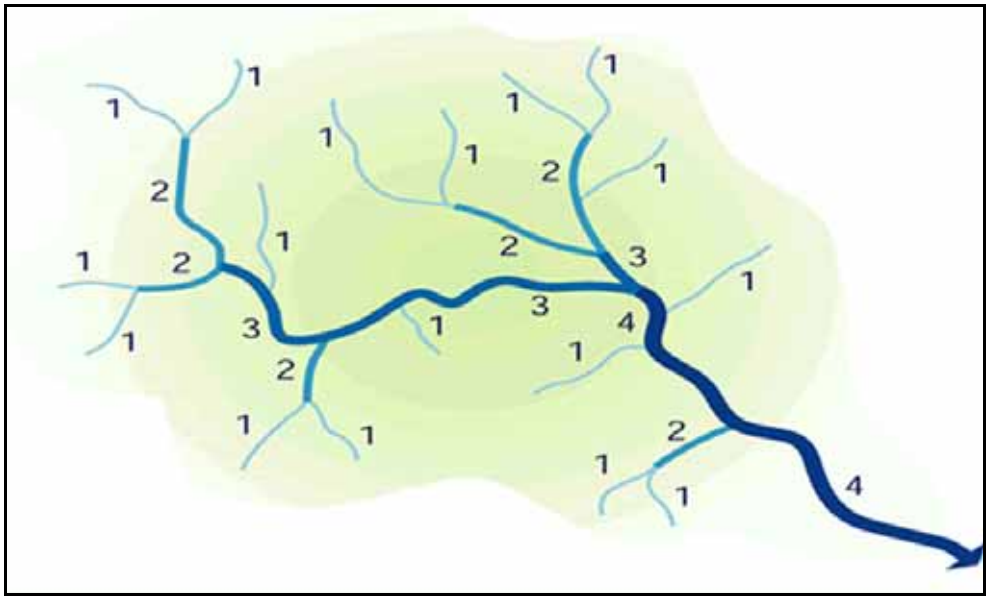
Snag means vegetation that is greater than 3 m in length and 300 mm in diameter.

Strahler stream ordering system is a classification system that gives waterways an ‘order’ according to the number of tributaries associated with each waterway (Strahler, 1952). Figure 7.3 illustrates the Strahler stream ordering process. Numbering begins at the top of a catchment with headwater (‘new’) flow paths being assigned the number 1. Where two flow paths of order 1 join, the section downstream of the junction is referred to as a second order stream. Where two second order streams join, the waterway downstream of the junction is referred to as a third order stream, and so on. Where a lower order stream (e.g. first order) joins a higher order stream (e.g. third order), the area downstream of the junction will retain the higher number (i.e. it will remain a third order stream).

The stream ordering system is designed to produce results that are consistent between catchments, but also recognises regional differences.

Further details on how to assess the stream order for a clearing stream are provided in the *Water Quality and Aquatic Biodiversity Operational Manual* (OEH).

Figure 7.3 Strahler stream ordering system



Source: www.fgmorph.com/fg_4_8.php

Top of bank means the:

- bankfull flow where the flow is contained by the banks and has not yet overtopped the banks, or
- edge of a channel where there is no defined bank, or
- centre of a drainage depression.

Unmapped stream means a stream that is not marked on a 1:25,000 (or next best available scale) topographic map but a flow path is visible on the ground. This can include a drainage depression.

Note:

The Australian Department of Sustainability, Environment, Water Populations and Communities has listed 'nationally important wetlands', a subset of which is a list of Nationally Important Wetlands in NSW. A list of these wetlands, *Nationally Important Wetlands in NSW*, is provided by CMA area in the *Operations Manual* (OEH) (see the Important Wetlands Database).

SEPP 14 wetlands are shown on the map of SEPP 14 wetlands provided in the certified decision support tool.

References:

Askey-Doran, M. (1999), 'Managing and rehabilitating riparian vegetation' in *Riparian Land Management Technical Guidelines Volume Two: On-ground Management Tools and Techniques.* Price, P. and Lovett, S. (Eds). LWRRDC, Canberra.

Caterall, (1993), 'The Importance of Riparian Zones to Terrestrial Wildlife' in *Ecology and Management of Riparian Zones in Australia.* Bunn, S.E *et al.* (Eds). *Proceedings of a National Workshop on research and management needs for riparian zones in Australia*, Marcoola, South-east Queensland April 13–14 1993.

Cotton Research and Development Corporation, (2003), *Managing riparian lands in the cotton industry*, Narrabri. www.crdc.com.au.

Department of Environment and Heritage, (2001), *Nationally Important Wetlands in NSW*, Canberra. www.deh.gov.au/water/wetlands/database/directory/pubs/ch6.pdf.

Department of Environment and Heritage, (2001), 'Inland Water Theme Report' in *Australian State of the Environment 2001 (Theme Report).* Department of Environment and Heritage, Canberra. www.deh.gov.au/soe/2001/inland.

Department of Environment and Resource Management (DERM), (2011), *Queensland Wetland Buffer Planning Guideline*, p 41. Queensland Wetlands Program, Brisbane, Queensland.

Dickson, J.G. and Williamson J.H, (1988), 'Small mammals in streamside management zones in pine plantations' 375–378 in *Management of amphibians, reptiles and small mammals in North America*. General Technical Report USDA Forest Service, RM166:1–458. Cited in Anderson S. and Masters R., (2003), *Riparian Forest Buffers.* OSU Extension Facts, Division of Agricultural Sciences and Natural Resources, Oklahoma State University. www.ttrs.org.au/images/pdfs/f_5034%20Riparian%20Forest%20Buffers.pdf.

Department of Natural Resources, (2003), *Draft Riparian Corridor Management Study: covering all of the Wollongong Local Government Area and Calderwoood Valley in the Shellharbour Local Government Area.* NSW Department of Natural Resources.

Department of Natural Resources and Environment, (2002), *Victoria's Native Vegetation Management – A Framework for Action.* Department of Natural Resources and Environment. www.dse.vic.gov.au.

Department of Natural Resources, Mines and Energy, (2003), *Nebo-Broadsound Draft Regional Vegetation Management Plan 2003*. Queensland Department of Natural Resources Mines and Energy. www.nrm.qld.gov.au/vegetation/pdf/nebo_broadsound/nebo_draft_rvmp.pdf.

Goulburn Broken Catchment Management Authority, (2000), *Goulburn Broken Native Vegetation Plan Vol. 2: Native Vegetation Retention Controls – Regional Guidelines for the Goulburn Broken Catchment, Draft August 2000*. Goulburn Broken Catchment Management Authority.

Halse, S.A., Jensen, A. and Davis, J.A., (1993), 'Riparian zone management in WA and SA: policy and practice' in *Ecology and Management of Riparian Zones in Australia.* Bunn, S.E. *et al.* (Eds). *Proceedings of a National Workshop on research and management needs for riparian zones in Australia*, Marcoola, South-east Queensland, April 13–14 1993.

Hairsine, P., (1997), *Controlling Sediment and Nutrient Movement within Catchments*, Cooperative Research Centre for Catchment Hydrology – Industry Report, Report 97/9, Victoria.

Hines, H.B. and the South-east Queensland Threatened Frogs Recovery Team 2002, *National recovery plan for Stream Frogs of South-east Queensland 2001–2005.* Report to Environment Australia, Canberra. Queensland Parks and Wildlife Service, Brisbane.

Jansen, A. and Robertson, A., (2001), 'Relationship between livestock management and the ecological condition of riparian habitats along an Australian floodplain river' in *Journal of Applied Ecology,* 38: 63–75.

Jorgensen, E., Canfield, T. and Mayer, P., (2002), *Research Needs in Riparian Buffer Restoration,* Issue Paper Advances in Restoration Science No. 1. United States Environmental Protection Agency. www.epa.gov.ada.download/issue/epa_600_s02_002.pdf.

Kingsford, R.T., Brandis, K., Thomas, R., Crighton, P., Knowles, E. and Gale, E., (2003), *Distribution of Wetlands in NSW,* Hurstville. www.nationalparks.nsw.gov.au/PDFs/Wetland_distribution_report.pdf.

Lismore City Council, (2002), *Development Control Plan No. 27 Buffer Areas.* www.lismore.nsw.gov.au.

Lovett, S. and Price, P., (2001), 'Land and Water Habitats' in *Managing Riparian Lands in the Sugar Industry: a guide to principles and practices.* Sugar Research and Development Corporation, Land & Water Australia, Brisbane.

Lynch, R.J. and Catterall, C.P., (1999), 'Managing riparian land for terrestrial wildlife' in *Riparian Land Management Technical Guidelines Volume Two: On-ground Management Tools and Techniques.* Price, P. and Lovett, S. (Eds). LWRRDC, Canberra.

Munks, S., (1996), *A guide to riparian vegetation and its management.* Tasmanian Department of Primary Industries and Fisheries, Hobart.

NSW Government, (1977), *Restrictions on the removal of trees on NSW watercourses*.

Prosser, I., Karssies, L., Ogden, R. and Hairsine, P., (1999), 'Using buffers to reduce sediment and nutrient delivery to streams' in *Riparian Land Management Technical Guidelines Volume Two: On-ground Management Tools and Techniques.* Price, P. and Lovett, S. (Eds). LWRRDC, Canberra.

Thompson, L., Robertson, A., Jansen, A. and Davies, P., (2003), *Identifying Best Management Practices for Riparian Habitats in Gippsland Dairy Regions: Riparian Condition and Relationships with Farm Management.* Johnstone Centre, CSU Wagga Wagga.

Wenger, S., (1999), *A review of the scientific literature on riparian buffer width, extent and vegetation.* I.O.E. Office of Public Service and Outreach. University of Georgia, Athens.

8 Prevention of land degradation

8.1 Introduction

This chapter of the EOAM defines the circumstances in which broadscale clearing is to be regarded as improving or maintaining environmental outcomes for prevention of land degradation under the *Native Vegetation Act 2003*.

The following land degradation hazards are assessed to determine a Land and Soil Capability (LSC) Class:

- areas that are very susceptible to environmental harm arising from clearing of native vegetation (sensitive terrain)
- water erosion
- wind erosion
- earth mass movement
- acid sulfate soils
- shallow and rocky soils
- soil structure, and
- soil acidification.

The LSC Class determines what management actions (if any) must be applied to the clearing site for the clearing to improve or maintain environmental outcomes for prevention of land degradation.

8.1.1 Land and Soil Capability classification

The Land and Soil Capability classification is based on the Rural Land Capability system defined by Emery (1985), with additional emphasis on soil limitations that are incorporated into the classification.

All parts of the landscape can be classified within eight capability classes, designated by numerals 1 to 8, the sequence indicating progressively greater land and soil limitations. These limitations usually restrict the type and diversity of land-use activities that can be undertaken without significant land and soil degradation occurring.

8.2 The improve or maintain test for land degradation

The Land and Soil Capability Class that any hazard (or group of hazards) falls within determines whether a proposal is considered to improve or maintain environmental outcomes as follows:

- **Land and Soil Capability Classes 1 & 2:** the proposal is regarded as improving or maintaining environmental outcomes (shaded green in hazard class tables)
- **Land and Soil Capability Classes 3 to 6*:*** clearing will not improve or maintain environmental outcomes unless the on-site management actions specified in the Land and Soil Capability Management Actions Database for each applicable hazard, class and land-use category are undertaken (shaded amber in hazard class tables)

- **Land and Soil Capability Classes 7 & 8*:*** clearing will not improve or maintain environmental outcomes and the impacts cannot be offset by management actions except in the following circumstances (shaded red in hazard class tables):
    1. where the land-use category (as set out in the LSC Management Actions Database) is for infrastructure, and engineering works are put in place to prevent land degradation associated with the clearing, or
    2. where an accredited expert defines appropriate management actions that will prevent land degradation associated with the clearing and/or ongoing management of the land.

Regardless of its Land and Soil Capability Class, clearing of native vegetation on sensitive terrain (as assessed under Section 8.3.7) is regarded as not improving or maintaining environmental outcomes as it is not possible to offset the impacts of clearing on sensitive terrain.

In order to be regarded as improving or maintaining environmental outcomes, the proposal must improve or maintain environmental outcomes for all Land and Soil Capability zones.

The process for assessing offset proposals in respect of land degradation is the same as described below for assessing clearing proposals, except where otherwise stated.

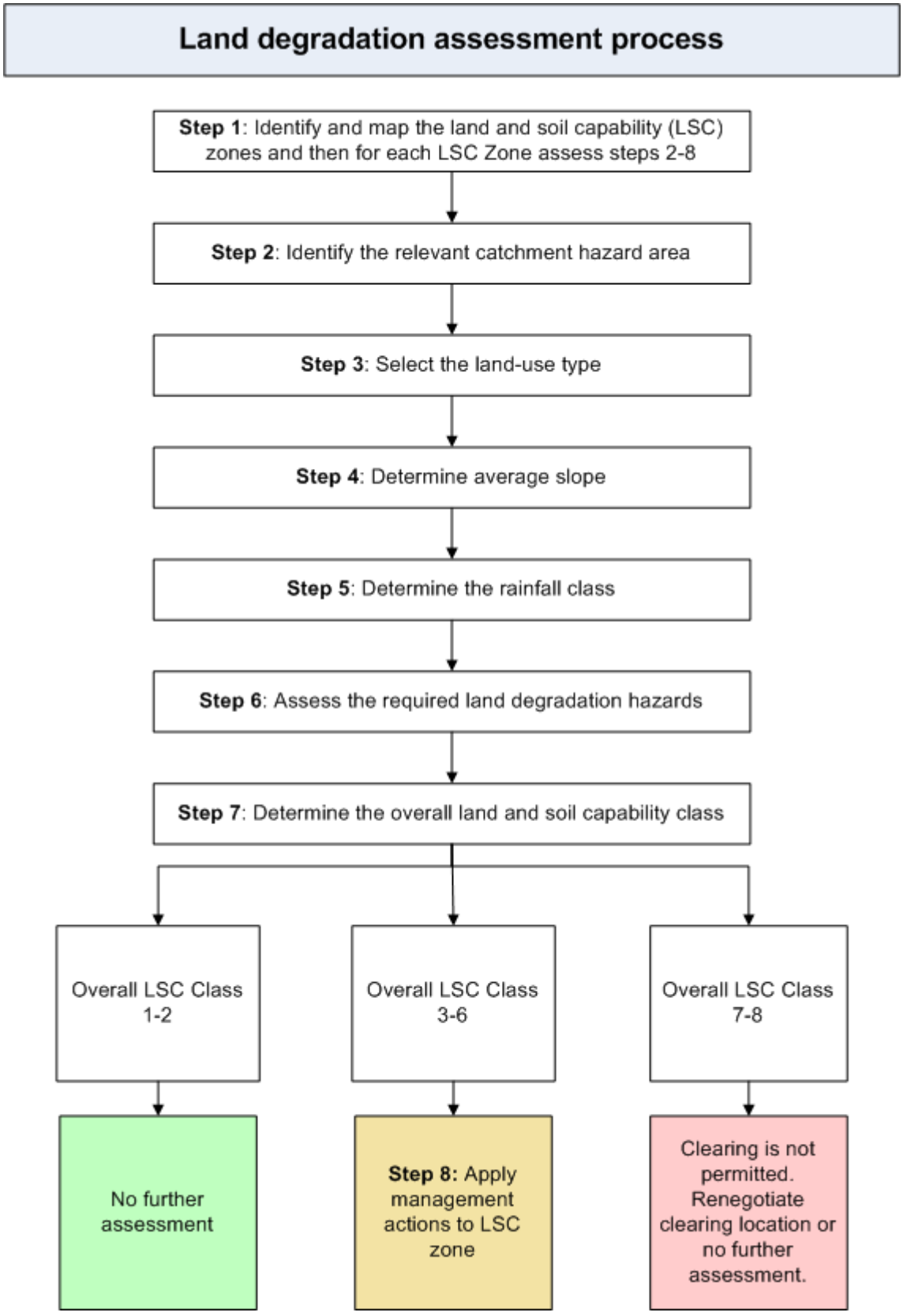
This chapter is also used to assess biodiversity, salinity or water quality offset proposals that involve soil disturbance in order to determine whether the offsets will improve or maintain environmental outcomes in relation to land degradation.

Where a proposal has several hazards the decision as to whether clearing or offset proposals will improve or maintain environmental outcomes is based on the most significant land degradation risk arising from the proposal, i.e. the hazard with the highest class.

The CMA may use its judgement to vary the application of the management actions in the LSC Management Actions Database to individual Property Vegetation Plans or development consents to ensure land degradation is minimised in the local circumstances.

8.3 Assessment process for land degradation

Figure 8.1 Assessment process for land degradation



Note:

This assessment process is provided as guidance and does not need to be rigidly adhered to by CMAs in the assessment of broadscale clearing proposals.

8.3.1 Identify the Land and Soil Capability zone

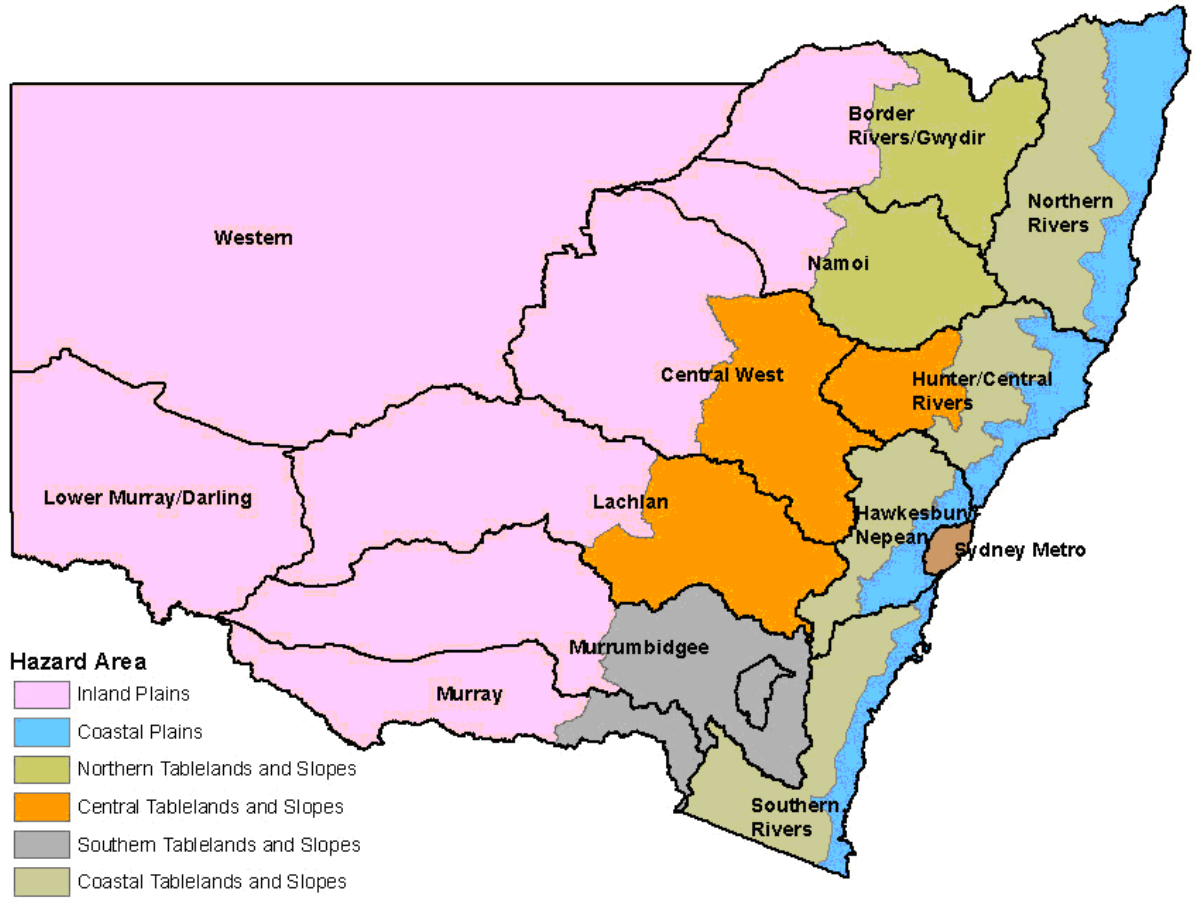
Land and Soil Capability zones are areas of land that have relatively uniform physical characteristics in relation to the parameters used to assess the land degradation hazard. In broad terms these include:

- slope
- rockiness
- soil type (texture etc.)
- soil drainage, and
- landform.

8.3.2 Identify the relevant Catchment Hazard Area

CMA areas have been divided into Catchment Hazard Areas based on common climatic, soil and geomorphic characteristics. These Catchment Hazard Areas are shown in Figure 8.2.

Figure 8.2 Map of Catchment Hazard Areas



8.3.3 Select the land-use type

Land use is not a factor which determines LSC Class. However, it is used to filter the management actions in the LSC Management Actions Database for LSC Classes 3 to 6 (and 7 and 8 for infrastructure land use), so that only management actions that are appropriate to the proposed land use are applied to the LSC zone.

In some circumstances it will be necessary to select multiple land-use categories. For example, where grazing is permitted within an orchard or vineyard then both the Horticulture/vineyard and Grazing land-use categories must be selected. Descriptions of the land-use categories are provided in the Land and Soil Capability Management Actions Database. The relevant CMA may use its judgement in assigning the land-use category when the proposed land use does not fit neatly into the five land-use descriptions listed in the database.

Note:

The land-use categories and their descriptions in the LSC Management Actions Database at the time of writing are listed in the table below. These categories and their descriptions may be updated or amended according to the protocols for updating databases.

Table N3 Land-use categories and descriptions

Land-use type	Description of land-use type
Horticulture/viticulture (permanent plantings)	Permanent and long-term plantings (whether irrigated or not) of grapevines, citrus, stone and other fruit trees, nut crops (trees or bushes) and berries.
Irrigation	Irrigated pastures Irrigated field crops – furrow irrigated crops (e.g. cotton, maize, etc.), rice Irrigated annual horticultural crops (e.g. vegetables etc.) Irrigation methods include: • surface irrigation by furrows and basins/bays • centre pivot and other mobile sprinkler or spray-irrigation techniques • fixed and semi-fixed systems such as subsurface drip, dripline and sprayline systems.
Infrastructure	Clearing for development that may or may not require local government development approval. Examples are clearing for construction of infrastructure such as powerlines to dwellings and subdivisions also construction of duel-occupancy dwellings, quarries, tourist cabins etc. This category does not include permitted or excluded clearing for development under the *Native Vegetation Act 2003*.
Dryland cropping	Dryland cropping for cereals, oilseeds, legume and fodder crops. This is frequently but not always carried out in rotation with pasture phases of improved pastures that include sown legume and grass species, or in some cases volunteer pasture phases including native pasture species. Some areas maybe cropped continuously using rotations of different crops to control diseases and weeds. Dryland cropping is confined to land where it is possible to till the soil adequately to sow annual crops and the cropping practices used will be determined by the capability of the land.
Grazing	Grazing can occur under improved pasture and native pasture. Grazing can be carried out on a broad range of land, but the intensity of grazing and the grazing practices used will be determined by the capability of the land. In many areas, dryland cropping and grazing are conducted as a mixed farming operation, with land being rotated between dryland cropping and pastures on a regular rotation. Where grazing is being used in rotation with cropping the management actions for the grazing and cropping must be applied in the PVP.

8.3.4 Determine average slope

Average slope is used to assess water erosion hazard and mass movement hazard. Average slope may be either:

- estimated visually in the field by experienced landscape assessors
- measured using an Abney level or clinometer, or
- estimated from a topographic map or digital elevation model.

The slope classes (see Table 8.4) used for assessment vary between different Catchment Hazard Areas to reflect local conditions and the specific criteria required for hazard assessments.

8.3.5 Determine rainfall class

Rainfall is one factor used to assess wind erosion hazard, soil structure decline, earth mass movement and soil acidification hazard. Average annual rainfall requires the selection of the appropriate 100 mm-class based on the Australian Bureau of Meteorology average annual rainfall map located at www.bom.gov.au/jsp/ncc/climate_averages/rainfall/index.jsp.

Note to reader:

The incorporation of a standard set of long-term rainfall data, that may replace the link provided above, is being investigated. This standard data is expected to be a national long-term data standard that will be adopted for modelling purposes such as Murray–Darling Basin salinity modelling, climate change impact modelling and various other purposes.

8.3.6 Assess the required land degradation hazards

In some Catchment Hazard Areas certain hazards are not significant and so are not assessed and are deemed to improve or maintain environmental outcomes. For example, acid sulfate soils are only assessed for coastal plains. The hazards to be assessed for each area are shown in Table 8.1.

Table 8.1 Required hazard assessment by Catchment Hazard Areas

Catchment Hazard Area	Which hazards are assessed?							
	Sensitive terrain	Water erosion hazard	Wind erosion hazard	Shallow & rocky soil hazard	Earth mass movement hazard	Soil structure hazard	Acid sulfate soil hazard	Soil Acidification hazard
Inland Plains	✓*	✓	✓	✓		✓		✓
Coastal Plains	✓	✓	✓	✓	✓		✓	✓
Northern Tablelands and Slopes	✓	✓	✓	✓	✓			✓
Central Tablelands and Slopes	✓	✓	✓	✓	✓			✓
Southern Tablelands and Slopes	✓	✓	✓	✓	✓			✓
Coastal Tablelands and Slopes	✓	✓	✓	✓	✓			✓

*A ticked cell indicates that hazard is assessed in the Catchment Hazard Area.

Where Table 8.1 indicates that a particular hazard requires assessment, that assessment must be carried out in accordance with Sections 8.3.7 to 8.3.14 where appropriate.

Note to reader:

Salinity hazard has been removed because it is dealt with in Chapter 9.

8.3.7 Assessing clearing on sensitive terrain

Sensitive terrains are areas of the landscape that are very susceptible to environmental harm arising from clearing of native vegetation. The types of sensitive terrain are defined in Table 8.2. Table 8.3 indicates what types of sensitive terrain areas must be assessed in each Catchment Hazard Area.

Clearing of native vegetation on sensitive terrain is regarded as not improving or maintaining environmental outcomes because it is not possible to offset the impacts of the clearing of sensitive terrain. Sensitive terrain is not assessed in respect of proposals for biodiversity or salinity offsets.

Table 8.2 Definitions of sensitive terrain

Sensitive terrain	Definition
Foredune to beach	Elongated, moderately inclined to very steep, single or compound ridge generally less than 15 m high, built up by the wind from predominantly sand-sized particles derived from an adjacent coastal beach.
Derelict mine site	Surface workings of former mining sites, whether remediated or un-remediated, which may contain toxic soil, rock or spoil materials.
High run-on area	Areas of the Inland Plains that have large upslope catchments and are subject to very high run-on volumes in times of rainfall.
Lakebed within 200 m of shoreline	Beds of ephemeral or fluctuating lakes, whether fresh or saline, of the inland plains. The near-shore areas of these lakebeds are often susceptible to wind erosion and environmental degradation.
Lunette	Occurs mainly in the Inland Plains and is an elongated, gently recurved, low ridge consisting of sand or pelletised silt and clay which has been built up by wind action on the north-eastern or eastern margin of an ephemeral freshwater or saline lake or closed depression. A lunette typically has a wave-modified slope towards the lake or depression.
Flow line	Occurs in the slopes and tablelands where surface water flow or seepage is initially concentrated in drainage depressions and is not yet in clearly defined streams.
Sand dune	Occurs mainly in the Inland Plains and Coastal Plains and is a moderately inclined to very steep, sub-parallel linear ridge or hillock built up from sand-sized particles by wind action.

Table 8.3 Applicability of sensitive terrain in Catchment Hazard Areas

	Sensitive terrain						
Catchment Hazard Area	**Foredune to beach**	**Derelict mine site**	**High run-on area**	**Lakebed**	**Lunette**	**Flow line**	**Sand dune**
Inland Plains		✓	✓	✓	✓		✓
Coastal Plains	✓	✓				✓	✓
Northern Tablelands and Slopes		✓				✓	
Central Tablelands and Slopes		✓				✓	
Southern Tablelands and Slopes		✓				✓	
Coastal Tablelands and Slopes		✓				✓	

8.3.8 Assessing water erosion hazard

Water erosion hazard is the susceptibility of land to soil erosion by moving water. Rainfall erosivity and water availability for plant growth are factors that affect soil erosion. These vary significantly between different parts of the State. Different slope classes in different Catchment Hazard Areas account for differences in these factors. These are set out in Table 8.4.

The severity of existing water erosion is categorised as either nil, low, moderate, high, very high or extreme according to the definitions of these categories contained in Table 8.5.

- If the existing water erosion is categorised as nil, low or moderate, the water erosion hazard class is assigned based on slope as indicated in Table 8.4.

  Water erosion hazard classes 4 and 5 are not differentiated from each other by slope, but by whether the soils have high natural fertility (class 4) or relatively low natural fertility (class 5).

- If the existing water erosion is categorised as high, the water erosion hazard is class 6, except for Land and Soil Capability zones in the Coastal Tablelands and Slopes Catchment Hazard Area, which are automatically assigned a water erosion hazard class of 7 where existing erosion is high.

- If the existing water erosion is categorised as very high, water erosion hazard is class 7.

- If the existing water erosion is categorised as extreme, water erosion hazard is class 8.

Table 8.4 Slope class (%) for each water erosion hazard class used to determine water erosion hazard in the Catchment Hazard Areas

	Water erosion hazard class					
	I	2	3	4 & 5	6	7 & 8
Catchment Hazard Area:	**Slope (%)**					
Inland Plains	< 1	1 – <3	3 – <10	10 – <25	25 – 33	> 33
Coastal Plains	< 1	1 – <2	2 – <8	8 – 25	25 – 33	> 33
Northern Tablelands and Slopes	< 1	1 – <2	2 – <8	8 – <25	25 – 33	> 33
Central Tablelands and Slopes	< 1	1 – <2	2 – <8	8 – <25	25 – 33	> 33
Southern Tablelands and Slopes	<1.5	1.5 – <5	5 – <12	12 – <25	25 – 33	> 33
Coastal Tablelands and Slopes	< 1	1 – <2	2 – <8	8 –-<25	25 – 50	> 50

Note to reader:

OEH is currently assessing the possibility of incorporating the universal soil loss equation into the estimation of water erosion.

Table 8.5 Definitions of existing water erosion categories

Category	Definition
Nil	No sheet or gully erosion present.
Low	Minor sheet and gully erosion present.
Moderate	Moderate sheet and gully erosion present; gullies restricted to major flow lines.
High	Severe sheet and gully erosion present; rills clearly evident, subsoil and C horizons clearly exposed in many areas; clearly evident depositional areas adjacent to fences and roads; gullies are deep and active in 2nd order streams showing branching into lower parts of 1st order flow lines.
Very high	Severe sheet erosion present causing bare ground and scalding; subsoil and C horizons or bare rock exposed in many areas; clearly evident areas of deposition on lower slopes, adjacent to fences and roads; gullies are active and strongly branched, extending high into 1st order flow lines; gullies often show tunnelling.
Extreme	Majority of the area is bare and scalded; usually extensive areas of active rilling and gullying present; gullies may occupy the majority of the area.

8.3.9 Assessing wind erosion hazard

Wind erosion hazard is the susceptibility of land to the erosion of soil particles by wind.

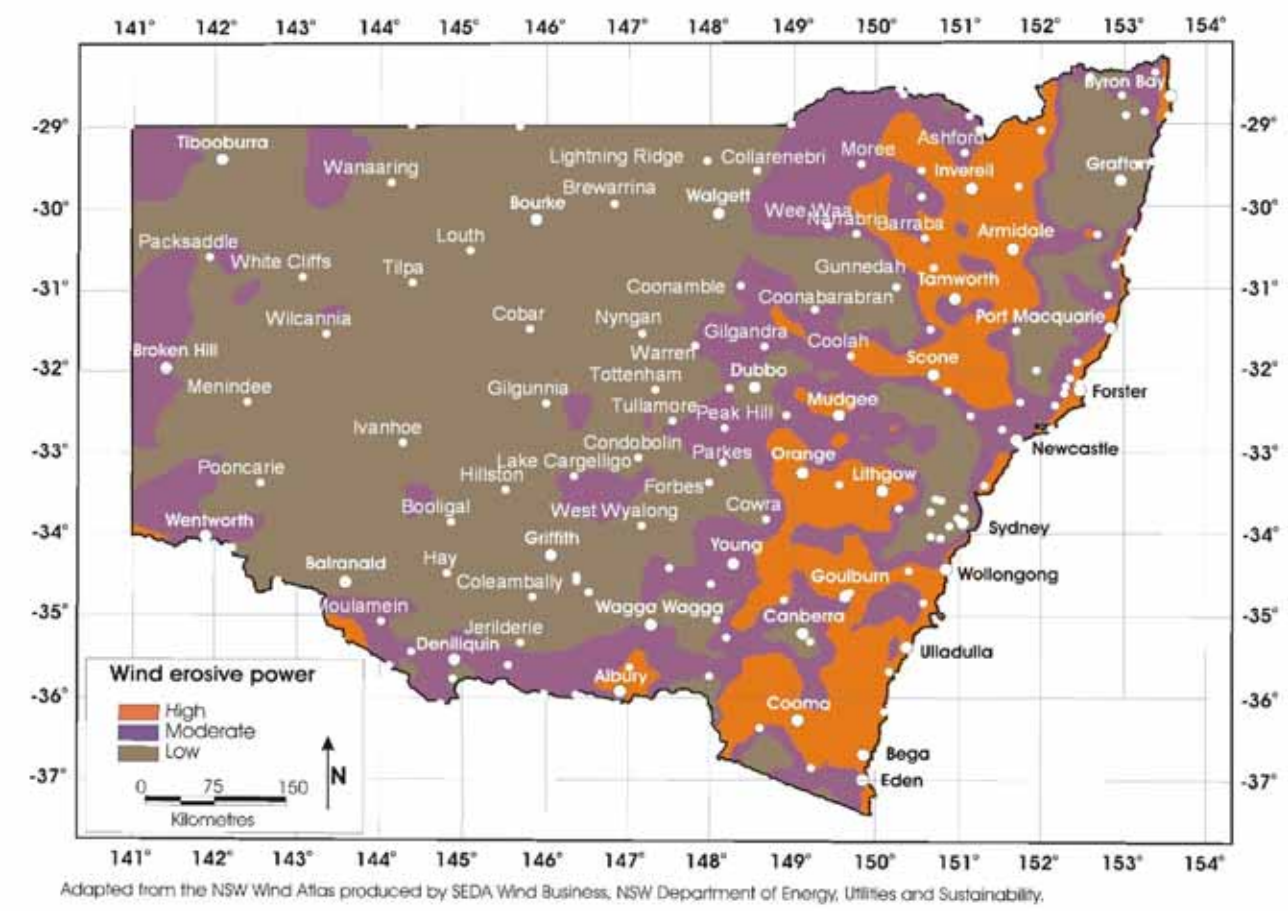
The criteria used to assess wind erosion hazard are:

- wind erodibility of soil
- wind erosive power
- exposure to prevailing winds, and
- average annual rainfall.

The categories of wind erodibility, wind erosive power and exposure to wind are defined in Table 8.6. Wind erosive power is determined using the wind erosive power map as shown in Figure 8.3.

The relationship between the criteria in determining the Land and Soil Capability Class is shown in Table 8.7.

Figure 8.3 Wind erosive power map of NSW



Adapted from the NSW Wind Atlas produced by SEDA Wind Business, NSW Department of Energy, Utilities and Sustainability.

Note to reader:

OEH is investigating the feasibility of incorporating this layer into the decision support tool (mapper). If this occurs, this map will be removed from the EOAM and instead referred to in the LSC Database.

Table 8.6 Wind erosion hazard criteria

Class	Definitions		
Wind erodibility class for soil	**Low erodibility:** loams, clay loams, clays (> 13% clay)	**Moderate erodibility:** fine sandy loams, sandy loams (clay 6 to <13%)	**High erodibility:** loam sands, loose sands (clay< 6%)
Wind erosive power	**Low power**	**Moderate power**	**High power**
Exposure to prevailing winds	**Low exposure:** sheltered locations in valleys or in the lee of hills	**Moderate exposure :** intermediate situations – not low or high exposure locations	**High exposure:** hilltops or exposed coastal locations

Table 8.7 Relationship between wind erodibility class of soil, wind erosive power, exposure to prevailing winds, and annual rainfall for Land and Soil Capability Classes

Average annual rainfall	Wind erodibility class of surface soil	Wind erosive power	Exposure to wind	LSC Class
>500 mm	Low	Low	Low	1
			Moderate	1
			High	2
		Moderate	Low	1
			Moderate	2
			High	3
		High	Low	2
			Moderate	3
			High	4
	Moderate	Low	Low	2
			Moderate	3
			High	4
		Moderate	Low	2
			Moderate	3
			High	4
		High	Low	3
			Moderate	4
			High	5
	High	Low	Low	3
			Moderate	4
			High	5
		Moderate	Low	4
			Moderate	5
			High	6

Average annual rainfall	Wind erodibility class of surface soil	Wind erosive power	Exposure to wind	LSC Class
		High	Low	5
			Moderate	6
			High	8
300–500 mm	Low	Low	Low	2
			Moderate	2
			High	3
		Moderate	Low	2
			Moderate	3
			High	4
		High	Low	3
			Moderate	4
			High	5
	Moderate	Low	Low	3
			Moderate	4
			High	5
		Moderate	Low	3
			Moderate	4
			High	5
		High	Low	4
			Moderate	5
			High	6
	High	Low	Low	4
			Moderate	5
			High	6
		Moderate	Low	5
			Moderate	6
			High	7
		High	Low	6
			Moderate	7
			High	8
200–<300 mm	Low	Low	Low	3
			Moderate	3
			High	4
		Moderate	Low	3
			Moderate	4

Average annual rainfall	Wind erodibility class of surface soil	Wind erosive power	Exposure to wind	LSC Class
			High	5
		High	Low	4
			Moderate	5
			High	6
	Moderate	Low	Low	4
			Moderate	5
			High	6
		Moderate	Low	4
			Moderate	5
			High	6
		High	Low	5
			Moderate	6
			High	7
	High	Low	Low	5
			Moderate	6
			High	7
		Moderate	Low	6
			Moderate	7
			High	8
		High	Low	7
			Moderate	8
			High	8
<200 mm	Low	Low	Low	6
			Moderate	6
			High	7
		Moderate	Low	6
			Moderate	6
			High	7
		High	Low	6
			Moderate	7
			High	7
	Moderate	Low	Low	7
			Moderate	7
			High	8
		Moderate	Low	6
			Moderate	7

Average annual rainfall	Wind erodibility class of surface soil	Wind erosive power	Exposure to wind	LSC Class
			High	8
		High	Low	7
			Moderate	8
			High	8
	High	Low	Low	7
			Moderate	8
			High	8
		Moderate	N/A	8
		High	N/A	8

8.3.10 Assessing shallow and rocky soil hazard

Shallow soils and rockiness reduce the land-use capability of soils and land.

The criteria used to assess shallow soil and rockiness hazard are:

- average soil depth
- estimated percentage exposure of rocky outcrops, and
- average annual rainfall.

The relationship between the criteria in determining the Land and Soil Capability Class is shown in Table 8.8.

Table 8.8 Relationship between soil depth, rocky outcrop, and average annual rainfall for assessment of shallow and rocky soils

Soil depth (cm)	Rocky outcrop (% coverage)	LSC Class if <500 mm average annual rainfall	LSC Class if >500 mm average annual rainfall
>=100	0	2	1
	>0–30	3	2
	>30–50	4	3
	>50–70	6	6
	>70	8	7
50–<100	0	3	2
	>0–30	3	3
	>30–50	5	4
	>50–70	6	6
	>70	8	7
25–<50	0	6	4
	>0–30	6	4

Soil depth (cm)	Rocky outcrop (% coverage)	LSC Class if <500 mm average annual rainfall	LSC Class if >500 mm average annual rainfall
	>30–50	7	5
	>50–70	7	6
	>70	8	7
10–<25	0	7	7
	>0–30	7	7
	>30–50	7	7
	>50–70	8	8
	>70	8	8
<10	N/A	8	8

8.3.11 Assessing earth mass movement hazard

The criteria used to assess earth mass movement hazard are:

- average annual rainfall
- slope class, and
- existing evidence of earth mass movement.

The categories for earth mass movement classes are defined in Table 8.9.

The relationship between the criteria in determining the Land and Soil Capability Class is shown in Table 8.10.

Table 8.9 Earth mass movement classes

Class	Evidence
Nil	No evidence for mass movement can be observed.
Limited	Some evidence for mass movement is present but only in the form of very small amounts of soil materials moving short distances. For example, terracing associated with stock tracks, or a very rare movement of a larger amount of materials.
Severe/ widespread	Clear evidence for movement of large amounts of soil materials over significant distances is common.

Table 8.10 Relationship between average annual rainfall, slope and evidence of existing mass movement for assessing earth mass movement hazard

Rainfall	Slope	Evidence of existing mass movement	LSC Class
>900 mm	0–12%	Nil	2
		Limited	4
		Severe/widespread	7
	12–25%	Nil	3
		Limited	6
		Severe/widespread	8
	>25%	Nil	6
		Limited	7
		Severe/widespread	8
600–900 mm	0–12%	Nil	1
		Limited	3
		Severe/widespread	6
	12–25%	Nil	1
		Limited	4
		Severe/widespread	7
	>25%	Nil	3
		Limited	6
		Severe/widespread	8
< 600 mm	0–12%	Nil	1
		Limited	2
		Severe/widespread	4
	12–25%	Nil	1
		Limited	3
		Severe/widespread	6
	>25%	Nil	1
		Limited	4
		Severe/widespread	7

Note to reader:

Earth mass movement assessment previously used subsurface soil saturation conditions, unconsolidated substrates, rainfall and slope to assess the hazard. These attributes have been replaced by evidence of existing mass movement, rainfall and slope only.

8.3.12 Assessing acid sulfate soils hazard

Acid sulfate soils are naturally occurring sediments and soils containing iron sulfides (principally pyrite) and/or their precursors or oxidation products. The exposure of the sulfides to oxygen by drainage or excavation leads to the generation of sulfuric acid.

With increased acidity (lower pH) in acid sulfate soils, iron and aluminium may become soluble in toxic quantities, with their precipitates affecting water quality and coating stream banks and benthic (sediment-dwelling) organisms.

The criteria used to assess acid sulfate soils hazard are:

- land elevation (m) above Australian Height Datum (AHD), and
- depth to potential or actual acid sulfate soil.

The depth to acid sulfate soils is estimated from Acid Sulfate Soil (ASS) risk maps, or can be obtained through field testing in the relevant Land and Soil Capability zone.

Note to reader:

Information about ASS risk maps is available from the OEH website: www.environment.nsw.gov.au/acidsulfatesoil/riskmaps.htm.

ASS risk maps can be ordered by email: acidsulfatesoils@environment.nsw.gov.au.

The relationship between the criteria in determining the Land and Soil Capability Class is shown in Table 8.11.

Table 8.11 Relationship between criteria determining class for acid sulfate soils hazard

Is land >10 m AHD?	Depth to acid sulfate soils hazard	LSC Class
Yes	NA	1
No	ASS not present	1
	>4 m	3
	2–4 m	4
	1–<2 m	5
	<1 m	8

8.3.13 Assessing soil structure hazard

Soil structure decline has the potential to significantly increase soil erosion, resulting in the increased cost of production and reduced productivity.

Soil structure decline is only assessed for the Inland Plains Catchment Hazard Area (as set out in Figure 8.1) and only if average annual rainfall is <600 mm.

The criteria used to assess soil structure decline hazard are:

- the organic content of the soil
- soil texture, and
- the mineral component of the soil.

The relationship between the criteria in determining the Land and Soil Capability Class is shown in Table 8.12.

Table 8.12 Relationship between soil texture and mineral content for the assessment of soil structural decline hazard in the Inland Plains of NSW (where annual rainfall <600 mm)

Soil type/textures	Mineral content	LSC Class
Organic/peat soils	NA	7
Loose sand	NA	1
Sandy loam	NA	3
Fine sandy loam	High levels of silt and very fine sand?	4
	None of the above (fine sandy loam)	3
Loam	High levels of silt and very fine sand?	4
	Soils friable or high in iron?	1
	Soils weakly sodic/dispersible?	4
	Soils sodic/dispersible?	6
	None of the above (loams)	3
Clay loam	Soils friable or high in iron?	1
	Soils weakly sodic/dispersible?	4
	Soils sodic/dispersible?	6
	None of the above (clay loams)	3
Clay	Soils friable or high in iron?	1
	Soils strongly self-mulching?	1
	Soils weakly self-mulching?	3
	Soils weakly sodic/dispersible?	4
	Soils sodic/dispersible?	6
	Soils strongly sodic/dispersible?	6
	None of the above (clays)	4

Note to reader:

Soil structure assessments previously used the nature of the surface soils to assess the hazard. The hazard is now assessed using the soils' organic content, texture and mineral composition.

8.3.14 Assessing soil acidification hazard

Note to reader:

The assessment of soil acidification hazard was not previously included in the prevention of land degradation assessment under the former EOAM. However, soil acidity is a serious and widespread land degradation issue that should be included in the assessment.

Acidic soils can have a negative impact on agricultural production, biological activity and plant productivity.

The criteria used to assess soil acidification hazard are:

- the acidity (pH in $CaCl_2$) of the surface soil
- the inherent (natural) buffering capacity of the surface soil, and
- average annual rainfall.

Measuring pH in the field

The procedure for assessing the LSC Class for soil acidification requires estimation of pH in the field.

The procedure for taking samples and measuring pH is:

- The area over which the assessment is to be made is stratified into LSC zones in accordance with Section 8.3.1.
- Each LSC zone is sampled and measured separately for pH.
- Small cores to 100 mm soil depth are taken and then bulked into one sample that is then tested for pH.
- The bulked sample must be effectively mixed and unified before the measurement of pH is made. This should be done in a large container with a metal spatula or other implement and NOT with the hands.
- A rule of thumb is that there should be at least one core/5 ha, with a minimum of 5 cores per LSC zone. Therefore a 100-ha portion of a paddock should have 20 small cores bulked into a single sample.

Note: Example

A single paddock with a 10-ha portion of drainage depression, a 40-ha footslope portion and an 80-ha midslope portion would produce three bulked cores for determining pH. Each of those bulked samples would be made up of the following:

- drainage depression 5 cores (as 5 is the minimum)
- footslope bulked sample made up of 8 cores (one core per 5 ha)
- midslope portion made up of 16 cores (one core per 5 ha).

A zig-zag pattern is used when collecting the cores for a bulked soil sample (Brown 1999).

Inherent (natural) buffering capacity

There are three options for determining the inherent (natural) buffering capacity of the surface soil. They are:

- great soil groups (Table 8.13)
- surface soil textures (Table 8.14), or
- soil parent materials (Table 8.15).

Table 8.13 Estimated buffering capacity of great soil groups

Great soil group	Buffering capacity of surface soil
Acid peats	Very low
Alluvial soils	Low
Alpine humus soils	Moderate
Black earths	Very high
Brown earths	Moderate
Brown podzolic soils	Low
Calcareous red earths	High
Calcareous sands	Moderate
Chernozems	High
Chocolate soils	Moderate
Desert loams	Moderate
Earthy sands	Very low
Euchrozems	High
Gleyed podzolic soils	Very low
Grey brown and red calcareous soils	High
Grey brown podzolic soils	Low
Grey, brown and red clays	Very high
Humic gleys	Very low
Humus podzols	Low
Kraznozems	Low
Lateritic podzolic soils	Low
Lithosols	Very low
Neutral to alkaline peats	Moderate
Non calcic brown soils	Low
Peaty Podzols	Low
Podzols	Very low
Prairie soils	High
Red and brown hardpan soils	High
Red brown earths	Moderate
Red earths – less fertile (granites and metasediments)	Low
Red earths – more fertile (volcanics, granodiorites)	Moderate
Red podzolic soils	Low
Rendzinas	High

Great soil group	Buffering capacity of surface soil
Siliceous sands	Very low
Solodic soils	Low
Solonchaks	High
Solonetz	Moderate
Solodized brown soils	Moderate
Solodized solonetz	Low
Soloths	Low
Terra rossa soils	Moderate
Wiesenboden	High
Xanthozems	Moderate
Yellow earths	Low
Yellow podzolic soils	Low

Table 8.14 Estimated buffering capacity of surface soil textures

Surface soil texture	Buffering capacity of surface soil
Sands and sandy loams, non Ca CO_3	Very low
Sands and sandy loams with Ca CO_3	Medium
Fine sandy loams, non Ca CO_3	Low
Fine sandy loams with Ca CO_3	Medium
Loams and clay loams, non Ca CO_3	Medium
Loams and clay loams with Ca CO_3	High
Dark loams	High
Clays, non Ca CO_3	High
Clays with Ca CO_3	Very high
Clays with high shrink swell	Very high

Table 8.15 Estimated buffering capacity of surface soils based on parent materials

Nature of parent material	Buffering capacity of surface soil
Highly weathered shales and metamorphic rocks, quartzose sandstones – highly siliceous	Very low
Siliceous granites, sandstones	Very low to Low
Intermediate type parent materials – granodiorites, less weathered shales and metamorphic rocks, andesites	Medium
Intermediate to basic rocks and parent materials – basalts, some andesites, gabbros, dolerites	High
Basic to ultrabasic rocks and parent materials – carbonates present, limestones, highly mafic	Very high
Alluvium with high levels of carbonate	High

Determining the soil acidity hazard class

The relationship between rainfall, natural buffering capacity and surface soil pH in determining the soil acidity hazard class is shown in Table 8.16.

Table 8.16 Soil acidity hazard class for combinations of inherent (natural) buffering capacity, acidity (pH in CaCl) of the surface soil and average annual rainfall

Average annual rainfall	Buffering capacity	pH of surface soil (pH CaCl)*				
		<4.0	4.0–5.0	5.0–6.5	6.5–8.0	>8.0
<500 mm	Very low	7	6	4	3	na
	Low	6	5	3	3	na
	Moderate	5	4	3	2	1
	High	4	3	2	1	1
	Very high	na	na	1	1	1
500–700 mm	Very low	7	6	5	4	na
	Low	6	5	4	3	na
	Moderate	6	5	3	3	1
	High	na	na	2	2	1
	Very high	na	na	1	1	1
>700–900 mm	Very low	7	6	5	4	na
	Low	7	5	4	4	na
	Moderate	6	5	3	3	2
	High	na	na	2	2	1
	Very high	na	na	2	1	1
>900 mm or irrigation	Very low	7	6	5	5	na
	Low	7	6	4	4	na
	Moderate	6	5	3	3	2
	High	6	5	2	2	1
	Very high	6	4	2	1	1

* Add 0.5 to 1.0 to convert to pH values for water and for field pH using a Raupach pH testing kit.

Note to reader:

Management actions for soil acidity hazard classes 3 to 6 need to be developed and included in the LSC Management Actions Database. The LSC Management Actions Database defines the onsite management actions for each applicable hazard class and land-use category. The LSC Management Actions Database is available on the OEH website.

8.4 Define and apply management actions to LSC zones in a PVP

Management actions required for LSC zones differ from site to site and between the different land uses and LSC hazard classes. Standard management actions must be applied to all LSC zones, where relevant. Other management actions may be required depending on the site attributes.

The standard management actions are specified in the LSC Management Actions Database (LSCMA Database). The database may also specify circumstances when the management actions must be applied and specific requirements for applying each management action and where it is appropriate for the accredited assessor (Level 2a) to apply judgement in the application of the management actions.

The LSC zone management actions must be clearly defined in the PVP to ensure the prevention of land degradation.

References:

Brown, A.J., (1999), 'Soil sampling and sample handling forchemical analysis'. In Peverill, K.I., Sparrow, L.A. and Reuter, D.J. (Eds) (1999), *Soil Analysis: An Interpretation Manual*, CSIRO Publishing, Melbourne.

Charman, P.E.V. and Murphy, B.W., (2000), *Soils: Their Properties and Management.* Second Edition. Oxford University Press, Melbourne, and NSW Department of Land and Water Conservation, Sydney.

Emery, K., (1985), *Rural Land Capability*. Soil Conservation Service of NSW.

Gunn, R.H., Beattie, J.A., Reid, R.E. and van de Graaff, R.H.M. (Eds), (1988), *Australian Soil and Land Survey Handbook: Guidelines for Conducting Surveys*. Inkata Press, Melbourne.

Hannam, I.D. and Hicks, R.W., (1980), 'Soil conservation and land use planning', *Journal of Soil Conservation, NSW,* 36: 135–145.

Klingebiel, A.A. and Montgomery, P.H., (1961), *Land Capability Classification, Agriculture Handbook No. 210*. Soil Conservation Service, U.S. Department of Agriculture, Washington, DC.

Lee, L.K. and Goebel, J. (1984), *The Use of the Land Capability Classification System to Define Erosion Potential on Cropland*. A & P Staff Report No. 85–1. Soil Conservation Service, Washington, DC.

Leys, J.F., Craven, P., Murphy, S., Clark, P. and Anderson, R., (1994), 'Integrated resource management of the Mallee of South-Western New South Wales'. *Australian Journal of Soil and Water Conservation*, 7(3): 10–19.

McKenzie, N.J., Coughlan, K.J. and Cresswell, H.P. (Eds), (2002), *Soil Physical Measurement and Interpretation for Land Evaluation*. Australian Soil and Land Survey Handbook Series, Vol 5. CSIRO Publishing, Collingwood.

Peverill, K.I., (1999), *Soil Analysis: An Interpretation Manual*. CSIRO Publishing, Canberra.

More information:

Soil structure decline definition:

www.environment.nsw.gov.au/resources/soils/detsoilstrucdec.pdf

Management options for soil acidity:

http://bettersoils.soilwater.com.au/module6/6_7.htm

Are my soils acid?

www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/167166/acid-soil.pdf

Acid sulfate soils definition and effects:

www.environment.nsw.gov.au/acidsulfatesoil/definitions.htm &

www.environment.nsw.gov.au/acidsulfatesoil/effects.htm

9 Prevention of salinity

9.1 Introduction

This chapter of the EOAM defines the circumstances in which broadscale clearing is to be regarded as improving or maintaining environmental outcomes for the prevention of salinity under the *Native Vegetation Act 2003*.

Two different approaches are used for the assessment of potential salinity impacts on clearing and offset proposals. The method of assessment of salinity impacts and offsets depends on whether hydrogeological landscape (HGL) data is available for the area in which clearing is proposed. The salinity assessment method to be applied for each location is defined in the Salinity Assessment Method and Management Actions Database (the 'Salinity Database').

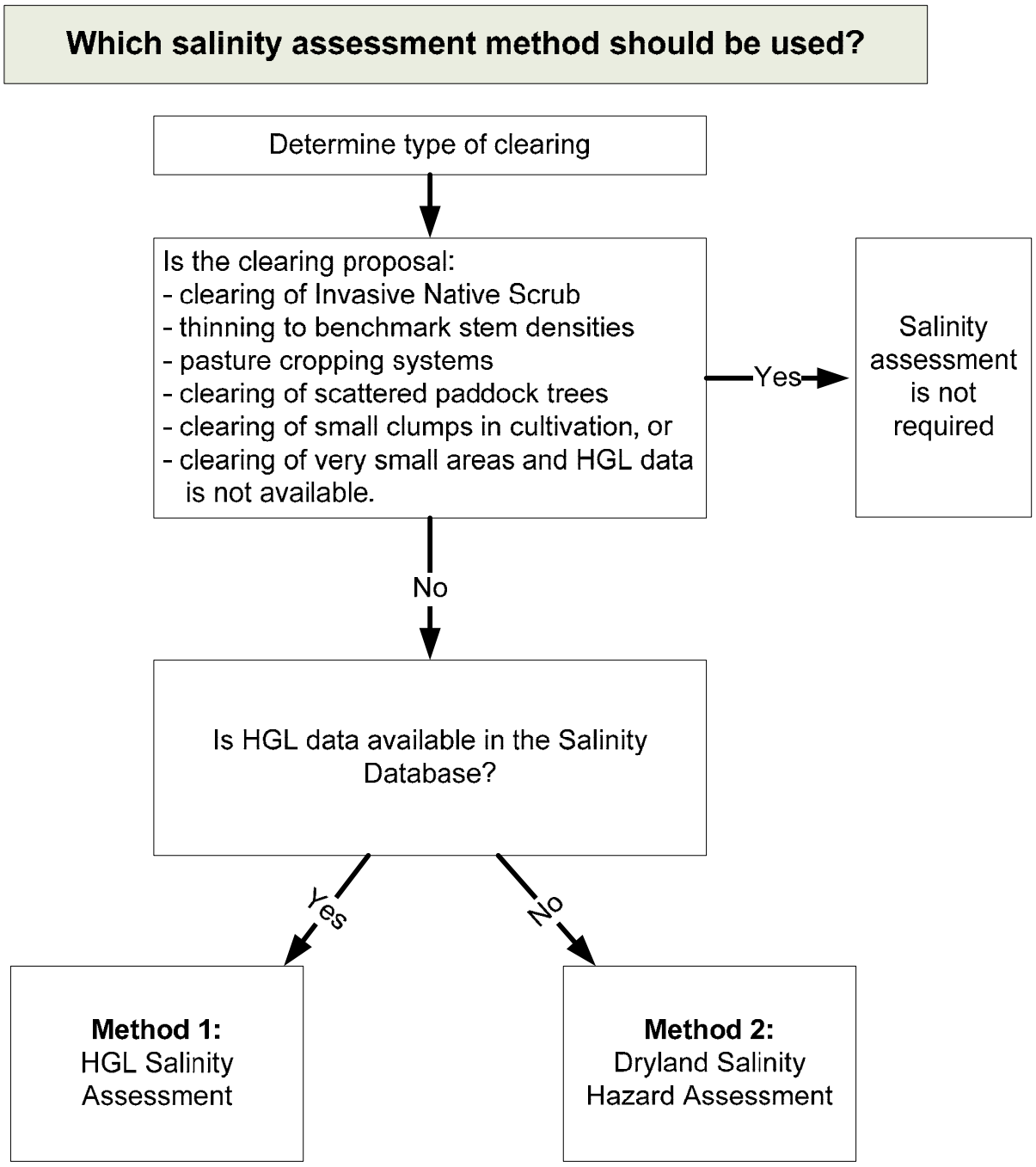
Note:
The Salinity Assessment Method and Management Actions Database will be built into the certified decision support tool to facilitate simple and rapid determination of the appropriate assessment pathway.

The locations and their respective salinity assessment methods can be summarised as follows:

- If HGL data is available in the Salinity Database for the proposed clearing area, then salinity impact and any offset requirements are assessed via **Method 1 – HGL Salinity Assessment**. Section 9.3 outlines the improve or maintain test for clearing proposals in these areas.
- In all other areas the assessment of salinity impact and any offset requirements are assessed via **Method 2 – Dryland Salinity Hazard Assessment**. Section 9.6 outlines the improve or maintain test for clearing proposals in these areas.

This is illustrated in Figure 9.1 below.

Figure 9.1 Decision pathway for deciding which salinity method to apply to a particular clearing assessment proposal



Note:

This assessment process is provided as guidance and does not need to be rigidly adhered to by CMAs in the assessment of broadscale clearing proposals.

Note:

Figure N1 Map showing coverage of the different salinity assessment methods: HGL availability at the time of gazettal

It is expected additional HGL data will become available over time, thus increasing the area assessed using the HGL approach.

9.2 Method 1 – Hydrogeological Landscape (HGL) Salinity Assessment

The hydrogeological landscape (HGL) concept provides a structure for understanding how salinity manifests itself in the landscape and how differences in salinity are expressed across the landscape. A HGL spatially defines areas of similar salt stores and pathways to salt mobilisation.

The process of HGL determination relies on the integration of a number of factors: geology, soils, slope, regolith depth, and climate; an understanding of the differences in salinity development ('plumbing'); and the impacts (land salinity/ salt load/ electrical conductivity) in landscapes.

Each HGL is classified into very high, high, medium, low and very low salinity hazard risk (see Section 9.4.2).

In addition to defining the salinity hazard risk, the HGL classifications and their respective profiles provide a framework that spatially defines management areas and recommends how best to manage each area from a salinity perspective. This includes the identification of

areas where clearing of native vegetation should not be permitted and potential management actions to offset salinity impacts when clearing is permitted.

9.3 The improve or maintain test for Method 1: HGL Salinity Assessment

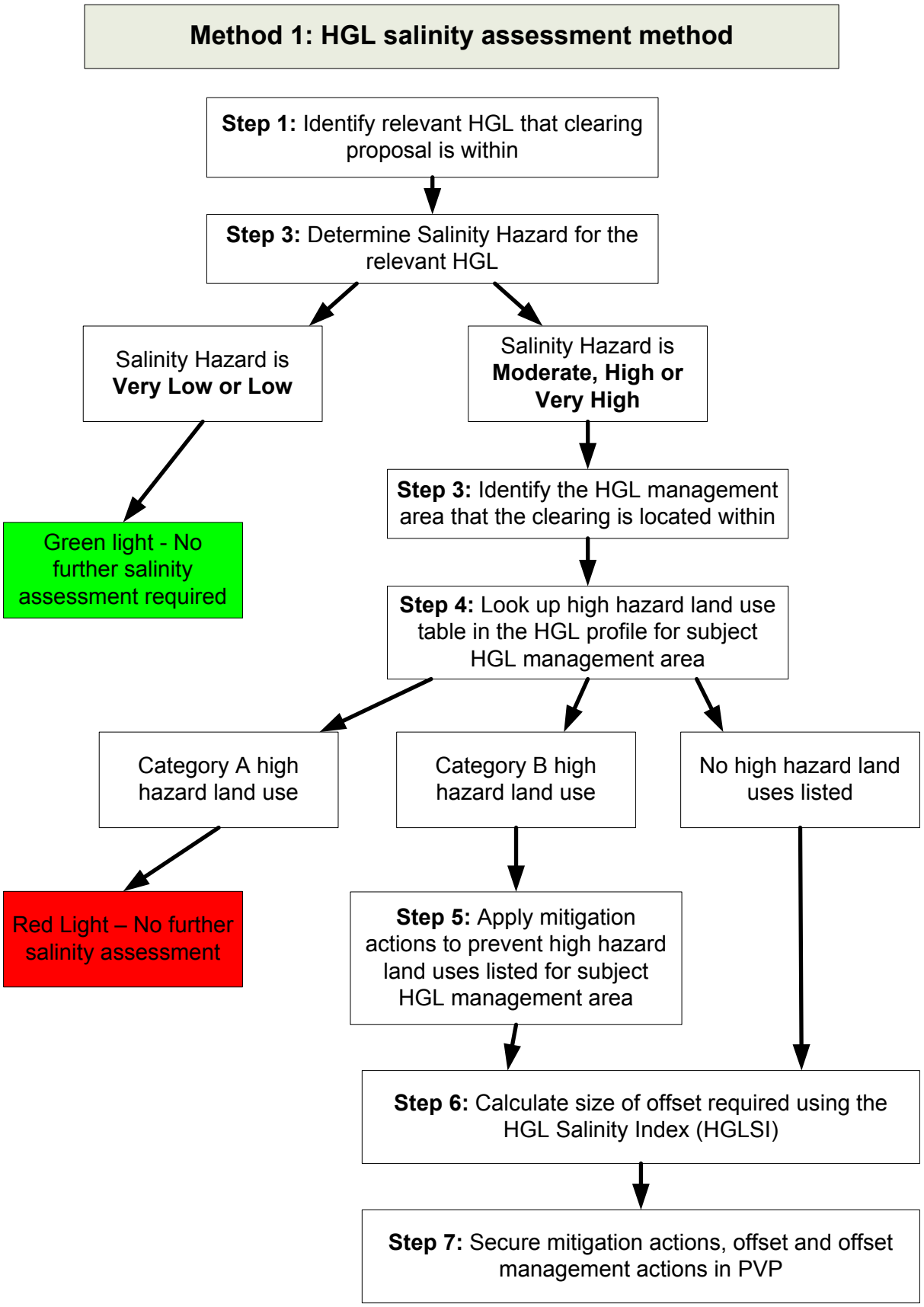
Proposed broadscale clearing is to be regarded as improving or maintaining environmental outcomes for the prevention of salinity using Method 1: HGL Salinity Assessment if the subject HGL management area:

1. has a salinity hazard that is very low or low, or
2. does not list any high-hazard land uses and any offsets that are required to balance the negative impacts of the clearing proposal as required under Section 9.4.6 are implemented, or
3. does not list any category A high-hazard land uses but does list any of the category B high-hazard land uses if:
    a) the clearing is carried out subject to the listed Category B land use being prohibited, and
    b) any offsets that are required to balance the negative impacts of the clearing proposal as required under Section 9.4.6 are implemented.

If the subject HGL management area lists any category A high-hazard land uses then the proposed clearing cannot be offset and therefore does not improve or maintain environmental outcomes for the prevention of salinity.

9.4 Assessment process for Method 1: HGL Salinity Assessment Method

Figure 9.2 HGL Salinity Assessment Method



Note:
This assessment process is provided as guidance and does not need to be rigidly adhered to by CMAs in the assessment of broadscale clearing proposals.

The HGL assessment process includes seven steps:

- **Step 1**: Identify the relevant HGL that the clearing site is located within.
- **Step 2**: Determine the salinity hazard for the relevant HGL. If the salinity hazard is:
  a) very low or low then no further assessment is required and the clearing is deemed to improve or maintain environmental outcomes for salinity
  b) moderate, high or very high then further assessment is required and the assessment continues with Step 3.
- **Step 3**: Identify the HGL management area that the clearing is located in using the HGL Management Cross Section for the relevant HGL.
- **Step 4**: Identify high-hazard land uses. Look up the High Hazard Land Use Table in the HGL profile for the relevant HGL to determine if any Category A or B land uses (as defined in Table 9.2) have been listed for the HGL management area.

  If the High Hazard Land Use Table for the subject HGL management area:
  – does not list any high-hazard land uses then the clearing may improve or maintain environmental outcomes for salinity if any required offsets are implemented (proceed to Step 6 to calculate offset requirements)
  – lists any Category A high-hazard land uses then the proposed clearing cannot be offset and therefore does not improve or maintain environmental outcomes for salinity
  – does not list any Category A high-hazard land uses but does list any of the Category B high-hazard land uses then the clearing may improve or maintain outcomes for salinity if:
    a) the clearing is carried out subject to the listed Category B land use being prohibited (mitigation actions must be added to the PVP to prevent these listed high-hazard land uses – see Step 5), and
    b) any offsets required to offset the impact of the salinity are implemented (proceed to Step 6 to calculate offset requirements).
- **Step 5**: Define any salinity impact mitigation actions.
- **Step 6**: Calculate the salinity offset required to balance the impact of the clearing, and
- **Step 7**: Include salinity mitigation actions, the offset and the relevant management of the offset in the PVP.

9.4.1 Identify the relevant hydrogeological landscape

Using the HGL mapping and HGL landscape descriptions and photos, identify the relevant HGL that the clearing is located within. Due to the scale of the mapping, the HGL descriptions should be checked to ensure the correct HGL is identified.

Note:

HGL profiles and the HGL spatial data are available through the certified decision support tool.

The HGL profiles describe the HGL and provide photos and other data required to undertake the salinity assessment.

9.4.2 Determine the salinity hazard

The salinity hazard for each HGL is classified using a standard risk matrix of potential impact and likelihood of occurrence. This salinity hazard classification integrates the salinity impacts in a landscape. The salinity hazard of a landscape may differ due to regolith thickness, the salt storage, the landscape shape and the underlying geology of a landscape. There is a huge range and variability of salinity hazard within a catchment.

Each HGL is classified in the HGL profile against a potential impact and likelihood of occurrence matrix as shown in Table 9.1.

Table 9.1 Salinity hazard matrix for HGLs

	Limited potential impact	Significant potential impact	Severe potential impact
High likelihood of occurrence	Moderate	High	Very High
Moderate likelihood of occurrence	Low	Moderate	High
Low likelihood of occurrence	Very Low	Low	Moderate

If the salinity hazard for the relevant HGL is:

- very low or low then no further assessment is required and the clearing is deemed to improve or maintain environmental outcomes for salinity
- moderate, high or very high then further assessment is required and the assessment continues with Step 3.

9.4.3 Identify the relevant HGL management area

Each HGL profile identifies different parts of the landscape (called management areas). It is necessary to determine the management area so that high-hazard land uses can be appropriately identified (Section 9.4.4).

Management areas are elements of a landscape that are similar in shape and landform, and are defined using conceptual landscape profiles where uniform landscape definitions (management areas) are applied to each HGL.

There are 10 standard management areas that are applied to each HGL. These are:

- MA1 – Ridges
- MA2 – Upper slopes – erosional
- MA3 – Upper slopes – colluvial

- MA4 – Midslopes
- MA5 – Lower slopes – colluvial
- MA6 – Rises
- MA7 – Saline site
- MA8 – Structural saline area
- MA9 – Alluvial plain
- MA10 – Alluvial channel.

Note:

These management units will be described in more detail in the *Salinity Operational Manual* (OEH).

9.4.4 Identify high-hazard land uses

High-hazard land uses are identified against each management area within each HGL where appropriate. These actions have the potential to have significant negative impact on dryland salinity and thus should be avoided.

There are 15 different high-hazard land uses which, for the purpose of this EOAM, have been sorted into category A or B (see Table 9.2 below).

Note: Example showing how high-hazard land-use actions are applied to an assessment proposal

Clearing located on a HGL management area which has 'DL4 – Clearing native vegetation' listed as a high-hazard land use is not permitted. However, clearing on a HGL management area that does not have DL4 listed, but does have 'DL3 – Annual cropping' listed as a high-hazard land use, may be permitted so long as the proposed land use is not annual cropping or any other land use that has a similar mechanism of impact on salinity. In this case the mechanism is increasing deep drainage, and land uses which maintain bare soil or low vegetation cover may be considered to have a similar mechanism of salinity impact.

Table 9.2 High-hazard land uses

Code	Land use	Category
DL1	Long fallows in cropping systems	B
DL2	Poor grazing management	B
DL3	Annual cropping	B
DL4	**Clearing of native vegetation**	**A**
DL5	Farm dams in flow lines	B
DL6	Drying up fresh surface water catchments	B
DL7	Siting infrastructure on discharge areas	B
DL8	Poor soil management – tillage causing poor structure	B
DL9	Poor soil management – chemistry and biological	B

Code	Land use	Category
DL10	Poor soil management – loss of surface soil layers	B
DL11	Deep ripping of soils to maximise water infiltration to subsoil	B
DL12	Flat contour banks	B
DL13	Irrigation using poor practices	B
DL14	Poor targeting of locations suitable for irrigation	B
DL15	Loading of soils with salt through irrigation and flow management	B

Note:

These high-hazard land uses will be described in more detail in the *Salinity Operational Manual* (OEH).

9.4.5 Define mitigation actions

If any category B high-hazard land uses are listed for the subject HGL management area then conditions must be added to the PVP to prohibit that land use and other land uses which have a similar mechanism of salinity impact. These conditions are referred to as 'mitigation actions'.

For example, if 'DL3 – Annual cropping' is listed for the subject HGL management area then conditions (mitigation actions) must be included in the PVP to prevent annual cropping (or other land uses which will have similar salinity impact) from being undertaken.

9.4.6 Calculate the salinity offset required

If the salinity hazard for the HGL is moderate, high or very high, then consideration must be given as to whether an offset is required.

There are three components to calculating the salinity offset requirements: defining the location, type and size of the offset.

Is an offset required?

No offset is required if there is no increase in surplus water and hence salt mobilisation as a result of the clearing. The following rules are used to interpret the HGL Salinity Index (HGLSI) for clearing:

- If $\mathbf{HGLSI_{clearing}} \geq 0$ then there is no requirement for salinity offsets
- If $\mathbf{HGLSI_{clearing}} < 0$ then the proposal can only occur if actions are undertaken elsewhere to offset the negative salinity impact.

How big does the offset need to be?

If offsets are required to balance the negative impacts of the clearing proposal then the following rules are used to interpret the offset HGL Salinity Index ($\mathbf{HGLSI_{offset}}$) relative to the clearing HGL Salinity Index ($\mathbf{HGLSI_{clearing}}$):

- If $\mathbf{HGLSI_{offset} + HGLSI_{clearing} \geq 0}$ then the cumulative impact of the clearing and offset actions is deemed to improve or maintain environmental outcomes for salinity

- If **$HGLSI_{offset}$ + $HGLSI_{clearing}$ < 0** then the cumulative impact of the clearing and offset actions will not improve or maintain environmental outcomes for salinity.

The size of the offset required will depend on the relative change in water-use efficiency between the current and proposed vegetation covers on both the clearing and the offset sites.

HGL offset requirement is calculated using the surplus water values corresponding to the current and proposed vegetation covers, average annual rainfall and the areas of the zone.

The HGL Salinity Index is calculated as follows:

Equation 9.1 HGL Salinity Index (HGLSI)

$$HGLSI = (SW_{current} – SW_{proposed}) \times AAR \times Area$$

Where:

HGLSI = HGL Salinity Index

$SW_{current}$ = surplus water before proposal (proportion of average annual rainfall)

$SW_{proposed}$ = surplus water after proposal (proportion of average annual rainfall)

AAR = average annual rainfall (mm)

Area = area of the zone (ha)

Location of offset

Salinity offsets must be located within the same HGL management area as the clearing. If the management area has multiple locations in the HGL then the offset can be located in any of these management areas.

Type of offset

The HGL profile provides guidance on what actions are most suitable within each management area within the HGL. Suitable salinity offsets range from planting woody vegetation to establishing and maintaining healthy perennial groundcovers.

9.4.7 Define and apply management actions to HGL areas in a PVP

Management actions required for salinity zones differ from site to site and between the different land uses. Standard management actions must be applied to all salinity zones, where relevant. Other management actions may be required depending on the site attributes.

The standard management actions are specified in the Salinity Management Actions Database (LSCMA Database). The database may also specify circumstances when the management actions must be applied and specific requirements for applying each management action and where it is appropriate for the accredited assessor (Level 2a) to apply judgement in the application of the management actions.

The salinity zone management actions must be clearly defined in the PVP to ensure the prevention of salinity.

9.5 Method 2: Dryland Salinity Hazard Assessment

The Dryland Salinity Hazard Assessment Method consists of two stages:

- An initial assessment is carried out to determine whether the proposed clearing is likely to improve or maintain environmental outcomes for dryland salinity and whether further assessment is required.
- If further assessment is required, the Salt Mobilisation Index is used to calculate the offset requirements.

The criteria used in the initial assessment of salinity hazard include:

- hydrological change rating
- evidence of salinity outbreaks in the LSC zone or downslope from the LSC zone
- salt store class for the area
- permeability of the soil, and
- condition of existing native vegetation.

The assessment of salinity hazard also depends on the Catchment Hazard Area in which the assessment is undertaken. Catchment Hazard Areas are defined in Section 8.3.2. The decision tree for the Dryland Salinity Hazard Assessment Method is illustrated in Figure 9.3. Criteria for determining the salinity hazard class are set out in:

- Table 9.3 for all Tablelands and Slopes Catchment Hazard Areas and the Coastal Plain Catchment Hazard Area, and
- Table 9.4 for the Inland Plains Catchment Hazard Area.

9.6 The improve or maintain test for Method 2: Dryland Salinity Hazard Assessment

Proposed broadscale clearing is to be regarded as improving or maintaining environmental outcomes for the prevention of Method 2: Dryland Salinity Assessment if each salinity zone:

1. has a salinity hazard class of 1 or 2, or
2. has a salinity hazard class of 3 to 6 and any offsets that are required to balance the negative impacts of the clearing proposal as required under Section 9.7.1 are implemented.

If a zone has a salinity hazard class 7 or 8, then the clearing cannot be offset and therefore cannot be considered to improve or maintain environmental outcomes for salinity except in the following circumstances (shaded red in hazard class tables):

1. where the land-use category (as set out in the LSC Management Actions Database) is for infrastructure, and engineering works are put in place to prevent salinity that may arise from the associated clearing, or
2. where an accredited expert defines appropriate management actions that will prevent land degradation associated with the clearing and/or ongoing management of the land. (shaded red in the salinity hazard class table).

9.7 Assessment process for Method 2: Dryland Salinity Hazard Assessment

Figure 9.3 Method 2: Dryland Salinity Hazard Assessment

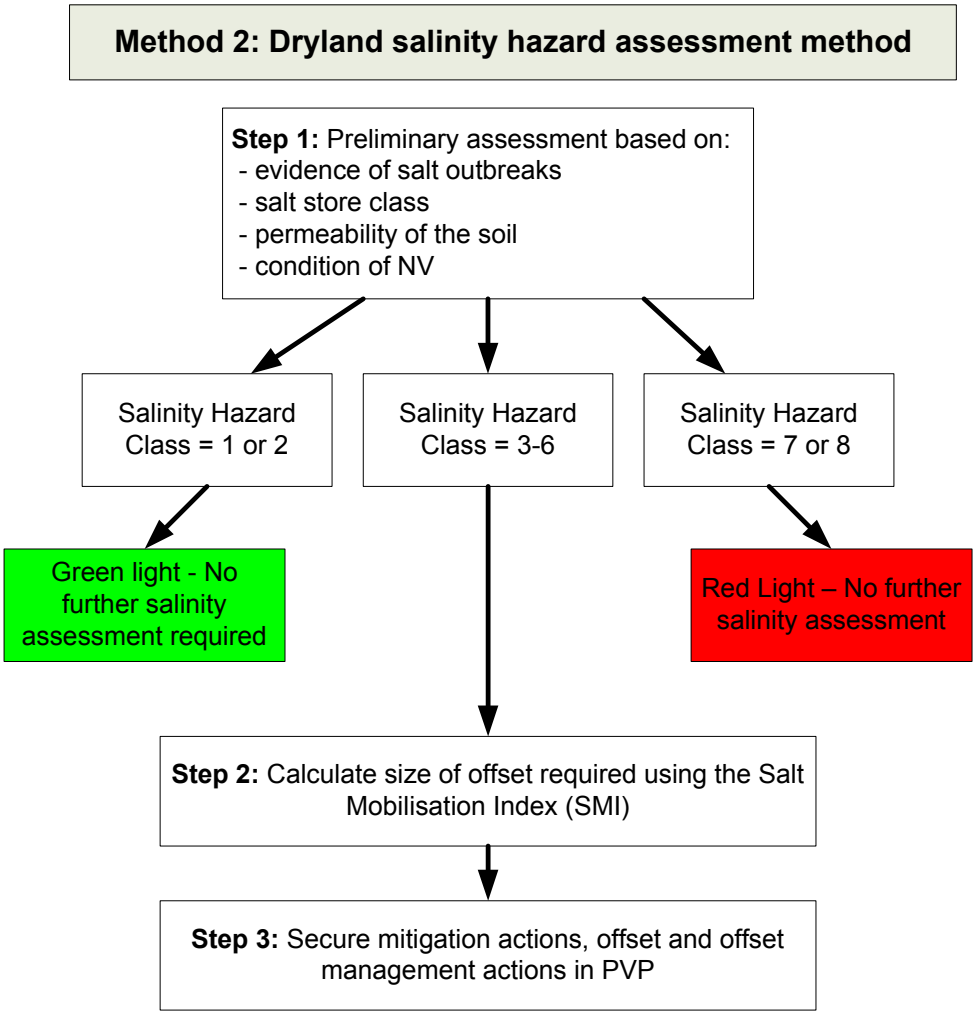


Table 9.3 Criteria for determining salinity hazard class for all Tablelands and Slopes Catchment Hazard Areas and the Coastal Plain Catchment Hazard Area

Salinity hazard risk category	Evidence of salinity outbreaks in the salinity zone or downslope from the salinity zone	Salt store class	Salinity hazard class
'No further assessment'	Not required	Not required	1
Low	No salt outbreaks	Very low	1
		Very low to Low; Low	2
		Low to Moderate; Moderate Moderate to High	3-6
		High; High to Very high	7
		Very high	8
	Salt outbreaks observed but not extensive and no severe scalding	Very low; Very low to Low; Low; Low to Moderate; Moderate	3-6
		Moderate to High; High	7
		High to Very high; Very high	8
	Salt outbreaks extensive and severe scalding	Any	7-8
Medium or High	No salt outbreaks	Very low; Very low to Low; Low; Low to Moderate; Moderate	3-6
		Moderate to High; High	7
		High to Very high; Very high	8
	Salt outbreaks observed but not extensive and no severe scalding	Very low; Very low to Low; Low; Low to Moderate	3-6
		Moderate; Moderate to High; High	7
		High to Very high; Very high	8
	Salt outbreaks extensive and severe scalding	Not required	7-8

Table 9.4 Criteria for determining salinity hazard class for the Inland Plains Catchment Hazard Area

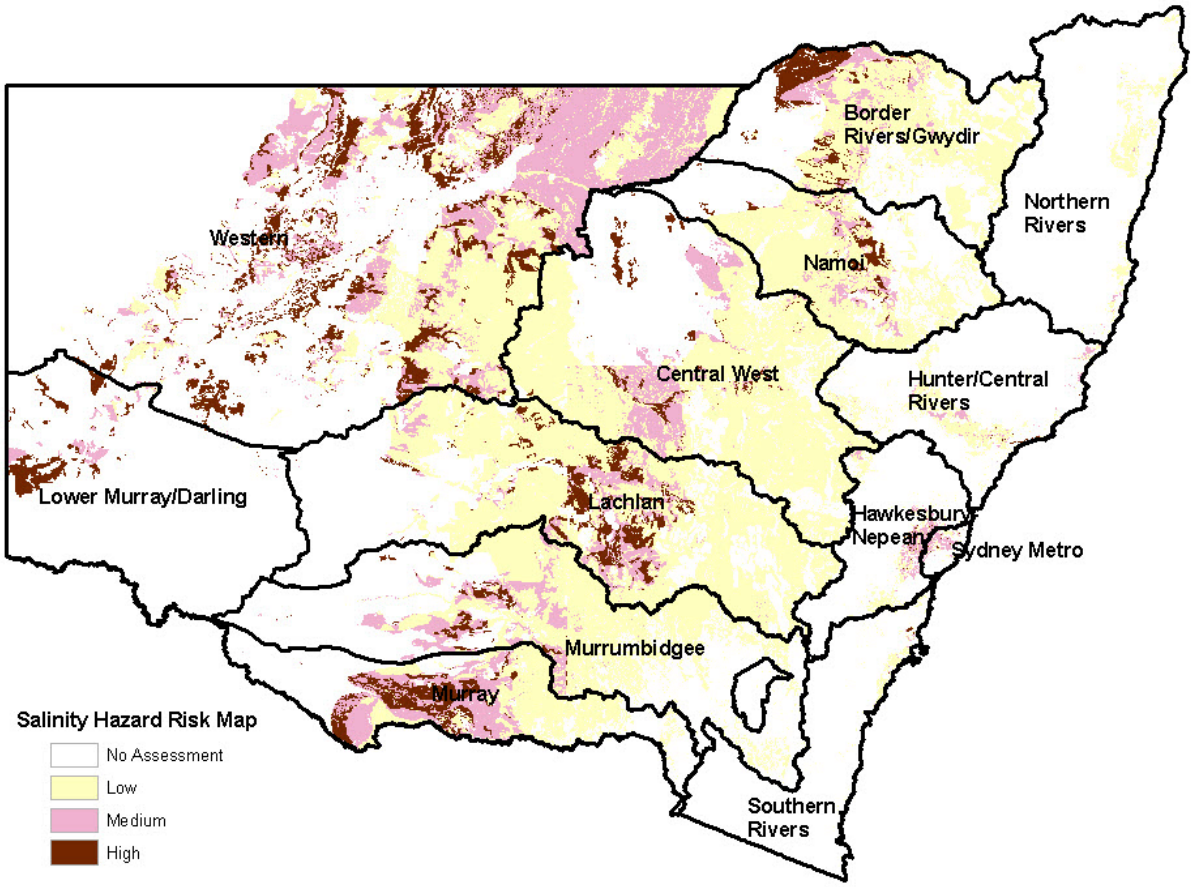
Salinity hazard risk category	Salt store class	Soil permeability class[1]	Low condition vegetation[2]	Salinity hazard class
'No further assessment'	Not required	Not required	Not required	1
Low	Very low; Very low to Low	Low	Yes	1
			No	1
		Moderate	Yes	1
			No	2
		High	Yes	2
			No	3
	Low; Low to Moderate	Low	Yes	1
			No	2
		Moderate	Yes	2
			No	3
		High	Yes	3
			No	4
	Moderate	Low	Yes	2
			No	3
		Moderate	Yes	3
			No	4
		High	Yes	4
			No	5
	Moderate to High; High	Low	Yes	3
			No	4
		Moderate	Yes	4
			No	5
		High	Yes	5
			No	6
	High to Very high; Very high	Low	Yes	4
			No	5
		Moderate	Yes	5
			No	6
		High	Yes	6
			No	7
Medium or High	Very low; Very low to	Low	Yes	3
			No	3

Salinity hazard risk category	Salt store class	Soil permeability class[1]	Low condition vegetation[2]	Salinity hazard class
	Low	Moderate	Yes	3
			No	3
		High	Yes	3
			No	4
	Low; Low to Moderate	Low	Yes	3
			No	3
		Moderate	Yes	3
			No	4
		High	Yes	4
			No	4
	Moderate	Low	Yes	3
			No	4
		Moderate	Yes	4
			No	4
		High	Yes	4
			No	5
	Moderate to High; High	Low	Yes	4
			No	4
		Moderate	Yes	4
			No	5
		High	Yes	5
			No	6
	High to Very high; Very high	Low	Yes	4
			No	5
		Moderate	Yes	5
			No	6
		High	Yes	6
			No	7

[1] Defined in Section 9.7.2.

[2] Defined in Section 9.9.

Figure 9.4 Salinity hazard risk map



Note: Explanation of salinity hazard risk map

Hydrological change maps have been derived by comparing modelled surplus water for trees with modelled surplus water for bare soil (largest potential hydrological change). Change in surplus water has been grouped into five categories representing low to very high hydrological change (< 0.5 ML/ha, 0.5–2 ML/ha, 2–4 ML/ha, 4–6 ML/ha and >6 ML/ha).

Hydrological change has been combined with the existing salt stores map to create four categories of salinity hazard as shown in the table below. Categories are largely governed by salt stores, except the highest category where larger hydrological change in the 'High' salt store category is also included.

Table N4 Salinity hazard risk categories

Salinity hazard risk category	Hydrological change	Salt store categories
'No further assessment'	<0.5 ML/ha	Very low, Very low to Low
Low impact	>0.5 ML/ha	Low, Low to Moderate
Medium impacts	>0.5 ML/ha	Moderate, Moderate to High
High impacts	>0.5 ML/ha >2.0 ML/ha	High, High to Very high, Very high High

9.7.1 The Salt Mobilisation Index

The Salt Mobilisation Index (SMI) is used to determine the impacts of the clearing and determine the level of offset required where an offset is necessary to meet the improve or maintain test. The rationale for, and calculation of, the Salt Mobilisation Index are described in Sections 9.7.1 to 9.7.2.

The assumption underpinning the Salt Mobilisation Index calculations is that reducing the mobilisation of salt stored in the ground is beneficial to the environment. Reducing salt mobilisation can be achieved through land cover changes that increase plant water uptake and, hence, reduce recharge.

Salt Mobilisation Index for clearing areas

Clearing is deemed to improve or maintain salinity outcomes if there is no increase in local recharge, hence salt mobilisation. The following rules are used to interpret the Salt Mobilisation Index (SMI) for clearing:

- If $\mathbf{SMI_{clearing}} \geq 0$ then there is no requirement for salinity offsets
- If $\mathbf{SMI_{clearing}} < 0$ then the proposal can only occur if actions are undertaken elsewhere to offset the negative salinity impact.

The steps for calculating the salt mobilisation offset requirement are described below.

Salt Mobilisation Index for offset areas

If offsets are required to balance the negative impacts of the clearing proposal then the following rules are used to interpret the offset Salt Mobilisation Index ($\mathbf{SMI_{offset}}$) relative to the clearing Salt Mobilisation Index ($\mathbf{SMI_{clearing}}$):

- If $\mathbf{SMI_{offset} + SMI_{clearing}} \geq 0$ then the cumulative impact of the clearing and offset actions is deemed to improve or maintain environmental outcomes for salinity
- If $\mathbf{SMI_{offset} + SMI_{clearing}} < 0$ then the cumulative impact of the clearing and offset actions will not improve or maintain environmental outcomes for salinity.

Salinity offsets required under this assessment method must be located:

- in the same subcatchment, and
- in catchments of the same stream order (Strahler system) or lower.

9.7.2 Calculating the Salt Mobilisation Index

The Salt Mobilisation Index is a function of the change in surplus water caused by the proposed land cover change and the area of the zone.

The Salt Mobilisation Index (SMI) is calculated as follows:

Equation 9.2 Salt Mobilisation Index (SMI)

$$SMI = (SW_{current} - SW_{proposed}) \times AAR \times Area \times SS_w$$

Where:

$SW_{current}$ = surplus water before proposal (proportion of average annual rainfall)

$SW_{proposed}$ = surplus water after proposal (proportion of average annual rainfall)

AAR = average annual rainfall (mm)

Area = area of the zone (ha)

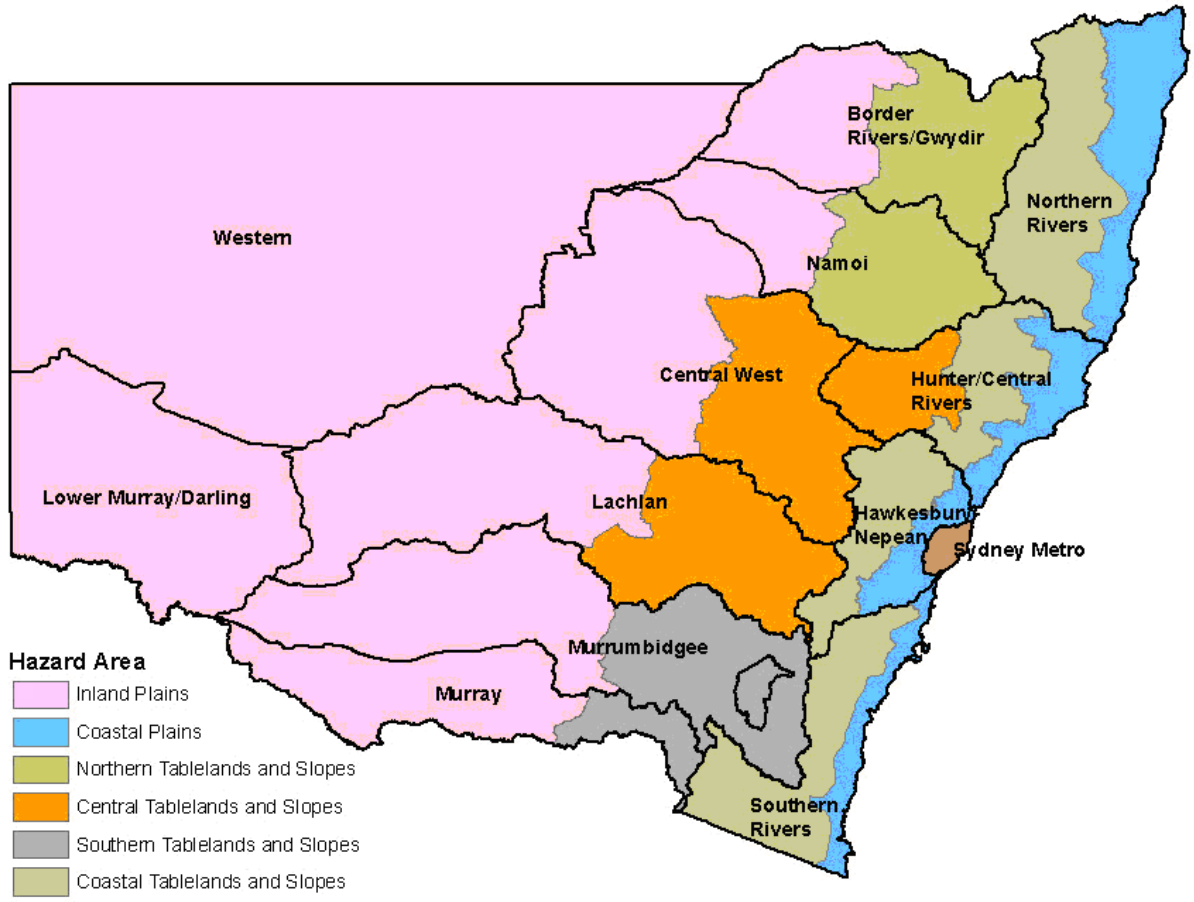
SS_w = salt store weighting

Note to reader:

The calculation of the offset index has been improved by expressing hydrological change as a proportion of average annual rainfall rather than using absolute values. These have been derived by grouping estimated surplus water with average annual rainfall and soil permeability across NSW for different land uses.

Surplus water

The hydrological impact of tree clearing and offset requirements has been predicted using the same water balance modelling used to forecast future salinity trends in the



and used in the original Salinity Benefits Index (SBI) tool.

Surplus water or non-transpired water is vertical recharge, surface run-off and shallow subsurface flow through the soils. These water pathways have a potential to mobilise salt stores on the soil surface, within the soil or in the groundwater. Statewide water balance modelling is underpinned by spatial climate data and soils mapping.

Modelled water balances have been derived for more than 100,000 combinations of soil type, slope and climate zone across NSW and have been undertaken for a wide range of land uses.

Each vegetation cover class has been classified into one of five water-use efficiency classes according to its water-use characteristics. Table 9.5 sets out the water-use efficiency rating that has been assigned to each vegetation cover class.

Total surplus water values for each of the five water-use efficiency classes have been calculated for three rainfall categories: <500 mm, 500–700 mm and >700 mm. These values are expressed as a proportion of average annual rainfall and are shown in Table 9.6.

In general, deep-rooted, perennial vegetation covers are on average higher water users than shallow-rooted or annual vegetation systems and the total surplus water values reflect this. For the native vegetation classes, it is assumed that water use will be less efficient where vegetation is in a 'low condition' than where it is in a relatively undisturbed condition. Section 9.9 provides the definition of 'low condition' for salinity purposes. This definition differs somewhat from the biodiversity definition of low condition, since from a water-use perspective a groundcover dominated by exotic perennials can be as efficient as the natural groundcover. In other words, it is not the composition of the groundcover so much as the extent of coverage which is significant in terms of water use. In Table 9.5, each of the native vegetation classes has a water-use efficiency classification reflecting the two conditions.

Table 9.5 Vegetation covers classified into water-use efficiency classes

Vegetation class	Water use-efficiency class	
	Not low condition	Low condition
Arid and semi-arid shrublands[1]	Very high	High
Semi-arid woodlands[1]	Very high	High
Sclerophyll grassy woodlands[1]	Very high	High
Dry sclerophyll shrub/grass forest[1]	Very high	High
Dry sclerophyll shrub forest[1]	Very high	High
Forested wetlands[1]	Very high	High
Grasslands (native)[1]	High	Moderate
Horticulture (with DIMP[2])	High	N/A
High water-use pasture (e.g. lucerne)	High	N/A
Response cropping	High	N/A
Pasture with paddock trees	High	N/A
No-till cropping/Deep-rooted perennial pasture rotation	High	N/A
Continuous no-till cropping	High	N/A
No-till winter cropping	Moderate	N/A
Crops with paddock trees	Moderate	N/A
Summer-winter cropping	Moderate	N/A
Pasture (e.g. annual grasses/medic)	Moderate	N/A
Winter cropping (with conventional fallow)	Low	N/A
Annual pasture (e.g. oats)	Low	N/A
Horticulture (with no DIMP[2])	Very low	N/A
Bare soil	Very low	N/A

[1] Based on Keith vegetation formations relevant to western NSW and non-native vegetation types relevant to western NSW.

[2] Drainage and irrigation management plan (DIMP).

Soil permeability classes are defined on the basis of their clay and sand content:

- Low: light, medium and heavy clays
- Moderate: loams, clay loams
- High: sandy loams, loamy sands, sands.

Sandy soils tend to have lower water holding capacities and higher conductivities than clay-rich soils, hence, everything else being equal, areas characterised by sandy soils have higher recharge rates.

Total surplus water values for each of the water-use efficiency classes and permeability classes are shown in Table 9.6 for three rainfall categories: <500 mm, 500–700 mm and >700 mm.

Table 9.6 Total surplus water as a proportion of average annual rainfall for each water-use efficiency class and permeability class for three rainfall categories

	<500 mm			500–700 mm			> 700 mm		
Permeability →	**High**	**Medium**	**Low**	**High**	**Medium**	**Low**	**High**	**Medium**	**Low**
Water-use efficiency class ↓									
Very low	0.14	0.13	0.12	0.25	0.24	0.22	0.38	0.37	0.35
Low	0.07	0.06	0.05	0.18	0.17	0.15	0.32	0.31	0.29
Medium	0.06	0.05	0.05	0.17	0.16	0.14	0.30	0.29	0.27
High	0.04	0.04	0.04	0.09	0.08	0.07	0.19	0.19	0.18
Very high	0.02	0.02	0.02	0.07	0.06	0.05	0.16	0.16	0.15

Salt store class

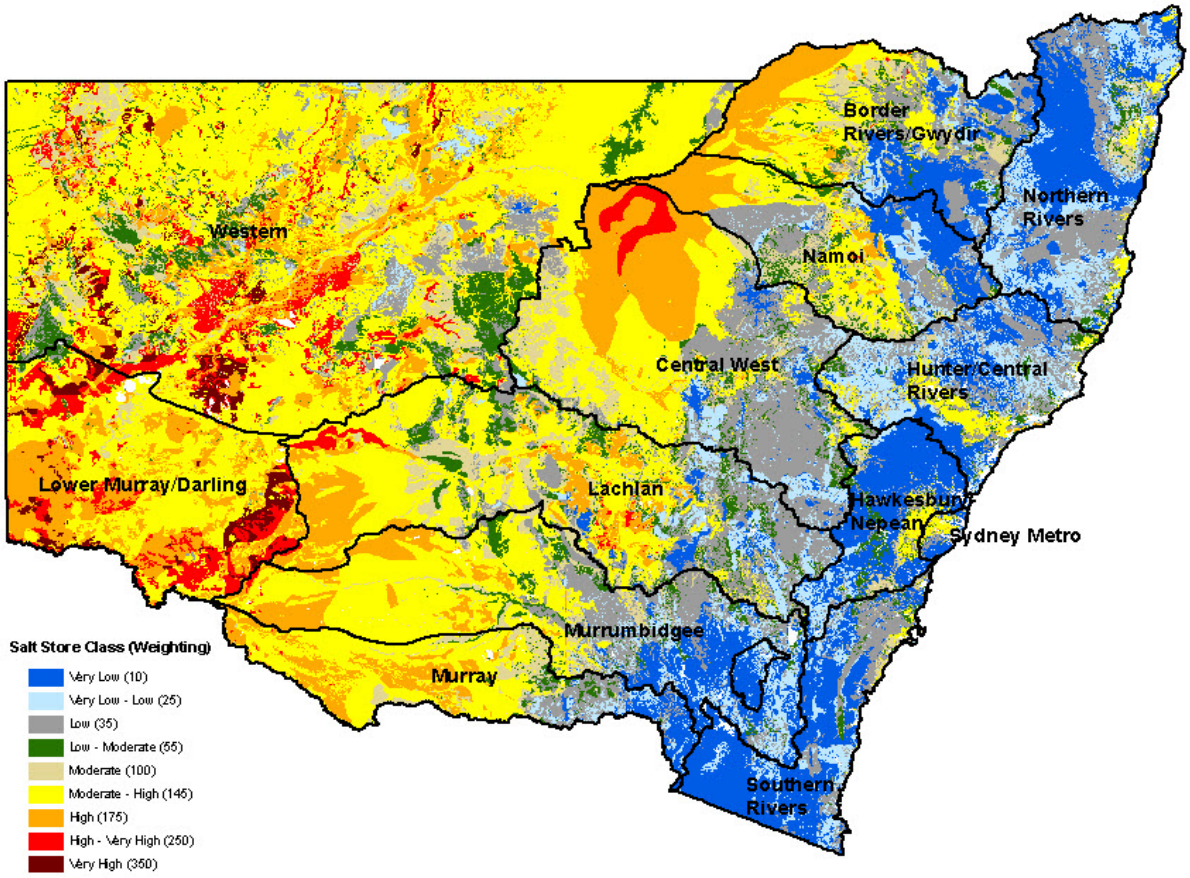
Salt weightings have been assigned to a salt store map of NSW (Figure 9.5), which was produced as part of the Salinity Hazard Mapping Program (Department of Natural Resources). The salt store map represents the spatial pattern of salt storage in the groundwater, regolith and soil, taken together.

This EOAM version has been classified into 9 classes (Table 9.7) and the weightings assigned to each class are based on the range of salinity values from groundwater data. Weightings have been used in preference to actual salinity values because of uncertainties in the soil, regolith and groundwater salt store data.

Table 9.7 Salt store classes and their model weightings

Salt store class	Weighting
Very low	10
Very low – Low	25
Low	35
Low – Moderate	55
Moderate	100
Moderate – High	145
High	175
High – Very high	250
Very high	350

Figure 9.5 Map showing salt store class and weightings



9.8 Define and apply management actions to salinity zones in a PVP

Management actions required for salinity zones differ from site to site and between the different land uses. Standard management actions must be applied to all salinity zones, where relevant. Other management actions may be required depending on the site attributes.

The standard management actions are specified in the Salinity Management Actions Database. The database may also specify circumstances when the management actions must be applied and specific requirements for applying each management action and where it is appropriate for the accredited assessor (Level 2a) to apply judgement in the application of the management actions.

The salinity zone management actions must be clearly defined in the PVP to ensure the prevention of salinity.

9.9 Definitions

Recharge refers to the component of rainfall that infiltrates (percolates) down through the soil, beyond the root zone of the vegetation cover and into the groundwater aquifer. Rates of recharge tend to be slow. Where recharge water is discharged from a groundwater aquifer into a stream, it contributes to base flow.

Low condition vegetation

For the purposes of the salinity assessments, native woody vegetation is in low condition if:

- the over-storey percent foliage cover is less than 50% of the over-storey percent foliage cover lower benchmark for that vegetation type, and
- the percent groundcover tends (or is on average) less than 50%.

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

- the percent groundcover tends (or is on average) less than 50%.

Groundcover can comprise non-native species, including weeds, as the interest from a salinity perspective is in water use by the vegetation cover. This represents a slight variation on the definition of 'low condition' used in biodiversity assessments.

Note:

In previous versions of the EOAM the Salinity Benefits Index was used to determine the salinity impact of clearing proposals in most tablelands and slopes catchments.

References:

Beven, K.J. and Kirkby, M.J., (1979), 'A physically based, variable contributing area model of basin hydrology', *Hydrological Sciences Bulletin*, *24*(1): 43–69.

Department of Infrastructure, Planning and Natural Resources, (2005), *NSW Salinity Hazard Assessment*. Draft Report August 2005, Sydney.

Hutchinson, M.F., (1995), 'Interpolating mean rainfall using thin plate smoothing splines', *International Journal of Geographic Information Systems*, 9: 385–403.

Lyne, V.D. and Hollick, M., (1979), 'Stochastic time-varying rainfall-runoff modelling', *Hydrology and Water Resources Symposium, Perth*. Institution of Engineers, Australia, pp. 89–92.

Murray–Darling Basin Commission Ministerial Council, (2003), *Basin Salinity Management Strategy Operational Protocols*. Murray–Darling Basin Commission, Canberra.

Tuteja, N.K., Beale, G.T.H., Dawes, W., Vaze, J., Murphy, B., Barnett, P., Rancic, A., Evans, R., Geeves, G., Rassam, D.W. and Miller, M., (2003), 'Predicting the effects of landuse change on water and salt balance – a case study of a catchment affected by dryland salinity in NSW, Australia', *Journal of Hydrology*, Vol. 283: 1–4, pp. 67–90.

Zhang, L., Dawes, W. R. and Walker, G. R., (2001), 'The response of mean annual evapo-transpiration to vegetation changes at catchment scale', *Water Resources Research*, *37*(3): 701–708.

Definition of electrical conductivity:
www.salinitymanagement.org/Salinity%20Management%20Guide/ls/ls_3d.html.

Note to reader:

These references need to be updated to reflect the removal of the SBI and adding in of HGL, salinity hazard risk etc.

10 Biodiversity values

10.1 Introduction

This chapter of the EOAM defines the circumstances in which broadscale clearing is to be regarded as improving or maintaining environmental outcomes for biodiversity values under the *Native Vegetation Act 2003*.

For the purpose of Chapter 10, biodiversity values include the composition, structure and function of ecosystems, and include (but are not limited to) threatened species, populations and ecological communities, and their habitats.

A reference in this chapter to 'biodiversity values' does not extend to biodiversity values as they relate to fish or marine vegetation within the meaning of Part 7A of the *Fisheries Management Act 1994*, other than those that are considered to be animals or plants because of an order made under section 5A of the *Threatened Species Conservation Act 1995* (TSC Act).

For the purpose of Chapter 10, 'threatened species' refers to:

1. the following entities listed under the TSC Act (NSW):
    - species listed as 'critically endangered', 'endangered', 'vulnerable' or flora species listed as 'presumed extinct', and
    - ecological communities listed as 'critically endangered' or 'endangered', and
    - endangered populations

AND

2. the following entities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act, Commonwealth):
    - species listed as 'critically endangered', 'endangered' or 'vulnerable', and
    - ecological communities listed as 'critically endangered' or 'endangered'.

The assessment of biodiversity values assesses the losses in biodiversity from proposed clearing and gains in biodiversity from proposed offsets.

The assessment of biodiversity values incorporates data held by OEH in the following databases: Vegetation Types Database, Vegetation Benchmarks Database, Overcleared Landscapes Database, and the Threatened Species Profile Database.

This chapter includes the methods used to assess the biodiversity values currently at a clearing site and an offset site. It also describes the process for measuring the loss of biodiversity values from the impact of clearing native vegetation, threatened species habitat and threatened species, and the gain in biodiversity values on an offset site from protecting native vegetation, threatened species habitat and threatened species, and from undertaking management actions that improve native vegetation, threatened species habitat and threatened species.

This chapter establishes ecosystem credits and species credits to measure the loss and gain in biodiversity values and identifies which threatened species are assessed for ecosystem credits or species credits.

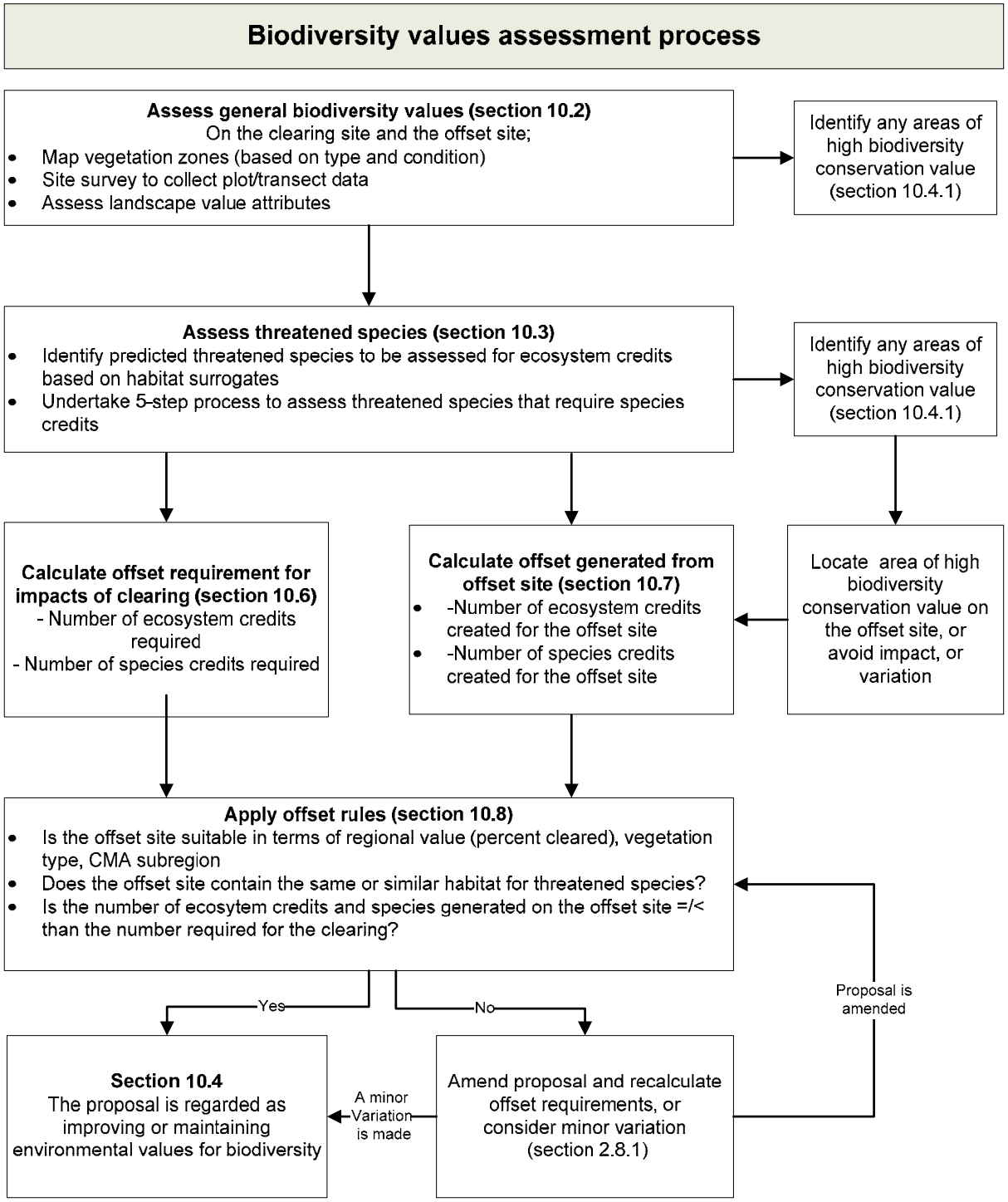
The chapter also sets out how ecosystem credits and species credits generated for improving biodiversity values at an offset site can be used to match the ecosystem credits and species credits required for the impacts of clearing on biodiversity values.

Proposed clearing may only be considered to improve or maintain environmental outcomes for biodiversity where the clearing site does not impact on an area of high biodiversity conservation value, and the impacts of clearing on biodiversity values are offset in accordance with the rules and requirements in Section 10.8 of this EOAM. The assessment pathway for assessing the biodiversity values of a clearing site and an offset site is shown in Figure 10.1.

Biodiversity assessments are to be undertaken by an accredited assessor (Level 2a).

Note:
Areas of high biodiversity conservation value are defined in Section 10.4.1.

Figure 10.1 Biodiversity values assessment process



10.2 Assessment and measurement of biodiversity values

This section describes how general biodiversity values are assessed and measured on land subject to clearing or a proposed offset.

General biodiversity values are assessed for the conservation significance of native vegetation types, condition and the landscape context and spatial configuration of native vegetation including connectivity and the extent of native vegetation cover on the clearing

site and offset site. The assessment of general biodiversity values involves measuring the loss of biodiversity values from the impact of clearing and measuring the gain in biodiversity values as a result of protection and management actions to improve biodiversity values on the offset site.

10.2.1 Assessing vegetation type and condition

Vegetation types are used as surrogates for general biodiversity values. A vegetation type is classified within a vegetation class, which in turn is classified within a vegetation formation. There are approximately 1600 vegetation types, 99 vegetation classes, and 12 vegetation formations in NSW.

The information on each vegetation type is contained within the Vegetation Types Database. This database is held by OEH and is publicly available on the OEH website. The Vegetation Types Database contains:

- a description of each vegetation type, its class and formation
- the CMA area within which the vegetation type occurs, and
- the percent cleared value of the vegetation type within each CMA area in which it occurs.

Any threatened ecological communities associated with a vegetation type are identified in the Threatened Species Profile Database.

Some of the vegetation types in the Vegetation Types Database are derived or secondary vegetation communities (that is, the vegetation types have been modified substantially since 1750). Derived vegetation types must only be selected where the original vegetation type cannot be determined. Where the original vegetation type cannot be determined, the derived vegetation must be assessed against the benchmark for the class of the most likely original vegetation type(s).

The Vegetation Benchmarks Database identifies the range of quantitative measures for the site attributes that represent the benchmark condition for the vegetation type. This database is held by OEH and is publicly available on the OEH website.

Vegetation benchmarks are quantitative measures that describe the range of variability in condition in vegetation with relatively little evidence of alteration, disturbance or modification by humans since European settlement (post 1750). Benchmarks are described for specified attributes by vegetation type or vegetation class. 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 animals or overabundant native herbivores, minimal soil disturbance, minimal canopy dieback, no evidence of recent fire or flood, is not subject to high frequency burning, and shows evidence of recruitment of native species.

Benchmark data that more accurately reflects the local environmental conditions for a vegetation type may be used in accordance with Section 2.8 (Minor variation and more appropriate local data). Benchmark data may be collected from local reference sites, or obtained from relevant published sources.

10.2.2 Identifying vegetation zones

Prior to assessment of impact from clearing at a clearing site, or management actions at an offset site, the site must be mapped into one or more vegetation zones, using digital aerial photography or a best available satellite image or aerial photograph of the site.

Vegetation zones are delineated by vegetation type and broad vegetation condition for the purpose of assessing the average Site Value (condition) of the vegetation.

Vegetation that is in low condition must always form a separate zone to vegetation that is not in low condition, including within the same vegetation type.

Areas of non-contiguous vegetation within a 1000-ha assessment circle can be combined into a single vegetation zone, where the vegetation is of the same vegetation type and broad condition at a clearing or offset site. Areas of the same vegetation type but in different condition above low condition are delineated as separate zones in order to stratify the site for field survey.

Where a clearing or offset site extends across one or more CMA subregions, the CMA subregion in which most of the proposal occurs must be used.

10.2.3 Assessment of Site Value

Site Value is the quantitative measure of structural and floristic condition of native vegetation and it is assessed for each vegetation zone. The Site Value of each vegetation zone is determined from the data collected from plot and transect surveys of native vegetation on a clearing site or offset site.

Ten site attributes that comprise Site Value are assessed against benchmark values as shown in Table 10.1, and assigned a score of 0, 1, 2 or 3 to determine the vegetation condition and the Site Value score. The Site Value score is calculated using Equation 10.1.

The same equation is used to determine the current Site Value score at a proposed clearing site or an offset site.

Equation 10.1 Determining the current Site Value score for a vegetation zone at the proposed clearing and proposed offset site

$$SV_c = \frac{\left(\sum_{v=a}^{j}\left(a_v w_v\right)+5\left(\left(a_a a_g\right)+\left(a_b a_i\right)+\left(a_h a_j\right)+\left(a_c a_k\right)\right)\right)\times 100}{c}$$

Where

SV_C is the current Site Value score of the vegetation zone

a_v is the attribute score for the vth site attribute (a–j) as defined in Table 10.1

a_k is equal to $(a_d + a_e + a_f)/3$, the average score for attributes d, e and f

w_v is the weighting for the vth site attribute (a–j) as defined in Table 10.1

c is the maximum score that can be obtained given the attributes a–j that occur in the vegetation type when in benchmark condition (the maximum score varies depending on which attributes occur in the vegetation type under assessment).

Note:

In the final calculation for an ecosystem credit (as per Equations 10.6, 10.7 and 10.9), it is proposed that the Site Value score is weighted by 0.7 to provide a score out of 70. The Landscape Value score is weighted by 0.6 to provide a score out of 30. This allows the overall score for that vegetation zone to be a score out of 100.

If the lower benchmark value for any site attribute is zero, and the measure of that attribute on the site is zero, then the score of that site attribute against the benchmark is 3. If the *only* benchmark value for any site attribute is zero, then the site attribute is not included in Equation 10.1 and the value of 'c' is scaled accordingly.

The multipliers for *native over-storey cover x proportion of over-storey species occurring as regeneration* and *number of trees with hollows x total length of fallen logs* may be omitted from Equation 10.1 (and 'c' is rescaled accordingly) for determining Site Value in vegetation zones that comprise vegetation types from the following vegetation formations: Grasslands, Heathlands, Alpine complex, Freshwater wetlands, Saline wetlands and Arid shrublands.

The assessment of the current Site Value score in Equation 10.1 may allow for permitted clearing activities under Division 2 or 3 of Part 3 of the *Native Vegetation Act 2003*.

Table 10.1 Scoring and weighting of the site attributes to determine the Site Value score

Site attribute		Site attribute score (see notes below)				Weighting for site attribute score
		0	1	2	3	
a)	Native plant species richness	0	>0 – <50% of benchmark	50 – <100% of benchmark	≥ benchmark	25
b)	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	10
c)	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	10
d)	Native groundcover (grasses)	0 – 10% or >200% of benchmark	>10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	within benchmark	2.5
e)	Native groundcover (shrubs)	0 – 10% or >200% of benchmark	>10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	within benchmark	2.5
f)	Native groundcover (other)	0 – 10% or >200% of benchmark	>10 – <50% or >150 – 200% of benchmark	50 – <100% or >100 – 150% of benchmark	within benchmark	2.5
g)	Exotic plant cover (calculated as percentage of total ground and mid-storey cover)	>66%	>33 – 66%	>5 – 33%	0 – 5%	5
h)	Number of trees with hollows	0 (unless benchmark includes 0)	>0 – <50% of benchmark	50 – <100% of benchmark	≥ benchmark	20
i)	Proportion of over-storey species occurring as regeneration	0	>0 – <50%	50 – <100%	100%	12.5
j)	Total length of fallen logs	0–10% of benchmark	>10 – <50% of benchmark	50 – <100% of benchmark	≥ benchmark	10

Note:

The term 'within benchmark' means a measurement that is within (and including) the range of measurement identified as the benchmark for that vegetation type. The term '< benchmark' means a measurement that is less than the minimum measurement in the benchmark range. The term '> benchmark' means a measurement that is greater than the maximum measurement in the benchmark range.

10.2.4 Change in Site Value with clearing

The change in Site Value with clearing measures the impact of clearing on Site Value (condition) at the clearing site.

Change in Site Value with clearing is determined from the difference between the current Site Value and the predicted Site Value following clearing in each vegetation zone on the clearing site using Equation 10.2.

Site Value following clearing is determined by predicting the impact of clearing on each site attribute according to the loss in the site attribute.

The change in Site Value score is the difference between the current Site Value score and the Site Value score following clearing.

Where there is variation in the impact of clearing on biodiversity values (e.g. partial clearing may take place in an area for an asset protection zone while total clearing may occur in other parts of the vegetation zone) a different level of impact may be determined for separate parts of a vegetation zone.

Equation 10.2 Calculating the change in Site Value score at the clearing site

$$\Delta S_{Loss} = S_{current} - S_{future}$$

Where:

ΔS_{Loss} is the change (loss) in the Site Value score of a vegetation zone at the clearing site

$S_{current}$ is the current Site Value score (SV_C), as determined by Equation 10.1

S_{future} is the predicted future Site Value score (after clearing), as determined by Equation 10.1

10.2.5 Change in Site Value with offset

The change in Site Value at the proposed offset site is based on the improvement in Site Value in the vegetation zones with implementation of the management actions listed in Section 10.7.3.

The change in Site Value score is calculated as the difference between the current Site Value score and the predicted future Site Value score. The future Site Value score is determined by increasing the current site attribute score by the predicted gain for that site attribute using Table 10.2 following management actions at the offset site.

An accredited assessor (Level 2a) may select a gain in a site attribute score higher or lower than the value shown in Table 10.2 in accordance with the specific management actions in the Property Vegetation Plan. Additional and/or more tailored management actions may be undertaken at an offset site to generate ecosystem credits and species credits. The additional management actions can be used to increase the site attribute scores (and hence biodiversity values) more that the site attribute scores shown in Table 10.2.

Equation 10.3 Change in Site Value score at the offset site

$\Delta S_{gain} = S_{future} - S_{current}$

Where:

ΔS_{gain} is the change (gain) in the Site Value score of a vegetation zone at the offset site

S_{future} is the predicted future Site Value score (with management actions), as determined by Equation 10.1

$S_{current}$ is the current Site Value score (SV_C), as determined by Equation 10.1.

Table 10.2 Predicted improvement in the site attribute score for each site attribute with management at the offset site

A higher or lower increase in the site attribute score can be used where the specific management actions warrant a higher or lower increase.

Site attribute		Increase in current site attribute score			
		0	1	2	3
a)	Native plant species richness	+0.5	+0.5	+ 1	No change
b)	Native over-storey cover	+1	+1	+1	No change
c)	Native mid-storey cover	+1	+1	+1	No change
d)	Native groundcover (grasses)	+1	+1	+1	No change
e)	Native groundcover (shrubs)	+1	+1	+1	No change
f)	Native groundcover (other)	+1	+1	+1	No change
g)	Exotic plant cover[1]	+0.5	+0.5	+1	No change
h)	Number of trees with hollows	0	+0.5	+1	No change
i)	Proportion of over-storey species occurring as regeneration	+0.5	+1	+1	No change
j)	Total length of fallen logs	0	+ 0.5	+1	No change

[1]Calculated as a percentage of total groundcover and mid-storey cover

10.2.6 Assessment of Landscape Value

Landscape Value encompasses fragmentation, connectivity and adjacency of native vegetation around the clearing and offset sites and the enhancement of an offset site by the inclusion of a riparian area. The accredited assessor (Level 2a) determines change in Landscape Value using the following variables:

- **Percent cover of native vegetation in the landscape:** This is current vegetation cover and predicted future vegetation cover in circles of radii of 1.79 km (1000 ha) and 0.55 km (100 ha) (with proposed clearing at the site and with proposed management actions at the offset site). Each circle is placed to encompass the maximum loss of native

vegetation cover (extent and condition) from clearing and the maximum gain in native vegetation cover (extent and condition) from the management actions. The clearing and offset sites may be within different circles.

Percent cover of native woody vegetation is assessed as a combination of extent and over-storey percent cover relative to benchmark cover for that vegetation type.

Percent cover of native non-woody vegetation is assessed as a combination of extent and percent cover of native groundcover relative to benchmark cover for those vegetation types. The scores for percent native vegetation cover are shown in Table 10.3.

- **Connectivity:** This assesses the change in connectivity of the vegetation in the area surrounding the clearing site or an offset site, taking into account the impacts of clearing and management actions. The loss in connectivity at a clearing site, and the gain in connectivity at an offset site, are determined according to changes to linkage width class (Table 10.4) and linkage condition class (Table 10.5 or Table 10.6), and scored according to the matrix in Table 10.7.
- **Total adjacent remnant area:** This is the total remnant area of which the clearing site is a part. It is recorded as extra large, very large, large, medium or small and scored as shown in Table 10.8.
- **Percentage within riparian area (offset site only):** Additional gains on the offset site are awarded if all or part of the offset site includes a riparian area. Riparian area is the combined zones A and B as defined in Tables 7.1, 7.2 and 7.3. The scores for percentage of the offset within riparian area are determined according to Table 10.9.

The relative weightings for each Landscape Value attribute are provided in Table 10.10.

Determining the percent native vegetation cover score

Benchmark equivalent cover of native vegetation is scored in 10% increments (deciles) within circles of 100 ha and 1000 ha as a combination of native vegetation extent and condition using Table 10.3. Judgement is applied when assessing the percent cover of native vegetation in the circles to determine vegetation condition from aerial imagery and qualitative field observations. Judgement is also used to score loss or gain in percent cover of native vegetation where the loss or gain in the percent cover moves up or down a decile and the overall loss or gain is less than 10%.

Note: Example

To illustrate the combined assessment of condition and extent to determine benchmark equivalent extent, an assessor measures that there is native vegetation remaining on 35 ha within a 100-ha circle. The 35 ha of vegetation is degraded and its over-storey cover is assessed as being 25% of the lower benchmark value for the vegetation type. Taking the condition of the vegetation into account, the assessor would score the benchmark equivalent extent as being in the >0–10% decile rather than the >30–40% decile as shown below.

Example: 35 ha x 0.25% of benchmark = 8.75 ha of benchmark equivalent extent.

Therefore there is 8.75 ha of benchmark equivalent extent of native vegetation in benchmark within the 100-ha circle. This 8.75 ha falls within the = >0–10% native vegetation cover decile as shown in Table 10.3.

Table 10.3 Details of scoring for percent cover of native vegetation within 1.79 km (1000 ha) and 0.55 km (100 ha) of site

Radius of circle around site	Percent native vegetation cover within circle	Score
1.79 km (1000 ha)	0	0
	>0 – 10	2.4
	>10 – 20	4.8
	>20 – 30	7.2
	>30 – 40	8.8
	>40 - 50	10.4
	>50 – 60	12.0
	>60 – 70	13.6
	>70 – 80	14.4
	>80 – 90	15.2
	>90 – 100	16
0.55 km (100 ha)	0	0
	>0 – 10	1.5
	>10 – 20	3.0
	>20 – 30	4.5
	>30 – 40	5.5
	>40 – 50	6.5
	>50 – 60	7.5
	>60 – 70	8.5
	>70 – 80	9.0
	>80 – 90	9.5
	>90 – 100	10.0

Determining the connectivity value score

The connectivity value score at a clearing site or an offset site is determined by assessing the impact of clearing or management actions on the average limiting width and average condition of a connecting link, taking into account all of the vegetation that forms the connecting link on and off the clearing or offset site.

A connecting link is vegetation in moderate to good condition which forms a link between adjacent patches of vegetation. A connecting link is defined as vegetation on the clearing site or the offset site being linked to adjacent vegetation, and the adjacent vegetation:

- is in moderate to good condition, and
- has a patch size >1 ha, and
- is not separated by either:
    a) a gap that is >100 m for woody vegetation or 30 m for non-woody vegetation, or
    b) a large water body, dual carriageway, wider highway or similar hostile link.

The clearing or the offset site may form part of a connecting link, or it may form an entire connecting link. A clearing site or an offset site may form, (or form part of) none, one, or

more than one connecting link. Where a clearing site or an offset site has more than one connecting link, the accredited assessor (Level 2a) must identify the primary connecting link. The primary connecting link is the connecting link which is used for the connectivity value score.

The primary connecting link is the connecting link which has the greatest loss in value resulting from clearing, or the greatest gain in value from management at the offset sites. The primary connecting link may be the same or a different connecting link for the clearing site and the offset site. If there is more than one connecting link for the clearing site or offset site, the connecting link with the highest connectivity value score is the primary connecting link.

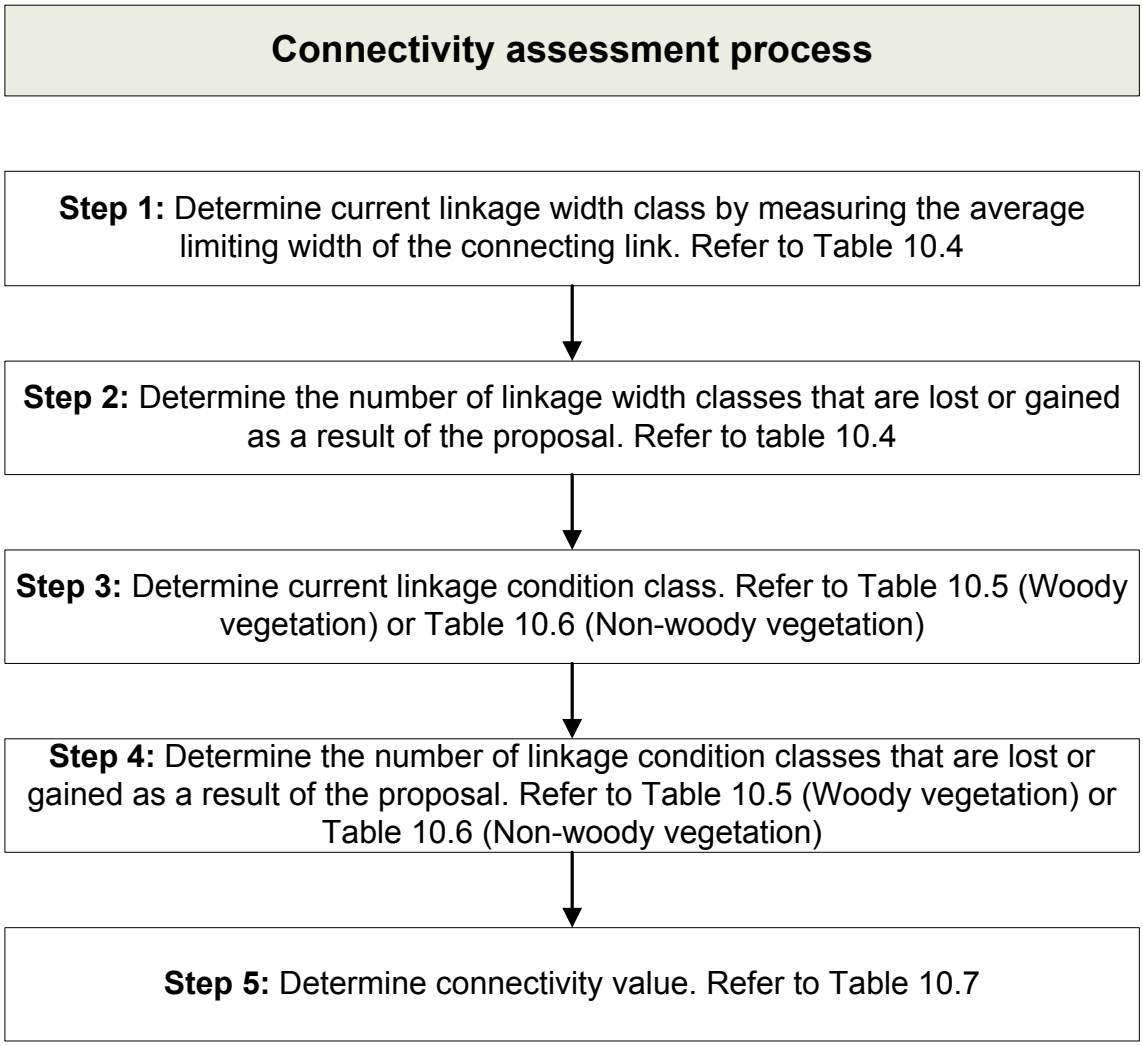
The scale at which a connecting link is assessed can vary depending on:

- the area of native vegetation on the proposed clearing site or the offset site
- the extent and condition of vegetation in the surrounding landscape
- the configuration of remnant vegetation in the surrounding landscape, and
- the context of a clearing or an offset site in relation to the vegetation in the surrounding landscape.

Generally the accredited assessor (Level 2a) must consider vegetation in the surrounding landscape at the scale of a 1000-ha circle to determine whether vegetation on a clearing site or offset site forms, or forms part of, a connecting link. A smaller or larger scale may be appropriate for determining the primary connecting link upon consideration of the above factors.

The connectivity value score at a clearing site and at an offset site is determined according to the five-step process set out below and shown in Figure 10.2.

Figure 10.2 Process to determine the connectivity value score



Step 1: Determine the current linkage width class at a proposed clearing site or an offset site

The **linkage width class** of a connecting link is determined by measuring the average limiting width of the connecting link, including vegetation on and off the clearing site or offset site.

The linkage width class considers the average limiting width of an area of the connecting link that extends for >100 m for woody vegetation types (or >30 m for non-woody vegetation). This area may be located on or off the clearing or offset site.

The linkage width classes are set out in Table 10.4.

Table 10.4 Linkage width classes

Linkage width classes (m)				
Very narrow	Narrow	Moderate	Wide	Very wide
0 – 5	>5 – 30	>30 – 100	>100 – 500	>500

Step 2: Determine the number of linkage width classes that are crossed – lost or gained

The accredited assessor (Level 2a) determines the linkage width class after accounting for the loss of vegetation resulting from clearing, or from increases in native vegetation resulting from management at the offset site.

The number of linkage width classes that are lost or gained can then be determined as follows:

0 = no change or change is within the linkage width class, i.e. does not cross a threshold between the classes

1 = crosses one linkage width threshold, i.e. changes from one linkage width class to the next one across one threshold

2 = crosses two linkage width thresholds, i.e. changes from one class to another class across two thresholds

3 = crosses three linkage width thresholds, i.e. changes from one class to another class across three thresholds

4 = crosses four linkage width thresholds, i.e. changes from one class to another class across four thresholds.

The number of linkage width classes that are crossed as a result of clearing native vegetation at a clearing site or as a result of management actions at an offset site is used in Step 5 to determine the connectivity value score for the connecting link.

Step 3: Determine the current linkage condition class

The **linkage condition class** is based on an estimate of the average condition of the over-storey vegetation and an estimate of the average condition of either the mid-storey or groundcover vegetation in the connecting link, including vegetation on and off the clearing site or offset site.

Mid-storey or groundcover is used according to which strata is the most appropriate for assessing connectivity for the vegetation types that form the connecting link.

For non-woody vegetation types, only the average condition of the groundcover is assessed.

The current linkage condition class for woody vegetation types is determined by assessing over-storey cover and mid-storey cover or groundcover according to the matrix in Table 10.5.

The current linkage condition class for non-woody vegetation types are determined according to Table 10.6.

Table 10.5 Linkage condition classes for woody vegetation

		Over-storey condition				
		No native over-storey or exotic vegetation with similar structure to the proposal	**<25% lower end benchmark or exotic vegetation with similar structure to the proposal**	**% foliage cover >25% of lower benchmark to lower benchmark**	**% foliage cover within benchmark**	
Mid-storey or groundcover condition	**No mid-storey or groundcover or exotic vegetation with similar structure to the proposal**	0	0.5	1	1.5	**Linkage condition class**
	% foliage cover of mid-storey or groundcover <25% lower end benchmark or exotic vegetation with similar structure to the proposal	0.5	1	1.5	2	
	% foliage cover of mid-storey or groundcover >25% of lower benchmark to benchmark	1	1.5	2	2.5	
	% foliage cover of mid-storey or groundcover within benchmark	1.5	2	2.5	3	

Table 10.6 Linkage condition classes for non-woody vegetation

Linkage condition class	Vegetation condition
0	Meets none of the above definitions
1	• % foliage cover <25% lower benchmark in native grassland, herbfield or wetland (herbaceous vegetation), or • exotic vegetation with similar structure to the proposal
2	% foliage cover >25% of lower benchmark to lower benchmark in native grassland, herbfield or wetland (herbaceous vegetation)
3	% foliage cover is within benchmark in native grassland, herbfield or wetland (herbaceous vegetation)

Step 4: Determine the number of linkage condition classes that are crossed – lost or gained

At the clearing site, the accredited assessor (Level 2a) determines the linkage condition class of the connecting link by accounting for the impacts of the clearing on the average condition of the over-storey vegetation and the average condition of the mid-storey or groundcover across the connecting link (including vegetation on and off the clearing site) using Table 10.5 for woody vegetation or Table 10.6 for non-woody vegetation. Only groundcover vegetation is assessed for non-woody vegetation.

The number of linkage condition class thresholds that are crossed as a result of the impacts of clearing is used in Step 5 to determine the connectivity value score for that connecting link.

At the offset site, the accredited assessor (Level 2a) determines the linkage condition class of the connecting link by accounting for the predicted improvement from the management actions on the average condition of the over-storey vegetation and the average condition of the mid-storey or groundcover across the connecting link, including vegetation on and off the offset site, using Table 10.5 for woody vegetation or Table 10.6 for non-woody vegetation. Only groundcover vegetation is assessed for non-woody vegetation.

The number of linkage condition class thresholds that are crossed as a result of the management actions at the offset site is used in Step 5 to determine the connectivity value score for that connecting link.

The number of linkage condition class thresholds that are crossed at a clearing site or an offset site are scored as:

0 = no change or change is within the same linkage condition class

1 = crosses one linkage condition threshold, i.e. changes from one connectivity condition class to the next one across one threshold

2 = crosses two linkage condition thresholds, i.e. changes from one class to another class across two thresholds

3 = crosses three linkage condition thresholds, i.e. changes from one class to another class across three thresholds

The number of linkage condition thresholds can include half points where the linkage condition class crosses to another threshold for only one stratum, as shown in Table 10.5.

Step 5: Determine the connectivity value score

The connectivity value score for each connecting link assessed is calculated in Table 10.7 by using both the number of linkage width classes crossed as determined in Step 2, and the number of linkage condition classes that are crossed as determined at Step 4. The scores shown in Table 10.7 show the number of linkage width and condition thresholds that are crossed.

If more than one connecting link is assessed for the clearing or offset site, the connecting link with the highest connectivity values score is the primary connecting link.

The connectivity value score of the primary connecting link is used to determine the change in Landscape Value score at a clearing site and at an offset site in accordance with Equation 10.4 and Equation 10.5. The primary connecting link for the clearing site and the offset site may be the same or different connecting links.

Table 10.7 Scores for loss/gain of linkage condition/width based on number of thresholds crossed

		Number of linkage width thresholds crossed			
		0	**1**	**2**	**3 or 4**
Number of linkage condition thresholds crossed	**0**	0	2	4	6
	0.5	1	3	5	7
	1	2	4	6	8
	1.5	3	5	7	9
	2	4	6	8	10
	2.5	5	7	9	11
	3	6	8	10	12

Determining the adjacent remnant area score

Adjacent remnant area is the area (ha) of native vegetation that is not in low condition and is linked (≤100 m for woody vegetation and ≤30 m for non-woody vegetation) to the clearing or offset site. The adjacent remnant area score is determined according to the criteria in Table 10.8.

Table 10.8 Criteria for assessing adjacent remnant area

Adjacent remnant area class	**Percent native vegetation cleared in the Mitchell landscape in which most of the proposal occurs***				**Adjacent remnant area (value d)**
	<30%	**30–70%**	**>70–90%**	**>90%**	
Extra large	>1000 ha	>200 ha	>100 ha	>50 ha	12
Very large	>500 – 1000 ha	>100 – 200 ha	>50 – 100 ha	>20 – 50 ha	9
Large	>200 – 500 ha	>50 – 100 ha	>20 – 50 ha	>10 – 20 ha	6
Medium	>100 – 200 ha	>20 – 50 ha	>10 – 20 ha	>1 – 10 ha	3
Small	≤100 ha	≤20 ha	≤10 ha	≤1 ha	0

*Mitchell landscapes percent cleared data is held in the Overcleared Landscapes Database.

Determining the percent of offset site within riparian area score

Riparian land often supports a greater diversity of native flora and fauna than non-riparian land. Riparian land is often an important drought refuge and it can provide an important connectivity function in the landscape. The inclusion of riparian land can enhance the biodiversity value of the offset site.

The percent within riparian area assesses the proportion of the offset site in a riparian area. Riparian area is the combined zones A and B as defined in Tables 7.1, 7.2 and 7.3. The score for the percent of offset site within a riparian area is in Table 10.9 below.

Table 10.9 Scoring percentage of offset site in riparian area (zone distances as defined in Tables 7.1, 7.2 and 7.3)

Percent of offset site within a riparian area	<1%	1 – 10%	>10 – 25%	>25%
Score	0 points	3 points	6 points	9 points

10.2.7 Change in Landscape Value with clearing

Change in Landscape Value with clearing is calculated as the difference between current Landscape Value and Landscape Value with clearing. Landscape Value at the clearing site encompasses fragmentation, connectivity and adjacency of native vegetation around the clearing site.

The change in Landscape Value at the clearing site is determined using Equation 10.4.

Equation 10.4 Change in Landscape Value at the clearing site

$$\Delta \text{ Landscape Value }_{\text{Clearingsite}} = \left(\sum_{v=a}^{d}\left(s_v w_v\right)\right)_{Current} - \left(\sum_{v=a}^{c}\left(s_v w_v\right)\right)_{With\ \ proposed\ \ clearing}$$

Where:

s_v is the score for the vth variable (a–d) as defined below

w_v is the weighting for the vth variable as defined in Table 10.10

a = percent native vegetation cover within a 1.79 km radius of the site (1000 ha)

b = percent native vegetation cover within a 0.55 km radius of the site (100 ha)

c = connectivity value

d = total adjacent remnant area

Note:

In the final calculation for an ecosystem credit (as per Equations 10.6, 10.7 and 10.9), it is proposed that the Landscape Value score is weighted by 0.6 to provide a score out of 30 and the Site Value score is weighted by 0.7 to provide a score out of 70. This allows the overall score for that vegetation zone to be a score out of 100.

Table 10.10 Weightings and maximum scores of Landscape Value attributes

Landscape Value attribute	Clearing site		Offset site	
	Weighting	Maximum score	Weighting	Maximum score
Percent native vegetation cover within a 1.79 km radius of the site (1000 ha)	1	16	0.625	10
Percent native vegetation cover within a 0.55 km radius of the site (100 ha)	1	10	1	10
Connectivity value	1	12	0.75	9
Total adjacent remnant area	1	12	1	12
Percent of offset site within riparian area	N/A	N/A	1	9

The scores calculated from Tables 10.3, 10.7, 10.8 and 10.9 are weighted to provide the final scores for the Landscape Value attributes in Equations 10.4 and 10.5, with maximum scores for the attributes shown in Table 10.10.

10.2.8 Change in Landscape Value with offset

Change in Landscape Value for an offset site is calculated as the difference between the current Landscape Value and future Landscape Value at the offset site following implementation of the management actions. Landscape Value at the offset site encompasses fragmentation, connectivity, adjacency of native vegetation cover with proposed management actions, percentage within riparian area and any contributions from additional Site Value.

The change in Landscape Value with management actions at the offset site is determined using Equation 10.5.

Equation 10.5 Change in Landscape Value at the offset site

$$\Delta \text{ Landscape Value }_{\text{Offset site}} = \left(\sum_{v=a}^{e}\left(s_v w_v\right)\right)_{\textit{With proposed management actions}} - \left(\sum_{v=a}^{c}\left(s_v w_v\right)\right)_{\textit{Current}}$$

Where:

s_v is the score for the vth variable (a–e) as defined below

w_v is the weighting for the vth variable as defined in Table 10.10

a = percent native vegetation cover within a 1.79 km radius of the site (1000 ha)

b = percent native vegetation cover within a 0.55 km radius of the site (100 ha)

c = connectivity value

d = total adjacent remnant area

e = percent within riparian area

10.3 Assessment and measurement of threatened species

This section sets out how biodiversity values of threatened species are assessed and measured at a clearing site and an offset site. It also sets out habitat assessment requirements for threatened species and defines the process for identifying which threatened species require ecosystem credits and which require species credits.

10.3.1 Threatened Species Profile Database

Threatened species are assessed using data extracted from the Threatened Species Profile Database from time to time. This database is held by OEH, and is publicly available on the OEH website.

The components of the Threatened Species Profile Database that are used to assess threatened species for ecosystem credits and species credits are:

- description of each threatened species, its habitat, ecology and threats, including the threatened species profile
- description of the habitat components for each species and population
- breeding, foraging or roosting habitat information contained in the profile for the threatened species
- CMA subregions within which the distribution of each species is associated (the distribution of a species is not associated with a CMA subregion if the species is identified by the database as being vagrant in that subregion)
- vegetation types with which each species is associated
- the percent native vegetation cover class (surrounding vegetation cover) with which the species is associated (used as an initial filter to identify species for assessment)
- minimum adjacent remnant area with which the species is associated (used as an initial filter to identify species for assessment)
- the minimum vegetation condition with which the species is associated (being paddock trees, low condition vegetation or moderate to good condition vegetation) (used as an initial filter to identify species for assessment)
- for each threatened species that is likely to occupy paddock trees, the specified number or area of equivalent habitat trees that must be managed at an offset site
- the management actions relevant for each species
- the ability of a species to respond to improvement in Site Value or other habitat improvement at an offset site due to the management actions (the T_G value)
- the class of credit (ecosystem or species) required for the species, and
- any specific habitat features associated with the occurrence of the species.

The additional components of the Threatened Species Profile Database that are used in the assessment of species credit species are:

- any geographic characteristics associated with the occurrence of the species
- threatened species which cannot withstand further loss
- the unit of measurement of impact to be applied for the species (either the number of individuals or area of habitat), and

- the months of the year that the species is identifiable.

The Threatened Species Profile Database has two different sets of habitat characteristics for some threatened species. In these instances, the methodology applies different assessment approaches to different components of the habitat for the same species. For example, the database may identify that the characteristics of breeding habitat for a cave roosting bat as different to the foraging habitat for the same species. The breeding habitat could be identified as an area of high biodiversity conservation value but the foraging habitat is not such an area.

An accredited expert may certify, in accordance with Section 2.8.2, that more appropriate local data can be used instead of data in the Threatened Species Profile Database if the local data more accurately reflects the local environmental conditions of the clearing site or offset site.

10.3.2 Species that can be predicted by habitat surrogates (ecosystem species)

Species that can be predicted to be present on the clearing site or offset site from habitat surrogates are identified by the Threatened Species Profiles Database as species that are assessed for ecosystem credits (ecosystem credit species). Ecosystem credit species are assessed in conjunction with general biodiversity values.

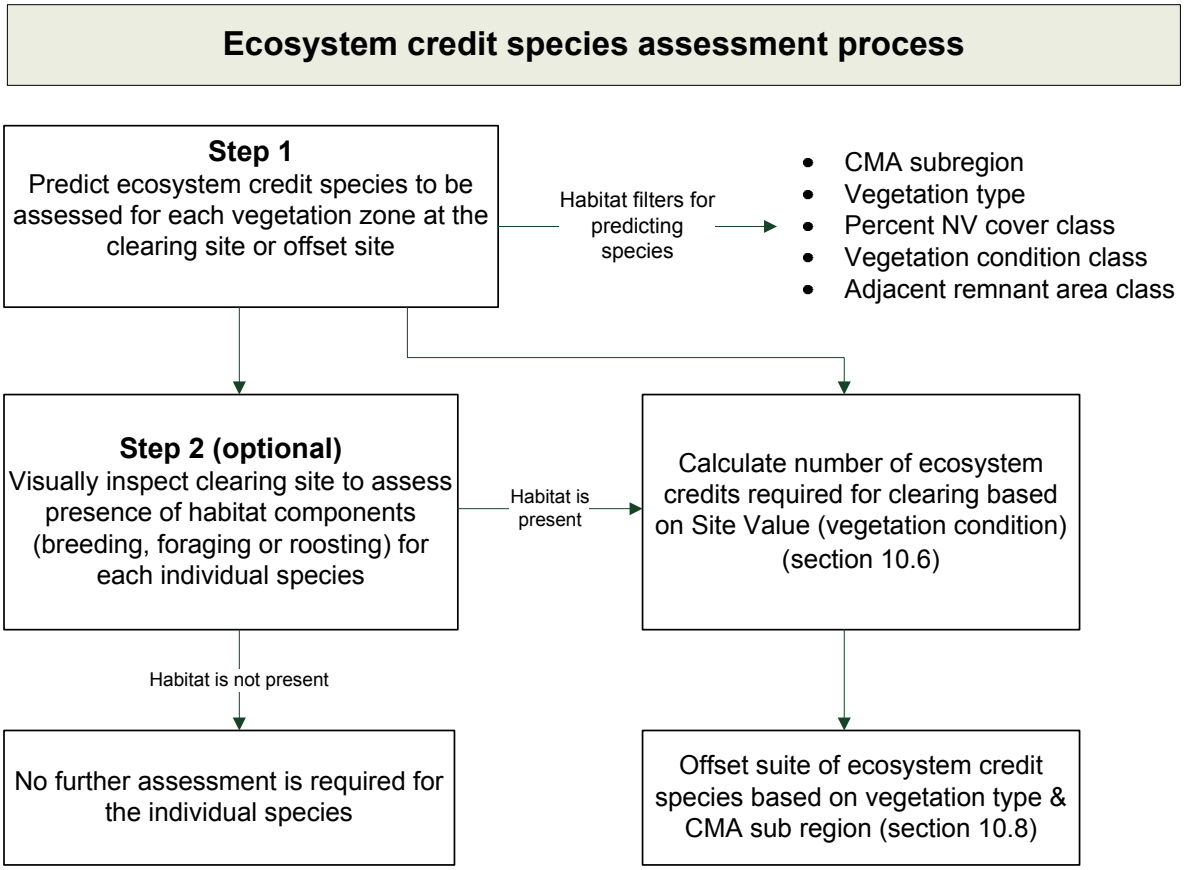
A visual assessment of the clearing site or offset site is not required to assess ecosystem credit species as they are predicted to occur on a clearing or offset site based on habitat surrogates.

The likely impacts on these species from clearing on a clearing site and the likely benefit from management actions undertaken at an offset site are measured by the change in Site Value that result from the clearing or management actions and by the area of land that is impacted by the clearing or is to be managed on the offset site.

Threatened species are identified for assessment for ecosystem credits at a clearing site or an offset according to Step 1 below. An additional step (Step 2) may be carried out on the clearing site where an accredited assessor (Level 2a) considers that the species is/are unlikely to occur at the proposed clearing site because of the lack of habitat components required for that species.

The assessment pathway for assessing threatened species that require ecosystem credits is shown in Figure 10.3.

Figure 10.3 – Method for assessing threatened species that require ecosystem credits



Step 1: Identify the threatened species that are to be assessed for ecosystem credits on the clearing or offset site

A threatened species is predicted as likely to occur on the proposed clearing site or proposed offset site if all of the following five criteria are met:

a) the distribution of the species includes the CMA subregion in which the clearing or offset site is located

b) the species is associated with the vegetation type of the vegetation zone on the clearing or offset site

c) the percent native vegetation cover class within the 1000-ha assessment circle is equal to or greater than the minimum class specified as being required for that species. The percent native vegetation cover class required for a species is either: <10%, 11–30%, 31–70% or >70% cover

d) the condition of any vegetation within the clearing or offset site is equal to or greater than the minimum condition required for that species; the minimum condition required for a species is either: paddock trees, low condition or moderate to good condition

e) the adjacent remnant area at the clearing or offset site is equal to or greater than the minimum specified for that species; the minimum adjacent remnant area required for a species is either: <5 ha, >5–25 ha, >25–100 ha or >100 ha.

The criteria a) – e) are applied as filters to each vegetation zone at the clearing or offset site to predict the threatened species for that vegetation zone.

If any one of these criteria is not met for a particular species, then no further assessment is required for that species at the clearing site under Section 10.3.2.

Threatened species that are identified in Step 1 are required to be assessed for ecosystem credits in accordance with Section 10.6.2, except where an assessment using Step 2 below determines that none of the habitat components (breeding, foraging or roosting habitat) of the predicted species are present on the proposed clearing site.

Step 2: Assess the habitat components of the vegetation zone at a proposed clearing site (optional)

The accredited assessor (Level 2a) may undertake an optional assessment of the habitat components (for breeding, foraging or roosting habitat) to refine the list of species predicted for the vegetation zone. This option is available where the criteria in Step 1 have predicted threatened species but an accredited assessor (Level 2a) considers that the species is/are unlikely to occur at the proposed clearing site because of the lack of habitat components required for that species.

The accredited assessor (Level 2a) assesses whether the habitat components (for one or more of breeding, foraging or roosting habitat) of threatened species that are predicted for a vegetation zone using the criteria in Step 1, are present on the proposed clearing site.

Where one or more of the habitat components (breeding, foraging or roosting habitat) for the predicted species is/are found to be present on the proposed clearing site, that species is then assessed for ecosystem credits in accordance with Section 10.6.

Where none of the habitat components (breeding, foraging or roosting habitat) of the predicted species are present on the proposed clearing site, no further assessment is required for the species. As part of the clearing assessment, the accredited assessor (Level 2a) is to include the reasons for the species not being present on the clearing site (i.e. lack of habitat components) in the assessment report or the certified decision support tool.

Where an assessment of habitat components on a proposed clearing site is not made for a species, that species is then assessed in accordance with Section 10.6.2.

An assessment of whether the habitat components (breeding, foraging or roosting habitat) is/are present on the proposed clearing site is undertaken using the habitat information in the Threatened Species Profile Database, including the written profiles for the relevant species.

The profiles for threatened species are part of the Threatened Species Profile Database and they contain information on the habitat and ecology of each threatened species including references to scientific literature. Further guidance on the assessment of the habitat components for species that require ecosystem credits may be provided in this literature or in the *Operational Manual*.

10.3.3 Assessment of threatened species for species credits

Threatened species that cannot reliably be predicted to occur on a clearing site or an offset site by vegetation (type and condition), distribution and/or habitat criteria are identified by the Threatened Species Profile Database as species that are to be assessed for species credits (species credit species). Species credit requirements can also apply to particular habitat components for ecosystem credit species, for example the breeding habitat of a cave roosting bat.

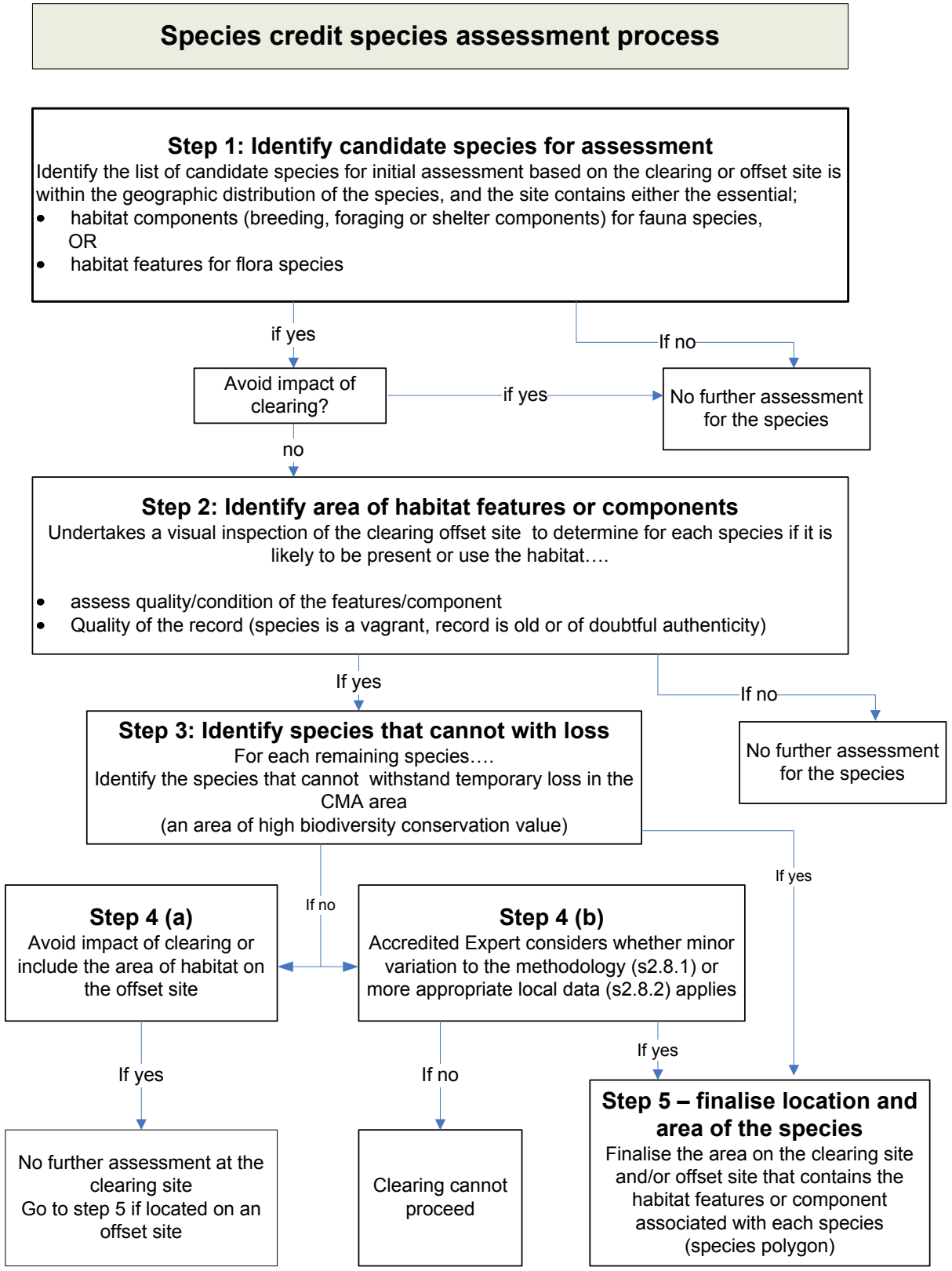
Generally flora species are assessed as species credit species. At the discretion of an accredited expert, cryptic flora (defined as flora that require seasonal survey) may be

considered to be ecosystem credit species where the clearing site and offset site are within a 5 km radius of each other and the offset site supports similar habitat types (e.g. same vegetation type and condition, same soils types, same landform, same geology) as present on the clearing site.

Species that require species credits are assessed within a species polygon. A species polygon is an area of land comprising the area of habitat for a threatened species or the location of threatened flora species in a proposed clearing site or an offset site.

Species that require species credits to offset the impacts of proposed clearing, or that generate species credits at a proposed offset site, are identified and assessed in accordance with the five steps below and shown in Figure 10.4.

Figure 10.4 Method for assessing species credit species



Step 1: Identify candidate species for initial assessment

A list of candidate threatened flora or fauna (species credit species) known or likely to occur on a proposed clearing site or offset site is developed, using data from the Threatened Species Profile Database.

Candidate species for initial assessment are those threatened species that are required by the Threatened Species Profile Database to be assessed for species credits because the following two criteria are met:

a) the distribution of the species includes the CMA subregion in which the clearing or offset site is located, and

b) the species is associated with the vegetation type of the vegetation zone on the clearing or offset site.

Species that are indicated as being present based on past surveys or ecological reports can be added to the list of candidate species if they have not been filtered in based on the above criteria.

All species identified in Step 1 are assessed under Step 2.

Step 2: Identify the area of the habitat component or habitat features

Each species on the list of candidate species established at Step 1 in Section 10.3.3 is assessed to determine whether the habitat component or feature is likely or unlikely to support the presence of the species at a proposed clearing site or an offset site.

Species on the list of candidate species can be removed from requiring further assessment at a proposed clearing or offset site if an accredited assessor (Level 2a) is satisfied that one or more of the following apply:

a) the clearing or offset site does not contain any specified geographic attributes that are associated with the species according to the Threatened Species Profile Database

b) the proposed clearing site or offset site does not contain the habitat features or components associated with the species, as identified in the Threatened Species Profile Database

c) assessment of the habitat component or habitat feature determines that the habitat component or feature is of poor quality for the particular species, such that the species is unlikely to be present or utilise the proposed clearing site

d) the Threatened Species Profile Database indicates that a particular flora species is not identifiable at the time of the assessment, and the proposed clearing will not impact on the likely location of the flora species if it were present

e) the species is only predicted (rather than known) to occur in the CMA subregion where the clearing site occurs according to the Threatened Species Profile Database

f) the species is a vagrant species in the CMA subregion and unlikely to utilise habitat on the clearing site, or

g) the records of the species presence in relation to the clearing site are old (usually two decades or more) or have doubtful authenticity.

A visual inspection of the proposed clearing site or offset site must be undertaken to determine the area of the habitat component or habitat features and assess the condition of the habitat components (breeding, foraging and roosting) for fauna species and habitat

features for flora species. For flora species, the visual inspection must be undertaken at a time specified for that species by the Threatened Species Profile Database.

Where a species is removed from further assessment on the basis of criteria c) – g) above the accredited assessor (Level 2a) must provide the reasons why the species is removed from the list of candidate species in the assessment report or the certified decision support tool.

If the species is not excluded on the basis of any of the above criteria a) – g) above then further assessment of the species is required in accordance with Step 3.

Step 3: Identify the threatened species which cannot withstand further loss

For each species credit species that occurs at the proposed clearing site, the accredited assessor (Level 2a) is to identify the species that cannot withstand further loss in the CMA area as identified in the Threatened Species Profile Database.

All species identified on site that cannot withstand further loss in the CMA area and are present on the proposed clearing site are in an area of high biodiversity conservation value and are required to be assessed in Step 4.

If the species is considered as being able to withstand further loss as identified in the Threatened Species Profile Database, and is considered as likely to occur at the proposed clearing site, the species is then assessed in accordance with Step 5.

Step 4: Assess threatened species that cannot withstand loss

Where a species credit species that cannot withstand loss is assessed to be on a proposed clearing site, the clearing proposal will not improve or maintain environmental values for biodiversity unless:

a) the area of the proposed clearing site is amended so that the proposed clearing will not impact on the habitat feature or component, or the habitat feature or component is to be contained in an offset area, or

b) an accredited expert is of the opinion that the use of more appropriate local data in accordance with Section 2.8.2, or special provisions for minor variation in accordance with Section 2.8.1 and Section 2.8.5 would result in a determination that the proposed clearing will improve or maintain environmental outcomes.

If criterion a) applies, then no further assessment of the species is required at the proposed clearing site.

Step 5: Finalise boundary of the species polygon

The accredited assessor (Level 2a) is required to map a species polygon onto an aerial image or best available ortho-rectified aerial image for each threatened species on the proposed clearing site or offset site.

The species polygon must include the location or extent of the species and contain the specific habitat component or habitat features associated with that species on the site.

The species polygon is attributed with a unit of measurement of impact that is used to determine the number of species credits that are required for the species. The Threatened Species Profile Database identifies which unit of measurement of impact is applicable to a species. For fauna species, the unit of measurement is the area (ha) of habitat impacted. For flora species, the unit of measurement is generally the number of individuals.

The *Operational Manual* may include guidelines that assist in determining the number of flora species, or the number of individual plants of a species where the species is abundant or the site is large.

The number of species credits required for a species polygon at a clearing site is calculated in accordance with Section 10.6.4. The number of species credits generated for a species polygon on an offset site is calculated in accordance with Section 10.7.2.

The species polygon is also used to create the credit profile for the species credits in accordance with Section 10.8.

10.4 Improve or maintain environmental outcomes for biodiversity

The clearing of native vegetation is to be regarded as improving or maintaining environmental outcomes for biodiversity where:

A. i) the clearing does not directly impact on biodiversity values in an area of high biodiversity conservation value

or

ii) the clearing does directly impact on an area of high biodiversity conservation value but an accredited expert is of the opinion that the clearing may be regarded as improving or maintaining the environmental outcomes for biodiversity in accordance with Section 10.5

AND

B. i) the impacts of the clearing are offset in accordance with the rules and requirements set out in Section 10.8.

or

ii) the impacts of the proposed clearing cannot be offset in accordance with Section 10.8 but an accredited expert determines that a minor variation to the methodology in accordance with Section 2.8.1 would result in the impacts of the clearing being offset.

10.4.1 Definition of an area of high biodiversity conservation value

An area of land is regarded as an area of high biodiversity conservation value if it contains one of more of the following:

1. a vegetation type that is greater than 70% cleared as listed in the Vegetation Types Database (that is, has less than or equal to 30% of its estimated distribution remaining in the CMA area before the year 1750) and the vegetation is not in low condition as defined below
2. a critically endangered or endangered ecological community listed under the TSC Act or EPBC Act, and the vegetation is not in low condition as defined below, or
3. any threatened species identified in the Threatened Species Profile Database that cannot withstand further loss in the CMA area because of one or both of the following:
    - the species is naturally very rare, is critically endangered, has few populations or a restricted distribution, or
    - the species or its habitat needs are poorly known.

10.4.2 Determining whether vegetation is in low condition

Vegetation in low condition means:

1. woody native vegetation with native over-storey percent foliage cover less than 25% of the lower value of the over-storey percent foliage cover benchmark for that vegetation type, and:
    - less than 50% of groundcover vegetation is indigenous species, or
    - greater than 90% of groundcover vegetation is cleared

OR

2. native grassland, wetland or herbfield where either:
    - less than 50% of groundcover vegetation is indigenous species, or
    - more than 90% of groundcover vegetation is cleared

OR

3. native vegetation with a Site Value score of 34 or lower as determined by Equation 10.1 in Section 10.2.3.

If native vegetation is not in low condition, it is in moderate to good condition.

For the purposes of determining whether vegetation is in low condition, vegetation types are assessed as native woody vegetation if the tallest structural layer is one metre or greater in height. In this case, the tallest structural layer is assessed as over-storey, and both over-storey and groundcover are assessed to determine whether the vegetation is in low condition.

Where all structural layers are less than one metre in height, the vegetation type is assessed as native grassland, wetland or herbfield vegetation. For vegetation types where the upper stratum is less than one metre in height, all strata are assessed as groundcover vegetation.

10.5 Determining that an impact on an area of high biodiversity conservation value may be offset

In determining that an impact on an area of high biodiversity conservation value may be offset, the accredited expert must be satisfied in regard to all of the following circumstances in order to determine that the proposed clearing will improve or maintain environmental outcomes:

- the contribution to regional biodiversity values must be low (Section 10.5.1), and
- viability must be low or not viable (Section 10.5.2).

If an area of high biodiversity conservation value is a vegetation type from the Grasslands or Arid Shrublands formation, or it is a secondary grassland, the accredited expert must be satisfied that the vegetation has low conservation value (Section 10.5.1) in order to determine that the proposed clearing will improve or maintain environmental outcomes.

10.5.1 Contribution to regional biodiversity values must be low

The accredited expert must be satisfied that an area of high biodiversity conservation value on land proposed for clearing makes a low contribution to regional biodiversity values.

In making an assessment that the contribution of an area of high biodiversity conservation value to regional biodiversity values is low, the accredited expert must consider the following factors for each vegetation type, critically endangered or endangered ecological community or threatened species habitat regarded as an area of high biodiversity conservation value:

1. **Relative abundance**: Whether the vegetation which comprises the area of high biodiversity conservation value at the clearing site is relatively abundant in the region

> **Note:**
>
> 'Relatively abundant in the region' may range from one or more thousands of hectares in coastal regions, up to tens of thousands of hectares or greater for some inland regions.

2. **Percent remaining is high**: Whether the percent remaining of the vegetation which comprises the area of high biodiversity conservation value at the clearing site is relatively high in the region

> **Note:**
>
> 'Relatively high' means relatively high in the region compared with the percent remaining of the vegetation type for the CMA area where the area of high biodiversity conservation value is located.

3. **Percent native vegetation (by area) remaining is high**: Whether the percent remaining of native vegetation cover in the region is relatively high

> **Note:**
>
> 'Relatively high' means relatively high in the region compared with the percent native vegetation cover for the CMA area where the area of high biodiversity conservation value is located

4. **Condition of the vegetation type**: Whether the vegetation which comprises the area of high biodiversity conservation value is generally in moderate to good condition in the region, and

5. **Low conservation significance** (**Grassland or Arid Shrubland formations, or secondary grassland only)**: whether the vegetation that comprises the area of high biodiversity conservation value has a floristic value score of less than 4, according to the method set out in the Appendix to Chapter 10. A site that has a score less than 4 has a low contribution to regional biodiversity values.

'Region' is defined as the CMA subregion in which the area of high biodiversity conservation value is located, and any of the adjoining CMA subregions.

10.5.2 Viability must be low or not viable

The accredited expert must be satisfied that the viability of biodiversity values in an area of high biodiversity conservation value must be low or not viable. 'Viability' is defined as the ability of biodiversity values at a site to persist for many generations or long time periods. The ecological viability of an area of high biodiversity conservation value and its biodiversity values depend on its condition, the area of the patch and its isolation, its current or proposed

tenure, the surrounding land use, and whether mechanisms are available to manage low-viability sites such that their viability is improved over time.

In making an assessment that the biodiversity values of an area of high biodiversity conservation value are low or not viable, the accredited expert must be satisfied that one or more of the following factors apply:

1. The current or known future land uses surrounding the vegetation **which comprises the area of high biodiversity conservation value** reduce its viability or make it unviable. Relatively small areas of native vegetation (e.g. patches of a few hectares or less) surrounded or largely surrounded by intense land uses, such as urban development, can be unviable or have low viability because of disturbances from urbanisation, including edge effects.
2. The size and connectedness (with other native vegetation) of the vegetation **which comprises the area of high biodiversity conservation value** is insufficient to maintain its viability. Relatively small areas of isolated native vegetation (e.g. patches of a few hectares or less that are more than several hundred metres from another patch of native vegetation) can be unviable or have low viability.
3. The condition of native vegetation **which comprises the area of high biodiversity conservation value** is substantially degraded, resulting in loss of or reduced viability. Native vegetation in degraded condition can be unviable or have low viability. 'Degraded condition' means substantially outside benchmark for the majority of vegetation condition variables as listed in Table 10.1 but the vegetation does not meet the definition of low condition in Section 10.4.2. Vegetation that is substantially outside benchmark due to a recent disturbance such as a fire, flood or prolonged drought is not considered degraded.

10.6 Calculating ecosystem credits and species credits at a clearing site

This section provides the rules for calculating the number of ecosystem credits and species credits that are required to offset the loss of biodiversity values on a clearing site where the land to be cleared has been assessed for:

- ecosystem credits under Section 10.2 and Section 10.3.2, and/or
- species credits under Section 10.3.3.

10.6.1 Ecosystem credits and species credits

Ecosystem credits and species credits are required to offset the impacts of clearing on biodiversity values.

Ecosystem credits and species credits are also created in respect of the management actions that improve the biodiversity values at an offset site.

Ecosystem credits and species credits that are generated from management actions at an offset site assessed under the *Native Vegetation Act 2003* cannot be retired in compliance with a biobanking statement under Part 7A of the TSC Act.

Note:

Any excess ecosystem credits and species credits that are generated from management actions at an offset site on a landholding may also be used to offset the impacts of clearing

that is approved on other landholdings, where those ecosystem credits and species credits are consistent with the credit profile and offset rules in Section 10.8.

The acquisition and retirement of biodiversity credits from the biodiversity register established under Part 7A of the TSC Act may be used to offset the impacts of clearing assessed under the *Native Vegetation Act 2003*.

Note to reader:

The TSC Act will require amendments to permit the use of biodiversity credits created under the NSW Biodiversity Banking and Offsets Scheme to offset the impacts of clearing under the *Native Vegetation Act 2003*. However, this provision has been included here for public exhibition to invite comments and feedback from the community in relation to this provision.

10.6.2 Calculating ecosystem credits for clearing where threatened species are predicted

Ecosystem credits for threatened species must be calculated if a threatened species that requires ecosystem credits is predicted to use land in a vegetation zone on a clearing site as determined under Section 10.3.2.

The number of ecosystem credits required for threatened species is weighted by the species offset multiplier which is based on the ability of the species to respond to improvement in Site Value with management actions at an offset site (referred to as the T_G value for the species). A T_G value is a figure between 0 and 1 and it is assigned to each threatened species in the Threatened Species Profiles Database.

The number of ecosystem credits for the zone is calculated in accordance with Equation 10.6. The loss in Site Value is weighted by 0.7 and the loss in Landscape Value score is weighted by 0.6 on the clearing site.

The number of credits required is rounded to the nearest whole number using conventional rounding rules, except if the number being rounded is less than one, in which case the number of credits is rounded up to one.

Equation 10.6 Ecosystem credits at the clearing site by zone

$$\text{Ecosystem credits required for a vegetation zone at a clearing site} = \left(\left\{ (\Delta S_{Loss} \times 0.7) + (\%\Delta LV_{loss} \times 0.6) \right\} \times \frac{1}{T_{G\ spp\ 1}} \times A \right)$$

Where:

ΔS_{Loss} is the change (loss) in the Site Value score of a vegetation zone at the clearing site as determined by Equation 10.2 and weighted by 0.7

ΔLV_{loss} is the proportion of the total Landscape Value change (loss) score for the clearing site as determined by Equation 10.4, apportioned to the vegetation zone and weighted by 0.6

$1/T_{G\ spp1}$ is the species offset multiplier. It is based on the ability of a species to respond to improvement in Site Value with management actions at a biobank site. $T_{G\ spp1}$ is identified for each species in the Threatened Species Profile Database and has values

between 0.1 and 1. Species1 is the species which requires the greatest number of ecosystem credits

A is the area in hectares of the vegetation zone.

Note to reader:

The Site Value score is weighted by 0.7 to provide a score out of 70. The Landscape Value score is weighted by 0.6 to provide a score out of 30. This allows the overall score for a vegetation zone to be a score out of 100.

10.6.3 Calculating ecosystem credits for clearing where no threatened species are predicted

Where no threatened species are identified for a vegetation zone in accordance with Section 10.3.2, Equation 10.7 is used to calculate the number of ecosystem credits required for the impact of clearing on biodiversity values.

The loss in Site Value score is weighted by 0.7 and the loss in Landscape Value score is weighted by 0.6 at the clearing site. The number of credits required is rounded to the nearest whole number using conventional rounding rules, except if the number being rounded is less than one, in which case the number of credits is rounded up to one.

Equation 10.7 Ecosystem credits required at a clearing site for general biodiversity values (no threatened species are predicted)

Number of ecosystem credits required for a vegetation zone at a clearing site

$$= \left\{(\Delta S_{loss} \times 0.7) + (\%\Delta LV_{loss}) \times 0.6)\right\} \times A$$

Where:

ΔS_{loss} is the change (loss) in the Site Value score of a vegetation zone at the clearing site, as defined by Equation 10.2 and weighted by 0.7

A is the area in hectares of the vegetation zone at the clearing site

$\%\Delta LV_{loss}$ is the proportion of the total Landscape Value change (loss) score for the clearing site as determined by Equation 10.4 apportioned to the vegetation zone and weighted by 0.6.

10.6.4 Calculating the number of species credits required at a clearing site

The species to which the calculation of species credits applies are identified through the assessment process set out in Section 10.3.3.

The number of species credits required to offset a clearing proposal is calculated for individual species based on the area of habitat or number or individuals likely to be impacted by clearing in a species polygon using Equation 10.8.

The number of species credits required for impacts on threatened species is weighted by the species offset multiplier which is based on the ability of the species to respond to improvement in Site Value with management actions at an offset site (referred to as the T_G

value). The T_G value is assigned to the threatened species in the Threatened Species Profile Database.

The number of credits is rounded to the nearest whole number using conventional rounding rules, except if the number being rounded is less than one, in which case the number of credits is rounded up to one.

Equation 10.8 Species credits – number of credits required to offset loss

$$\text{Number of species credits required for a threatened species at the clearing site} = H_{loss} \times \frac{1}{T_{G\ spp1}}$$

Where the Threatened Species Profile Database indicates that the unit of measurement of impact for a species is the area of habitat (mostly fauna), then:

- H_{loss} is the area of habitat (in hectares) to be lost at the clearing site, as determined in accordance with Section 10.3
- $1/T_{G\ spp1}$ is the species offset multiplier. It is based on the ability of the species to respond to improvement in Site Value with management actions at an offset site. T_G is a value identified for each species in the Threatened Species Profile Database and has values between 0.1 and 1.

Where the Threatened Species Profile Database indicates that the unit of measurement of impact for a species is the number of individuals (mostly flora), then:

- H_{loss} is the number of individuals to be lost at the clearing site, as determined in accordance with Section 10.3.

10.7 Calculating ecosystem credits and species credits created at an offset site

This section sets out the rules for calculating the number of ecosystem credits and species credits that are created at an offset site where the land has been assessed for:

- ecosystem credits under Section 10.2 and Section 10.3.2
- species credits under Section 10.3.3.

10.7.1 Calculating ecosystem credits at an offset site

Ecosystem credits are created for the improvement in biodiversity values at the offset site. This is measured by the predicted improvement in Site Value from undertaking the management actions set out in Section 10.7.3 and securing the protection of vegetation in good condition in accordance with Equation 10.9.

The equation is applied to each vegetation zone on the offset site. The gain in Site Value score is weighted by 0.7 and the gain in Landscape Value score is weighted by 0.6.

The number of credits is rounded to the nearest whole number using conventional rounding rules, except if the number is less than one, in which case the number of credits is one.

Note:
The security gain score (see Equation 10.9 below) is only applied to vegetation that is above moderate condition (i.e. with a current Site Value score =/> 60. The security gain score rewards landholders for their past good management of vegetation. The amount of gain that can be achieved increases proportionally according to the current Site Value score of vegetation on the offset site as shown in Table 10.11.

Equation 10.9 Ecosystem credits – number of credits created at an offset site

Number of ecosystem credits created at an offset site

$$= \sum_{i=1}^{n} \left(\left[\left\{ (S_{current} \times \%sg) + \Delta S_{gain} \right\} \times 0.7 \right] + \left(\%\Delta LV_{gain} \times 0.6 \right) \times A \right)$$

Where:

n is the number of offset vegetation zones

i is the *i*th vegetation zone to be managed at the offset site

$S_{current}$ is the current Site Value score of a vegetation zone at the offset site, as defined by Equation 10.1

%sg is the security gain for improving the management of vegetation in good condition as set out in Table 10.11

ΔS_{gain} is the change (gain) in the Site Value score of a vegetation zone at the offset site, as defined by Equation 10.3 and weighted by 0.7

$\%\Delta LV_{gain}$ is the proportion of the total Landscape Value gain score for the offset site, as determined by Equation 10.5, apportioned to the vegetation zone and weighted by 0.6.

A is the area in hectares of the *i*th vegetation zone.

The calculation of ecosystem credits created at an offset site includes a security gain for vegetation that has a current Site Value score of 60 or greater. The security gain is based on a weighted proportion of the current Site Value score. The weighting for the security gain is applied according to Table 10.11.

Table 10.11 Security gain at an offset site

Current Site Value score	Proportionate weighting % for Equation 10.9
< 60	0
60 – <70	10
70 – <80	15
80 – <90	20
> 90	30

The Property Vegetation Plan must identify the management actions that are undertaken on the offset site to achieve gains for threatened species.

The final number of ecosystem credits created on the offset site is based on the number of agreed management actions that are applied at the offset site and are set out in the PVP, according to the percentage that each agreed management action contributes towards the ecosystem credits as shown in Table 10.12.

The total number of ecosystem credits calculated in Equation 10.9 is scaled back by the summed percentage contribution for the management actions that are not identified in the PVP, according to the following three-step process and Equation 10.10.

- Step 1: Calculate the number of credits created by Equation 10.9.
- Step 2: Identify the management actions that are not included in the PVP and sum the percentage contribution for each management action according to the percentages shown in Table 10.12.
- Step 3: Calculate the final number of ecosystem credits that can be generated for each vegetation zone at the offset site by subtracting the percentage contribution summed in Step 2 from the number of ecosystem credits calculated in Equation 10.10.

Equation 10.10 Ecosystem credits – final number of ecosystem credits generated at an offset site with agreed management actions (MAs)

$$\text{Number of ecosystem credits created for the agreed management actions in a PVP} = \text{Number of ecosystem credits calculated for Equation 9.9} \times \left(100 - \text{\% contribution of MAs not undertaken}\right)$$

Where:

Equation 10.9 is the number of ecosystem credits calculated for the vegetation zone

% contribution of MAs not undertaken is the sum percentage discount for each management action as calculated in Step 2 above.

Note to reader:

OEH is considering an alternative method to calculate the final number of ecosystem credits created on the offset site, based on the number of agreed management actions that are set out in the PVP.

The alternative approach closely resembles that used in the current EOAM where the offset area is calculated based on the response to management for an individual species for the selected management actions. This differs to the approach set out above where the response to management is averaged across all possible management actions.

10.7.2 Calculating species credits at an offset site

The number of species credits created at an offset site for a species credit species is calculated using Equation 10.11. The number of species credits that can be created at an offset site is based on the area of habitat or number of individuals of a threatened species within a species polygon as determined in Step 5 in Section 10.3.3, and the improvement in biodiversity values from management actions undertaken at the offset site.

Equation 10.11 Species credits – number of credits created at an offset site

$$\text{Number of species credits created for a species at an offset site} = H_{current} \times \%\Delta S_{gain}$$

Where the Threatened Species Profile Database indicates that the unit of measurement of impact for a species is the area of habitat (mostly fauna), then:

- $H_{current}$ is the current area of habitat in hectares for the species that will be improved by the agreed management actions at an offset site, as determined in accordance with Section 10.7.3
- $\%\Delta S_{gain}$ is the proportional gain in habitat for the species from the management actions, usually measured as proportional gain in Site Value score (as defined by Equation 10.3) for the vegetation zone that contains the species polygon. A value of 0.60 (60%) is used as the default value for $\%\Delta S_{gain}$ where improvement in Site Value cannot be measured directly. $\%\Delta S_{gain}$ is scaled according to the number of agreed management actions undertaken for the species as a proportion of the total number of management actions required to be undertaken for the species according to the Threatened Species Profile Database.

Where the Threatened Species Profile Database indicates that the unit of measurement of impact for a species is the number of individuals (mostly flora), then:

- $H_{current}$ is the current number of individuals of the species that will be increased by the agreed management actions at an offset site, as determined in accordance with Section 10.7.3.
- $\%\Delta S_{gain}$ is the proportional gain in number of the species from the management actions, usually measured as proportional gain in Site Value score (as defined by Equation 10.3) for the vegetation zone that contains the species polygon. A value of 0.60 (60%) is used as the default value for $\%\Delta S_{gain}$ where improvement in Site Value cannot be measured directly. $\%\Delta S_{gain}$ is scaled according to the number of agreed management actions undertaken for the species as a proportion of the total number of management actions required to be undertaken for the species according to the Threatened Species Profile Database.

Equation 10.11 is required to be calculated for each species credit species that occurs on the offset site according to Step 5 in Section 10.3.3.

The final number of species credits created at the offset site for each individual species is based on the number of agreed management actions that are applied at the offset site and are identified in the PVP – according to the percentage that each agreed management action contributes towards the species credits according to the Threatened Species Profile Database.

The total number of species credits calculated in Equation 10.11 is scaled back by the summed percentage contribution of management actions that are not identified in the PVP, according to the following three-step process and Equation 10.12.

- Step 1: Calculate the number of species credits created by Equation 10.11 for each individual assessed at the offset site.

- Step 2: Identify the management actions that are required to be undertaken for the species according to the Threatened Species Profile Database and are not included in the PVP. Sum the percentage contribution for each management action according to the percentages shown in the Threatened Species Profile Database.
- Step 3: Calculate the final number of species credits that can be generated at the offset site by subtracting the percentage contribution summed in Step 2 from the number of species credits calculated in Equation 10.11.

Equation 10.12 Ecosystem credits – final number of species credits generated at an offset site with agreed management actions (MAs)

$$\text{Number of species credits created for the agreed management actions in a PVP} = \text{Number of species credits calculated for Equation 9.11} \times \left(100 - \text{\%contribution of MAs not undertaken}\right)$$

Where:

Equation 10.11 is the number of species credits calculated for the vegetation zone.

%contribution of MAs not undertaken is the sum percentage discount for each management action as calculated in Step 2 above.

10.7.3 Management actions for generating ecosystem credits and species credits

Improvement in the biodiversity values through management actions at an offset site is the basis for generating ecosystem credits and species credits at an offset site.

The Threatened Species Profile Database identifies the management actions that can be undertaken to provide gains for threatened species and the management response that can be expected from each action. This is measured by either an increase in the number of individuals, or area of habitat components or key habitat features.

Ecosystem credits are created in respect of the standard management actions listed below:

- retention of regrowth and remnant native vegetation (provision may be made in the PVP to allow thinning of regrowth or remnant vegetation in offset areas to benchmark stem densities where dense regeneration occurs in the offset area)
- management of human disturbance
- grazing management; the default grazing management is grazing exclusion however wherever a strategic livestock grazing regime provides a better biodiversity outcome, then a strategic livestock grazing management action should be used
- retention of all dead timber (standing and fallen)
- weed control
- erosion control
- replanting and/or supplementary planting of native over-storey species or native mid-storey species where natural regeneration will not be sufficient to achieve benchmark cover
- replanting and/or supplementary planting of native groundcover where natural regeneration will not be sufficient to achieve 70% groundcover

- retention of rocks
- management of fire for conservation (or fire exclusion); the PVP must define the appropriate fire regime for the offset area
- exclusion of all Routine Agricultural Management Actions except Routine Agricultural Management Actions for:
  - the control of feral native species
  - the control of noxious weeds
  - the control of noxious animals
  - traditional cultural activities
  - maintenance of public utilities
  - operation and maintenance (but not construction) of rural infrastructure, and
  - imminent risk of serious injury or damage.

Additional management actions may be required at an offset site to improve populations or habitats of particular threatened species. These management actions are additional to the standard management actions and may be required to generate ecosystem credits or species credits at offset sites.

Examples of additional actions that may be required for relevant species as identified in the Threatened Species Profile Database are:

- control of feral herbivores, and/or overabundant native herbivores
- thinning of remnant or regrowth vegetation to stem density benchmarks
- vertebrate pest management – pigs
- vertebrate pest management – foxes and/or miscellaneous species
- nutrient control
- control of exotic fish species (within dams)
- maintenance or reintroduction of natural flow regimes to wetlands (where possible)
- exclusion of commercial apiary sites from the property.

Additional and/or more tailored management actions may also be undertaken at an offset site to generate ecosystem credits and species credits. The additional management actions can be used to increase the site attribute scores (and biodiversity values) more that the default site attribute scores shown in Table 10.2.

Table 10.12 Percentage scaling for management actions for generating ecosystem credits

Conservation measures or actions	Percentage that management action contributes to an ecosystem credit
Manage grazing for conservation or grazing exclusion	7.5% (unless grazing exclusion is chosen) 5% if grazing exclusion is chosen
Weed control	7.5%
Manage fire for conservation or Fire exclusion	7.5% (unless fire exclusion is chosen) 5% if fire exclusion is chosen
Manage human disturbance	7.5%
Retain regrowth and remnant native vegetation	7.5%
Replant/supplementary planting	7.5%
Retain dead timber	7.5%
Nutrient control	5%
Erosion control	5%
Retention of rocks	5%
Control feral herbivores (and/or overabundant natives) [1]	7.5%
Vertebrate pest control (pigs) [1]	7.5%
Vertebrate pest control (foxes and/or miscellaneous spp.) [1]	7.5%
Control exotic fish species[1]	5%
Maintain natural flow regimes[1]	5%

[1] The discount for these management actions only applies when the relevant species as identified in the Threatened Species Profile Database is predicted to occur on the offset site according to Section 10.3.2.

10.8 Credit profiles and offset rules for using credits

This section sets out the rules which govern how the impacts on the biodiversity values from clearing are offset by the improvements in biodiversity values at an offset site.

The purpose of these offset rules is to ensure that losses of particular biodiversity values from clearing are offset by improvements on land with the same or similar biodiversity values.

Under the offset rules in this section, the credit profiles for credits created at an offset site are 'matched' against the profile for the credits required to offset the impacts of clearing in order to determine whether the credits at the offset site can be used to offset the loss of environmental outcomes for biodiversity.

10.8.1 Credit profile for ecosystem credits

A credit profile for an ecosystem credit required for clearing or created at an offset site is made up of the following two attributes:

- CMA subregion/s – this attribute identifies the CMA subregion/s from which a credit from an offset site can be matched to a credit requirement on a proposed clearing site
- vegetation type – this attribute identifies the vegetation type/s from which a credit from an offset site can be matched to a credit requirement on a proposed clearing site.

The credit profile for ecosystem credits required at a clearing site and generated at an offset site is established according to Table 10.13.

Table 10.13 Attributes of the credit profile for ecosystem credits

Credit profile attribute	Credit profile for ecosystem credits required for each vegetation zone at a clearing site	Credit profile for ecosystem credits created for each vegetation zone at an offset site
Attribute 1: CMA subregions	a) CMA subregion in which the clearing occurs, and b) any other adjoining CMA subregions that immediately adjoin the CMA subregion identified in a), and c) any other CMA subregions that have the same geographic distribution of the threatened species assessed for the ecosystem credit in accordance with Section 10.3.2.	a) CMA subregion in which the offset site occurs

Credit profile attribute	Credit profile for ecosystem credits required for each vegetation zone at a clearing site	Credit profile for ecosystem credits created for each vegetation zone at an offset site
Attribute 2: vegetation types	a) The vegetation type for which the ecosystem credit is required for the impacts of the clearing, and b) any other vegetation type of the same vegetation class as identified in a), and c) any other vegetation types that: • have a percent cleared value of the vegetation type in the CMA equal to or greater than the percent cleared of the vegetation type specified in a) or • have a percent cleared value up to 10% lower than the vegetation type specified in a) if the percent cleared of the vegetation type specified in a) is less than or equal to 70% cleared in the CMA and d) any other vegetation types that are identified in the Threatened Species Profile Database as providing habitat for the threatened species that are assessed for the ecosystem credit in accordance with Section 10.3.2.	a) The vegetation type for which the ecosystem credit is created at the offset site

If no threatened species are predicted to be at the clearing site as assessed in accordance with Section 10.3.2, then the credit profile for ecosystem credits required at a clearing site is:

- for Attribute 1, CMA subregion:
  - any CMA subregion within the CMA boundary or IBRA[1] region in which the clearing site is located, and
- for Attribute 2, vegetation types:
  - any vegetation type that is in any formation and is equally or more cleared than the vegetation type for which the ecosystem credit is required

  or
  - vegetation types that have a percent cleared value up to 10% lower than the vegetation type impacted on at the clearing site if the percent cleared value of that vegetation type is less than or equal to 70% cleared in the CMA.

10.8.2 Offset rules for ecosystem credits

The ecosystem credits generated at an offset site may be used to offset the impacts of clearing on biodiversity values in accordance with Section 10.4. [B. i)], where the following conditions are met:

[1] Interim Biogeographic Regionalisation for Australia (IBRA) defines Australia's bioregions.

1. the CMA subregion identified in Attribute 1 of the credit profile for the offset site in Table 10.13 is the same as any of the subregions identified in a) – c) of the credit profile for the clearing site in Table 10.13, and
2. the vegetation type identified in Attribute 2 of the credit profile for the vegetation zone at the offset site in Table 10.13 is the same as any of the vegetation type(s) identified in a) – d) of the credit profile for the vegetation zone clearing site in Table 10.13, and
3. the number of ecosystem credits created on the offset site is equal to or greater than the number required at the clearing site.

10.8.3 Credit profile for species credits

The credit profile of a species credit relates only to the threatened species or population for which the credit is required or created.

10.8.4 Offset rules for species credits

The Property Vegetation Plan must apply to an offset site that is used to offset the impacts of clearing on a species credit species, and the offset site must:

a) support the same or a similar vegetation type to that being cleared – the offset cannot be used as an offset for a threatened species if it does not contain a vegetation type that is known to be used by the subject threatened species (as recorded in the Threatened Species Profile Database), or

b) contain key habitat feature/s or components that would support the threatened species, or

c) be occupied by a sufficient population of the threatened species (usually only flora), or support a sufficient area of threatened species (usually only fauna or ecological communities) as confirmed by site inspection, and

d) contain the vegetation in a condition suitable to support the subject threatened species (fauna), including consideration of the future condition of the vegetation with implementation of management actions.

The Property Vegetation Plan may allow a requirement that the offset is obtained from the acquisition and retirement of biodiversity credits from the biodiversity register established under Part 7A of the TSC Act.

10.9 Definitions

Area of high biodiversity conservation value: An area of land with high biodiversity conservation values as defined in Section 10.4.1. Where an area of high biodiversity conservation value occurs on a clearing site, the impact of the clearing on biodiversity values cannot be offset in order to improve or maintain environmental values, unless an accredited expert determines otherwise.

Benchmarks or benchmark value or vegetation benchmarks: Quantitative measures of the range of variability in condition attributes of vegetation communities where there is relatively little evidence of modification by humans since European (post-1750) settlement. Benchmarks are available by vegetation class (*sensu* Keith 2004) at www.environment.nsw.gov.au/projects/BiometricTool.htm, and can also be obtained from reference sites, scientific literature or expert knowledge provided that the data has been certified by an accredited expert as set out in Section 2.8.2.

Biodiversity values: For the purposes of Chapter 10, biodiversity values include composition, structure and function of ecosystems, and include (but are not limited to) threatened species, populations and ecological communities and their habitats, as defined by the TSC Act, and exclude fish or marine vegetation, unless that fish or marine vegetation has been the subject of an order under section 5A of the TSC Act.

Catchment Management Authority area: The area of operation of a Catchment Management Authority, as described in Schedule 2 of the *Catchment Management Authorities Act 2003.*

Catchment Management Authority area subregion: Subregions of Catchment Management Authority areas as set out in Appendix B to chapter 10 of the *Environmental Outcomes Assessment Methodology,* Native Vegetation Regulation 2012.

Cover of vegetation remaining in the landscape: The percentage of native vegetation remaining within a 1.79 km radius (1000 ha) of the site to be cleared. Percent cover of native vegetation is scored in 10% portions (deciles) in circles of 100 ha and 1000 ha as a combination of native vegetation extent and condition using Table 10.3. See also **percent cover of native vegetation.**

Database: See Section 2.10.1.

Ecosystem credits: These are required at a clearing site for all impacts on biodiversity values, including threatened species that can be reliably predicted from habitat surrogates. They are created at the offset site from the improvement in biodiversity values from the management actions. Threatened species that require ecosystem credits are identified in the Threatened Species Profile Database.

Endangered population: 'Endangered population' within the meaning of the *Threatened Species Conservation Act 1995.*

Essential habitat feature: A habitat attribute (as specified in the Threatened Species Profile Database) that must be present for a threatened species (flora) to be predicted as likely to occur.

Grassland vegetation: Herbaceous native vegetation in the Grasslands vegetation formation described in Keith (2004).

Groundcover: Any type of herbaceous vegetation as defined in the *Native Vegetation Act 2003*.

Ground stratum: All native vegetation below one metre in height.

Ground stratum cover: Percent foliage cover of the relevant category of ground stratum native vegetation (grasses, shrubs, other).

Habitat: An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component.

Habitat component: The component of habitat that is used by threatened species (fauna) for the purposes of either breeding, foraging or shelter.

Habitat surrogates: Measures of habitat for threatened species, populations and communities; in this methodology they are CMA subregion, vegetation type, percent vegetation cover, vegetation condition and patch size.

Herbfield vegetation: Herbaceous native vegetation that does not contain an over-storey or mid-storey and where the groundcover is dominated by non-grass species.

Indigenous: 'Indigenous' within the meaning of section 6(2) of the *Native Vegetation Act 2003*.

Key habitat feature: A clearly defined habitat component, such as a tree species with hollows of a specified entrance diameter, which is the only (or the primary) habitat component within a site likely to be used by a particular threatened species (fauna). Key habitat features should generally only be considered when measuring the loss of a threatened species in vegetation in low condition or existing as paddock trees.

Landscape Value: A measure of native vegetation cover, connectivity and adjacency of native vegetation. On offset sites Landscape Value may also include riparian areas and any additional Site Value contribution.

Management action: The management actions listed in Section 10.7.3, being actions identified in the Threatened Species Profile Database (for threatened species) that can be undertaken to provide gains for threatened species and the management response that can be expected from each action at an offset site.

Mitchell Landscape: Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000. This definition is adopted from:

- Mitchell, P.B., (2002), *NSW ecosystems study: background and methodology*. Unpublished report to the NSW National Parks and Wildlife Service, Hurstville, and
- Mitchell, P.B., (2003), *NSW ecosystems database mapping unit descriptions*. Unpublished report to the NSW National Parks and Wildlife Service, Hurstville. Updated in Ecological Australia, (2008), *Editing Mitchell Landscapes, Final Report.* Unpublished report prepared by Ecological Australia for the NSW Department of Environment and Climate Change.

Non-woody vegetation: Herbaceous vegetation that is grassland, wetland or herbfield vegetation.

Offset rules: The circumstances in which ecosystem credits and species credits can be used to offset the impacts of clearing on biodiversity values.

Offset site: An area of land to which management actions are applied to achieve gains in biodiversity, including threatened species, in order to balance losses in biodiversity associated with clearing on a clearing site.

Over-abundant native herbivore: Native herbivores that are in densities or numbers likely to cause detrimental effects on vegetation condition or other biodiversity values (where biodiversity values are defined as in the TSC Act 4A (1)).

Patch: An area of native vegetation that is more than 100 m (or more than 30 m in grassland, wetland or herbfield vegetation types) away from other native vegetation.

Percent cover of native vegetation: Percentage cover of native vegetation of an area assessed in accordance with Section 10.2.6.

Plot: Area in which some of the 10 site attributes that make up the Site Value score are assessed in a vegetation zone.

Predicted response: The percent increase in a population, or increase in habitat carrying capacity, expected in response to each relevant management action for a threatened species, as specified in the Threatened Species Profile Database. The predicted response values are estimated on the basis of offsets being appropriately managed in perpetuity.

Reference site: Relatively unmodified sites used to obtain local benchmark information when benchmarks in the vegetation benchmark database are too broad or otherwise not relevant for the particular vegetation type and/or local situation.

Regional value: The percentage of a vegetation type's original extent that has been cleared in the CMA area, adjusted with a generic species–area relationship.

Riparian area: Area in zones as defined in Tables 7.1, 7.2 and 7.3. Refer to Chapter 7 for definitions of types of streams and wetlands.

Secondary grassland: A secondary grassland is a grassland that has resulted from the clearing of trees in a woodland or forest

Site: General term for one or more clearing zones and for one or more offset zones. Clearing zones and offset zones can be on the same land. Also used in the context of reference site.

Site Value: Quantitative measure of structural, compositional and functional condition of native vegetation, measured by site attributes.

Species credits: These are required at a clearing site for impacts on threatened species that cannot be reliably predicted from habitat surrogates. They are generated at the offset site from the improvement in habitat due to the management actions. Threatened species that require species credits are identified in the Threatened Species Profile Database.

Species polygon: The actual area of habitat, or number of individuals of a threatened species, impacted by clearing at a clearing site or by management actions at an offset site.

T_G value: The ability of a species to respond to improvement in Site Value or other habitat improvement at an offset site with management actions. T_G is based on the lowest value of the following: effectiveness of management actions, life history characteristics, naturally very rare species, and very poorly known species.

Threatened species: The following entities listed under the *Threatened Species Conservation Act 1995* (NSW):

- species listed as 'critically endangered', 'endangered', 'vulnerable' or flora species listed as 'presumed extinct', and
- ecological communities listed as 'critically endangered' or 'endangered', and
- endangered populations

and

the following entities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth):

- species listed as 'critically endangered', 'endangered' or 'vulnerable', and
- ecological communities listed as 'critically endangered' or 'endangered'.

Threatened ecological communities: Any ecological community that is listed as 'critically endangered' or 'endangered' under the NSW *Threatened Species Conservation Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Threatened species (fauna): Any species of fauna or a population of fauna that is listed as 'critically endangered', 'endangered' or 'vulnerable' under the NSW *Threatened Species Conservation Act 1995* or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Threatened species (flora): Any species of plant or a population of a plant that is listed as 'critically endangered', 'endangered', 'vulnerable' or 'presumed extinct' under the NSW *Threatened Species Conservation Act 1995* or listed as 'critically endangered', 'endangered' or 'vulnerable' under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Transect: A line or narrow belt along which environmental data is collected.

Vagrant species: A species that is found well outside of its normal distribution.

Vegetation class: An intermediate level of vegetation classification as defined in Keith (2004).

Vegetation community: A generic term for vegetation type or combination of types up to vegetation class.

Vegetation formation: As defined in Keith (2004).

Vegetation in low condition: As defined in Section 10.4.2.

Vegetation type: The finest level of classification of native vegetation used in this EOAM. Vegetation types are assigned to vegetation classes, which in turn are assigned to vegetation formations.

Vegetation zone: A relatively homogenous area within a clearing, thinning or offset site that is the same vegetation type and broad condition. A zone may not contain vegetation that is a mix of low and not low condition. A vegetation zone may comprise one or more discontinuous areas.

Wetland vegetation: Herbaceous native vegetation in the freshwater wetland vegetation formation described in Keith (2004), and consistent with the definition of wetland in the *Native Vegetation Act 2003.*

Woody native vegetation: Native vegetation that contains an over-storey and sometimes a mid-storey that predominantly consist of trees and/or shrubs.

References:

EcoLogical Australia (2008). *Editing Mitchell Landscapes, Final Report*. A report prepared by EcoLogical Australia for the NSW Department of Environment and Climate Change.

Gibbons, P., Briggs, S.V., Ayers, D., Seddon, J., Doyle, S., Cosier, P., McElhinny, C., Pelly, V. and Roberts, K., (2009), 'An operational method to assess impacts of land clearing on terrestrial biodiversity'. *Ecological Indicators* 9: 26–40.

Keith, D., (2004), *Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT*. NSW Department of Environment and Conservation, Hurstville, NSW.

Mitchell, P.B., (2002), *NSW ecosystems study: background and methodology*. Unpublished report to the NSW National Parks and Wildlife Service, Hurstville.

Mitchell, P.B., (2003), *NSW ecosystems database mapping unit descriptions*. Unpublished report to the NSW National Parks and Wildlife Service, Hurstville.

Threatened Species are identified in accordance with the list published by the Office of Environment and Heritage at: www.environment.nsw.gov.au/threatenedspecies/index.htm.

Mitchell Landscapes (Overcleared Landscapes Database) and vegetation types are identified in accordance with the lists published by the Office of Environment and Heritage at: http://www.environment.nsw.gov.au/vegetation/eoam/index.htm

Appendix A to Chapter 10

Determining the floristic value score

The floristic value score is a quantitative method that can be used to assess the conservation value of grasslands and arid conservation shrublands. A floristic value score can be calculated for a vegetation zone identified in Section 10.2.2.

The method relies upon assigning a significance score to each native species that is identified from plot surveys and is based on the document *A method to assess grassy ecosystem vegetation zones: Using floristic information to assess a vegetation zones quality* (Rehwinkel 2007). The significance score for each native species is contained in the Species Significance Score Database that is available from the OEH website.

Significance scores are assigned to each species according to the conservation significance of the species for particular areas of the state (e.g. the Monaro subregion).

Step 1: List all native species in a 20 m x 20 m plot with their Braun-Blanquet cover abundance score (see below). The 20 m x 20 m plot can be the same one used to determine the site value score according to Section 10.2.3. Additional plots may be required to determine the floristic value score to ensure the vegetation zone is sampled at several locations. Additional plots should be randomly chosen.

These Braun-Blanquet cover abundance scores are:

Score	Cover abundance
r	<5% cover and solitary (<4 individuals)
+	<5% cover and few (4–15 individuals)
1	<5% cover and numerous/scattered (>15 individuals)
2	5% – 25% cover
3	26% – 50% cover
4	51% – 75% cover
5	>75% cover

Step 2: Add the species type code for each species for the subregion of the proposed clearing, according to the Species Significance Score Database.

The species type code will indicate whether the species is:

- a common or increaser species
- an indicator level 1 species, or
- an indicator level 2 species.

The Braun-Blanquet assessment will use scores for those species which are either indicator level 1 or indicator level 2 species.

Step 3: Count the number of indicator level 2 species with a Braun-Blanquet score. Enter the number of species counted at the bottom of the table.

Step 4: Count the number of indicator level 2 species with a Braun-Blanquet score other than 'r' (that is, those species that are rare in the plot are not counted. Enter the number of species counted at the bottom of the table.

Step 5: Count the number of indicator level 1 species and indicator level 2 species with a Braun-Blanquet score other than 'r' (that is, those species that are rare in the plot are not counted. Enter the number of species counted at the bottom of the table.

Step 6: Calculate the floristic value score for the plot by adding the count of species from Step 3, Step 4 and Step 5.

- If the floristic value score is 4 or greater, then the vegetation zone has moderate to high floristic value and the vegetation zone is considered to have moderate to high conservation value.
- If the floristic value score is less than 4, the vegetation zone has relatively low conservation value.

Note that the vegetation zone may appear to have a high species richness or diversity. However, if many of these species are either common or are increaser species, or the species is mostly rare in this vegetation zone (i.e. fewer than 4 plants are recorded in the plot) they do not contribute towards the floristic value score for the vegetation zone.

A worked example of the 6-step method is set out in Figure 10.5.

Figure 10.5 Worked example setting out the 6-step process

	Step 1	Step 2	Step 3	Step 4		Step 5
Species name	**Braun-Blanquet score**	**Species type code**	**Indicator species level 2**	**Indicator species level 2 with the exception of those with scores of "r"**	**Indicator species (level 1 & 2)**	**Indicator species levels 1 & 2 with the exception of those with scores of "r"**
Themeda australis	4	2	4	4	4	4
Chrysocephalum apiculatum	2	I			2	2
Austrodanthonia spp.	2	C				
Goodenia pinnatifida	2	2	2	2	2	2
Lissanthe strigosa	2	I			2	2
Microlaena stipoides	2	C				
Rutidosis leptorrhynchoides	2	2	2	2	2	2
Austrostipa densiflora	3	C				
Cryptandra amara	+	2	+	+	+	+
Leptorhynchos squamatus	+	I			+	+
Calocephalus citreus	r	I			r	
Cheilanthes sp.	r	2	r		r	
Convolvulus angustissimus	r	C				
Dianella revoluta	r	I			r	
Euchiton sp.	r	C				
Goodenia hederacea	r	I			r	
Leucopogon fraseri	r	2	R		r	
Lomandra multiflora	r	I			r	
Pimelea curviflora	r	I			r	
Velleia paradoxa	r	2	R		r	
Wurmbea dioica	r	2	R		r	
Tally			**8**	**4**		**7**

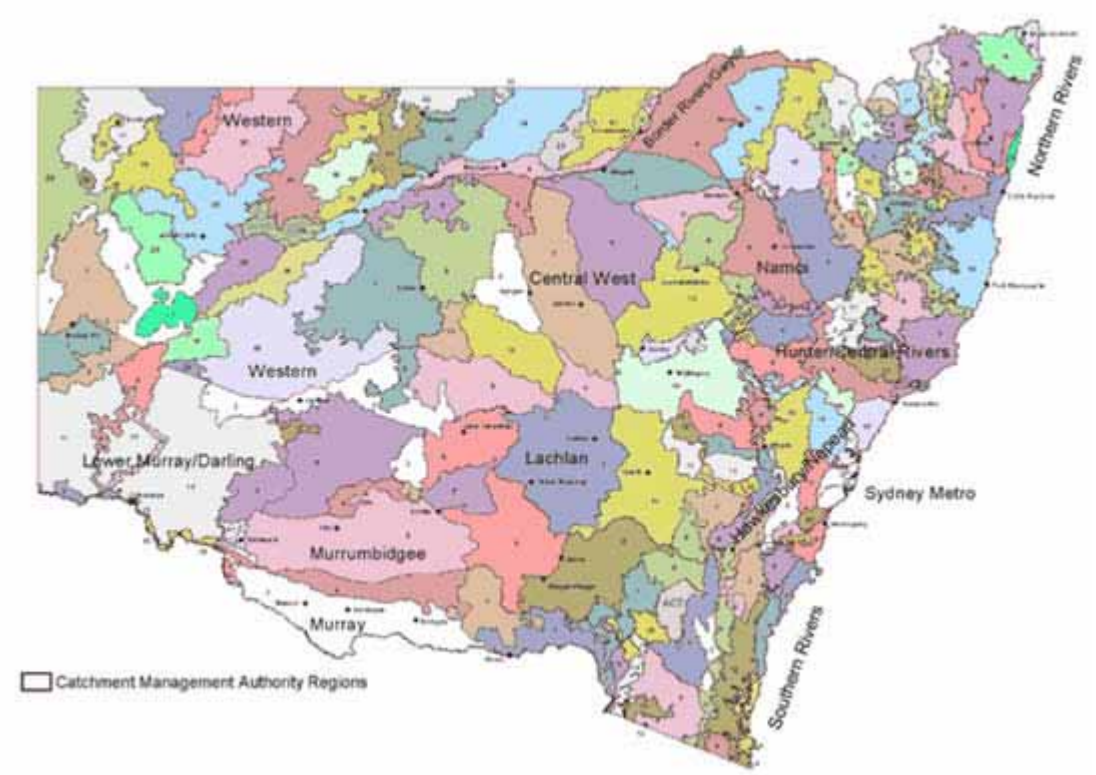
Using this example, 8 species were counted at Step 3, 4 species were counted at Step 4 and 7 species were counted at Step 5.

So the calculation of the floristic value at Step 6 is:

8 + 4 + 7 = 19

Therefore, this vegetation zone is considered to have a moderate to high floristic value.

Appendix B to chapter 10 - Sub-regions of NSW Catchment Management Authority Areas



Sub-regions of NSW Catchment Management Authority Areas	
Key to map	
Border Rivers/Gwydir	
1	Beardy River Hills
2	Binghi Plateau
3	Bundarra Downs
4	Castlereagh-Barwon
5	Deepwater Downs
6	Eastern Nandewars
7	Glenn Innes-Guyra Basalts
8	Inverell Basalts
9	Kaputar
10	Moredun Volcanics
11	Nandewar, Northern Complex
12	Northeast Forest Lands
13	Northern Basalts

14	Northern Outwash
15	Peel
16	Severn River Volcanics
17	Tenterfield Plateau
18	Tingha Plateau
19	Yarrowyck-Kentucky Downs
Central West	
1	Bathurst
2	Bogan-Macquarie
3	Canbelego Downs
4	Capertee
5	Castlereagh-Barwon
6	Hill End
7	Kerrabee
8	Liverpool Range
9	Lower Slopes
10	Nymagee-Rankins Springs
11	Oberon
12	Orange
13	Pilliga
14	Pilliga Outwash
15	Talbragar Valley
16	Upper Slopes
17	Wollemi
Hawkesbury/Nepean	
1	Bathurst
2	Bungonia
3	Burragorang
4	Capertee
5	Crookwell
6	Cumberland
7	Kanangra

8	Monaro
9	Moss Vale
10	Oberon
11	Pittwater
12	Sydney Cataract
13	Wollemi
14	Yengo
Hunter/Central Rivers	
1	Barrington
2	Comboyne Plateau
3	Ellerston
4	Hunter
5	Karuah Manning
6	Kerrabee
7	Liverpool Range
8	Macleay Hastings
9	Mummel Escarpment
10	Pilliga
11	Tomalla
12	Upper Hunter
13	Walcha Plateau
14	Wollemi
15	Wyong
16	Yengo
Lachlan	
1	Barnato Downs
2	Crookwell
3	Darling Depression
4	Kanangra
5	Lachlan
6	Lachlan Plains
7	Lower Slopes

8	Murrumbateman
9	Nymagee-Rankins Springs
10	Oberon
11	Orange
12	South Olary Plain, Murray Basin Sands
13	Upper Slopes
Lower Murray/ Darling	
1	Barrier Range
2	Barrier Range Outwash, Fans and Plains
3	Darling Depression
4	Great Darling Anabranch
5	Lachlan
6	Menindee
7	Murray Scroll Belt
9	Pooncarie-Darling
10	Robinvale Plains
11	South Olary Plain, Murray Basin Sands
Murray	
1	Bondo
2	Lower Slopes
3	Murray Fans
4	Murrumbidgee
5	New South Wales Alps
6	South Olary Plain, Murray Basin Sands
7	Upper Slopes
Murrumbidgee	
1	Bondo
2	Darling Depression
3	Kybeyan - Gourock
4	Lachlan
5	Lachlan Plains

6	Lower Slopes
7	Monaro
8	Murrumbateman
9	Murrumbidgee
10	New South Wales Alps
11	South Olary Plain, Murray Basin Sands
12	Upper Slopes
Namoi	
1	Castlereagh-Barwon
2	Eastern Nandewars
3	Kaputar
4	Liverpool Plains
5	Liverpool Range
6	Northern Basalts
7	Peel
8	Pilliga
9	Pilliga Outwash
10	Walcha Plateau
Northern Rivers	
1	Armidale Plateau
2	Carrai Plateau
3	Cataract
4	Chaelundi
5	Clarence Lowlands
6	Clarence Sandstones
7	Coffs Coast & Escarpment
8	Comboyne Plateau
9	Dalmorton
10	Ebor Basalts
11	Glenn Innes-Guyra Basalts
12	Guy Fawkes
13	Macleay Gorges

14	Macleay Hastings
15	Murwillumbah (Qld - Southeast Hills and Ranges)
16	Nightcap
17	Northeast Forest Lands
18	Richmond - Tweed (Qld - Scenic Rim)
19	Rocky River Gorge
20	Round Mountain
21	Stanthorpe Plateau
22	Upper Manning
23	Walcha Plateau
24	Washpool
25	Wongwibinda Plateau
26	Woodenbong
27	Yuraygir
Southern Rivers	
1	Bateman
2	Bungonia
3	Burragorang
4	East Gippsland Lowlands (EGL)
5	Ettrema
6	Illawarra
7	Jervis
8	Kybeyan - Gourock
9	Monaro
10	Moss Vale
11	New South Wales Alps
12	South East Coastal Ranges
13	South East Coastal Plains
Western	
1	Barnato Downs
2	Barrier Range
3	Barrier Range Outwash, Fans and Plains

4	Bogan-Macquarie
5	Boorindal Plains
6	Bulloo Dunefields
7	Bulloo Overflow
8	Canbelego Downs
9	Castlereagh-Barwon
10	Central Depression
11	Central Downs - Fringing Tablelands and Downs
12	Core Ranges
13	Core Ranges
14	Culgoa-Bokhara
15	Darling Depression
16	Kerribree Basin
17	Louth Plains
18	Menindee
19	Moonie - Barwon Interfluve, Collarenebri Interfluve
20	Mootwingee Downs
21	Narrandool
22	Nebine Plains, Block Range
23	Nymagee-Rankins Springs
24	Paroo Overflow
25	Paroo Sand Sheets, Cuttaburra-Paroo
26	Paroo-Darling Sands
27	Scopes Range
28	South Olary Plain, Murray Basin Sands
29	Strzelecki Desert, Western Dunefields
30	Urisino Sandplains
31	Warrambool-Moonie
32	Warrego Plains
33	Warrego Sands
34	West Warrego - Tablelands and Downs
35	White Cliffs Plateau
36	Wilcannia Plains