native vegetation:

sustaining a living landscape

Vegetation Quality Assessment Manual
– Guidelines for applying the habitat
hectares scoring method

Version 1.3

Victoria
The Place To Be

Vegetation Quality Assessment Manual

Guidelines for applying the Habitat Hectares scoring method

Department of Sustainability and Environment

Biodiversity and Natural Resources Division

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Version 1.3

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1.   Glossary

Benchmark	A standard vegetation-quality reference point relevant to the vegetation type that is applied in habitat hectare assessments. Represents the average characteristics of a mature and apparently long-undisturbed state of the same vegetation type.
Bioregion	A landscape based approach to classifying the land surface using a range environmental attributes such as climate, geomorphology, lithology and vegetation.
Diameter at Breast Height Over Bark (DBH)	The diameter of the main trunk of a tree measured over bark at 1.3 m above ground level.
Ecological Vegetation Class (EVC)	A type of native vegetation classification that is described through a combination of its floristics, life form and ecological characteristics, and through an inferred fidelity to particular environment attributes. Each EVC includes a collection of floristic communities (i.e. lower level in the classification that is based solely on groups in the same species) that occur across a biogeographic range, and although differing in species, have similar habitat and ecological processes operating.
EVC Complex	A vegetation mapping unit with influences of two or more defined EVCs that cannot be differentiated at the site scale.
EVC Mosaic	A vegetation mapping unit containing two or more defined EVCs that cannot be differentiated at the scale of mapping.
Habitat Hectare	A site based measure of quality and quantity of native vegetation that is assessed in the context of the relevant native vegetation type.
Habitat Score	The score assigned to a *habitat zone* that indicates the quality of the vegetation relative to the Ecological Vegetation Class (EVC) *benchmark* – sum of the *site condition score* and *landscape context score* usually expressed as a percentage or on a scale of zero to 1.
Habitat Zone	A discrete area of native vegetation consisting of a single vegetation type (EVC) with an assumed similar averaged quality. This is the base spatial unit for conducting a habitat hectare assessment.
High Threat Weed	Introduced species (including non-indigenous 'natives') with the ability to out-compete and substantially reduce one or more indigenous life forms in the longer term assuming on-going current site characteristics and disturbance regime.
Landscape Context	Measure of the viability and functionality of a patch of vegetation in relation to its size and position in the landscape in relation to surrounding vegetation.
Projective Foliage Cover	The proportion of the ground that is shaded by vegetation foliage when lit from directly above.
Recruitment	Evidence of immature plants that have survived for at least one year since germination or first establishment.
Remnant Patch	A continuous area of native vegetation regardless of vegetation type that may include adjoining areas not being assessed. May occur across one or more land tenures. Patches may consist of one or more *habitat zones*.
Site Condition	Measure of the 'naturalness' or 'intactness' of a patch of vegetation using a number of site-based attributes assessed against a defined benchmark.
Site	An area of interest that may contain contiguous or discrete *patches* of native vegetation on private or public land, requiring a habitat hectare assessment.
Tree Canopy	Uppermost stratum of woody vegetation usually consisting of trees greater than 5 m tall that contributes to or forms the vegetation 'canopy'.
Vegetation Quality	Measure of the intactness and viability of vegetation in relation to its *site condition* and *landscape context*.

2. Introduction

This manual is intended to describe the application of the habitat hectares method for assessing vegetation quality. It provides a step-by-step approach to conducting assessments in the field and useful tips for ensuring consistency of application. The method involves the assessment of a number of site-based habitat and landscape components against a pre-determined 'benchmark' relevant to the vegetation type being assessed. The manual provides a guide for how assessments are to be conducted rather than why that component is being assessed. Refer to Parkes et al. (2003) for a more detailed discussion of the habitat hectares approach.

The method has been intentionally designed such that assessors do not require highly specialised expert knowledge of native vegetation. However, an intermediate level working knowledge of native vegetation is required in order to produce meaningful results. Assessors will require access to reference material (e.g. Ecological Vegetation Class descriptions, bioregional benchmarks and maps) and an ability to interpret this information at the site scale. Refer to Appendix 1 for a summary of required level of expertise necessary to conduct a Habitat Hectare assessment.

The habitat hectares method described in this manual is the result of an on-going research and development phase that has been implemented by DSE over a number of years. The described approach has been developed following user-feedback on previous versions and as a result of a research project undertaken by DSE Arthur Rylah Institute that recommended a number of options for refining the approach described by Parkes et al. (2003). Version 1.3 described in this manual supercedes all previous versions including Parkes et al. (2003). Appendix 2 provides a summary of the development of the approach up to the current version.

Version 1.3 (this manual)

- Supercedes all previous habitat hectare versions including that described by Parkes et al. (2003)

- Clarifies the assessment of a number of site condition and landscape context attributes and includes a method for assessing treeless vegetation types

- Provides a summary of the development of the approach and the differences between Version 1.3 and previous versions (Appendix 2)

One of the major reasons for the development of the habitat hectares approach is to enable vegetation condition or quality to be accounted for in native vegetation planning and investment decision-making processes. The habitat hectares approach is not a measure of conservation significance in itself but it can help determine the conservation significance of native vegetation in combination with other assessed biodiversity attributes (see Victoria's Native Vegetation Management Framework: A Framework for Action, NRE 2002 for definition of conservation significance and how it is determined).

To ensure that decisions concerning native vegetation are made in an appropriate and consistent manner, it is important that the habitat hectares method is applied consistently by all assessors. This manual has been designed to assist in that process.

3. Information Requirements

Prior to going on-site to conduct a habitat hectare assessment, it will be necessary to source existing biodiversity and spatial information relating to the site to be assessed. This information should be accessible in the field to assist in the assessment process where required. Contact the Department of Sustainability and Environment (DSE) for advice on available biodiversity and native vegetation information and how to access this.

Bioregions

Assessments of native vegetation are routinely undertaken in a bioregional context. Bioregions are a landscape based approach to classifying the land surface using a range environmental attributes such as climate, geomorphology, lithology and vegetation.

Habitat hectare assessments are conducted with reference to a bioregional benchmark for the vegetation type in question and as such assessors will need to determine the bioregion(s) in which an assessment is to be conducted.

The statewide bioregion map (see Figure 1) and bioregion layer within the DSE Geospatial Data Library identifies the distribution of the 28 bioregions within Victoria. This map is a useful starting point, however it should be used with caution when applied at the site scale due primarily to the coarse scale of mapping (1:250 000). Inevitably, determination of the appropriate bioregion at the site scale will require reference to the bioregion map in combination with validation of bioregional characteristics in the field.

Assessors should familiarise themselves with the characteristics used to define and differentiate Victoria's bioregions – go to the DSE website to obtain descriptions of Victoria's bioregions.

Useful tips

- The bioregion map at 1:250 000 may not account for fine-scale variation at the local level. Many bioregions may contain outliers in adjoining bioregions that are not identified on the map.

- Always validate the bioregion on site using defined bioregional characteristics in combination with any observed site characteristics. Use the mapped information as a default in the absence of any further site-based information.
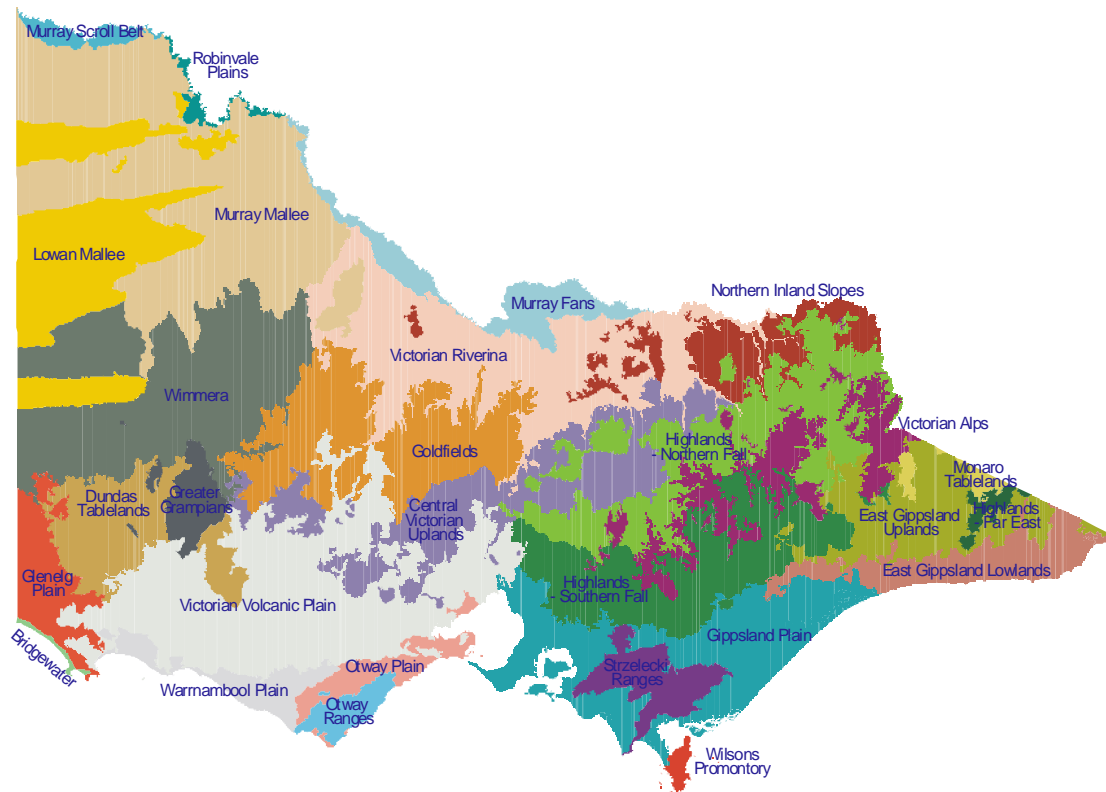
Figure 1: Victorian bioregions.

Ecological Vegetation Classes

Ecological Vegetation Classes (EVCs) are aggregations of floristic communities that are defined by a combination of floristics, life form, position in the landscape and an inferred fidelity to particular environments. The habitat hectares method involves identifying and assessing habitat zones that consist of a single EVC with an assumed similar averaged quality. Access to information on the occurrence and distribution of EVCs on or in the vicinity of the site will aid in defining these habitat zones.

In general, the range of EVCs likely to be encountered on the site can be inferred from extant EVC maps available as a layer in the DSE Geospatial Data Library. In some cases, pre-1750[1] EVC mapping will also assist in this process, particularly in the case of highly fragmented landscapes where patches of extant native vegetation are generally small and poorly defined.

Assessors should also make use of other sources of available information to assist with the delineation of EVCs at the site scale including EVC descriptions, bioregional EVC keys and/or the EVC benchmarks in combination with direct field observations.

Useful tips

- Most EVC mapping in Victoria has been modelled at either the 1:100 000 or 1:25 000 scales.

- Always exercise caution when applying EVC maps at the site scale because they may not account for fine-scale variation in the vegetation.

- Always attempt to validate the EVC on site using suitable reference materials in combination with any observed site-based information. Use the mapped information as the default EVC in the absence of any further site-based information.

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[1] Pre-1750 EVC mapping is a model of the assumed pre-European settlement vegetation types of Victoria and provides an understanding of native vegetation both current and prior to clearing. This layer in combination with the extant EVC mapping has been used to identify the level of depletion (and hence Bioregional Conservation Status) of EVCs across Victorian bioregions since settlement (see Victoria's Native Vegetation Management Framework: *A Framework for Action*, NRE 2002 for further details).

Despite the scale issues, EVC maps are a very useful tool for determining the range of vegetation types present in an area and in general, the EVCs likely to be encountered on the site can be inferred from the mapping for the site and immediate surrounding areas.

Unlike lines drawn on maps, vegetation boundaries on the ground can appear fuzzy and any one assessment may occur in a transition zone between two EVCs. In such circumstances, the assessor can either:

1. Decide which EVC is the more influential and then assess the site using the appropriate EVC benchmark. This would be routinely undertaken with reference to key features that define and separate the particular EVCs such as position in the landscape, life form representation, structural attributes or environmental characteristics; or

2. Where the more influential EVC cannot be identified, choose a benchmark that represents the intermediate characteristics of the two EVCs.[2] This may be particularly applicable to habitat attributes where the benchmark values vary considerably between the two EVCs. For example, where two EVCs have large tree benchmark values of 50 cm and 70 cm, it may be appropriate to use a benchmark of 60 cm for intermediate areas. The assessor should ensure that any decision to adopt an 'intermediate benchmark' is appropriately recorded and be able to defend this decision where required.

Useful tip

- When assessing sites that exhibit characteristics of more than one EVC, identify the key characteristics that have been used to define and separate the EVCs to help decide on which EVC is the most appropriate for the assessment area.

EVC Benchmarks

The habitat hectares approach requires that the condition of native vegetation at the site scale be assessed in comparison to a 'benchmark' that represents the average characteristics of a mature and apparently long-undisturbed state for the *same* vegetation type (Parkes et al. 2003).

The 'habitat hectares' approach interprets 'mature' according to the dominant growth forms and reproductive strategies of the vegetation type and 'apparently long-undisturbed' as a period without significant un-natural disturbances. As such, the notion of a *mature and apparently long-undisturbed* benchmark is relative to the definition of the EVC and the inferred ecological disturbance regime required to maintain the EVC over time (Parkes et al. 2004).

Thus a forest benchmark may be based on the average for stands of 200 year old trees with no visible signs of significant un-natural disturbance, whereas a grassland benchmark may be based on the average for stands of five year 'old' individuals[3] with a similar lack of un-natural disturbance.

The benchmarks used for habitat hectare assessments relate to a single EVC within one bioregion (see Figure 2)[4]. These 'benchmarks' have been generated from existing native vegetation using a combination of analysis of quadrat data applied as part of EVC mapping projects and other quadrat data held in the DSE Flora Information System along with input from botanists with expert knowledge of chosen EVCs in particular bioregions. This process produced a set of 'draft' benchmarks that were tested in the field within sites assumed to be mature and undisturbed for particular habitat components and refined appropriately to produce a final benchmark. Where this was not possible, due to the poor condition of all remaining examples of a vegetation type, then the benchmark values represent the *assumed* long-undisturbed

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[2] In such cases a decision to place the assessment area within a defined EVC will still be required where a Bioregional Conservation Status assessment of the area is proposed.

[3] This definition recognises that many individual plants within a grassland will be older than 5 years but being 'resprouters', effectively function as new individuals following a fire event.

[4] In some cases, more than one EVC benchmark may exist for a bioregion. This is particularly the case for EVCs where variants containing different life form characteristics and occupying different environments are known to exist (refer to DSE website for further information).

condition for the EVC. These have been developed with reference to historical information and comparisons with related vegetation types.

The benchmark information provided for each of the various habitat components represents the *average characteristics* of a mature and apparently long-undisturbed state for the *same* vegetation type. This should not be interpreted as either a 'prescribed ideal' or a 'climax' state. As such, it is reasonable to expect that some patches of native vegetation may contain greater than the benchmark values for one or more habitat components. In addition, the benchmark information has been filtered to reduce the impact of natural and seasonal variation or assessor ability on the final score. For example, life forms that are difficult to observe (e.g. small life forms with low benchmark diversity and cover) have been removed from relevant benchmarks although species within these life forms may still appear in the *typical species* list to assist with EVC identification.

Current bioregional benchmarks for Victoria can be obtained from the DSE website [www.dse.vic.gov.au/].

How to use an EVC benchmark

Each EVC benchmark contains a range of information necessary for conducting a habitat hectare assessment. Figure 2 is an example of the type of information that each benchmark contains and how this is applied to the various habitat hectare components.

EVC/Bioregion Benchmark for Vegetation Quality Assessment

Gippsland Plain bioregion

EVC 3: Damp Sands Herb-rich Woodland

Mature canopy tree benchmark height – canopy tree genera of at least 80% of this height are considered part of tree canopy

Description:
A low, grassy or bracken-dominated eucalypt forest or open woodland to 15 m tall with a large shrub layer and ground layer rich in herbs, grasses, and orchids. Occurs mainly on flat or undulating areas on moderately fertile, relatively well-drained, deep sandy or loamy topsoils over heavier subsoils (duplex soils).

Benchmark large tree diameter at breast height – applies only to canopy genera

Large trees:

Species	DBH(cm)	#/ha
Eucalyptus spp.	70 cm	15 / ha

Large tree genus – tree canopy genera only

Benchmark number of large trees per hectare – all canopy genera combined

Tree Canopy Cover:

%cover	Character Species	Common Name
15%	*Eucalyptus viminalis* ssp. *pryoriana*	Rough-barked Manna Gum

Benchmark tree canopy cover – only applies to canopy

Typical canopy species (not comprehensive)

Benchmark species diversity within understorey life forms

Understorey:

Life form	#Spp	%Cover	LF code
Immature Canopy Tree		5%	IT
Understorey Tree or Large Shrub	1	5%	T
Medium Shrub	5	25%	MS
Small Shrub	3	5%	SS
Prostrate Shrub	1	1%	PS
Large Herb	2	5%	LH
Medium Herb	8	15%	MH
Small or Prostrate Herb	5	10%	SH
Large Tufted Graminoid	2	10%	LTG
Large Non-tufted Graminoid	1	1%	LNG
Medium to Small Tufted Graminoid	4	10%	MTG
Medium to Tiny Non-tufted Graminoid	2	10%	MNG
Ground Fern	1	15%	GF
Bryophytes/Lichens	na	10%	BL

Benchmark percentage cover of understorey life forms

Ecological Vegetation Class bioregion benchmark

Figure 2a: Example of an EVC bioregional benchmark (page 1)

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EVC 3: Damp Sands Herb-rich Woodland - Gippsland Plain bioregion

Typical species within understorey lifeforms for at least part of the distribution of the EVC in the bioregion (not comprehensive)

LF Code	Species typical of at least part of EVC range	Common Name
T	Acacia mearnsii	Black Wattle
T	Acacia melanoxylon	Blackwood
MS	Epacris impressa	Common Heath
MS	Leptospermum continentale	Prickly Tea-tree
MS	Banksia marginata	Silver Banksia
MS	Leptospermum myrsinoides	Heath Tea-tree
SS	Leucopogon virgatus	Common Beard-heath
SS	Dillwynia glaberrima	Smooth Parrot-pea
SS	Amperea xiphoclada var. xiphoclada	Broom Spurge
PS	Astroloma humifusum	Cranberry Heath
MH	Gonocarpus tetragynus	Common Raspwort
MH	Drosera peltata ssp. auriculata	Tall Sundew
MH	Viola hederacea sensu Willis (1972)	Ivy-leaf Violet
MH	Geranium solanderi s.l.	Austral Cranesbill
SH	Hydrocotyle laxiflora	Stinking Pennywort
SH	Opercularia varia	Variable Stinkweed
SH	Dichondra repens	Kidney-weed
SH	Poranthera microphylla	Small Poranthera
LTG	Lomandra longifolia	Spiny-headed Mat-rush
LTG	Austrostipa mollis	Supple Spear-grass
LNG	Tetrarrhena juncea	Forest Wire-grass
MTG	Lepidosperma concavum	Sandhill Sword-sedge
MTG	Dianella revoluta s.l.	Black-anther Flax-lily
MTG	Lomandra filiformis	Wattle-headed Mat-rush
MTG	Poa sieberiana	Grey Tussock-grass
MNG	Microlaena stipoides var. stipoides	Weeping Grass
GF	Pteridium esculentum	Austral Bracken

Recruitment strategy – guide to assess adequacy of recruitment

Recruitment:
Continuous

Organic Litter:
40 % cover

Benchmark organic litter cover

Benchmark log length

Logs:
15 m/0.1 ha

Weed species typical of EVC (not comprehensive)

Weed species invasiveness and impact (where applicable) – use as a guide when determining 'high threat' weeds

Weediness:

LF Code	Typical Weed Species	Common Name	Invasive	Impact
MH	Hypochoeris radicata	Cat's Ear	high	low
LTG	Anthoxanthum odoratum	Sweet Vernal Grass	high	high
LNG	Holcus lanatus	Yorkshire Fog	high	high

www.dse.vic.gov.au

Figure 2b: Example of an EVC bioregional benchmark (page 2)

4. Useful Field Tools

Useful materials to take into the field to assist with a vegetation quality assessment include:
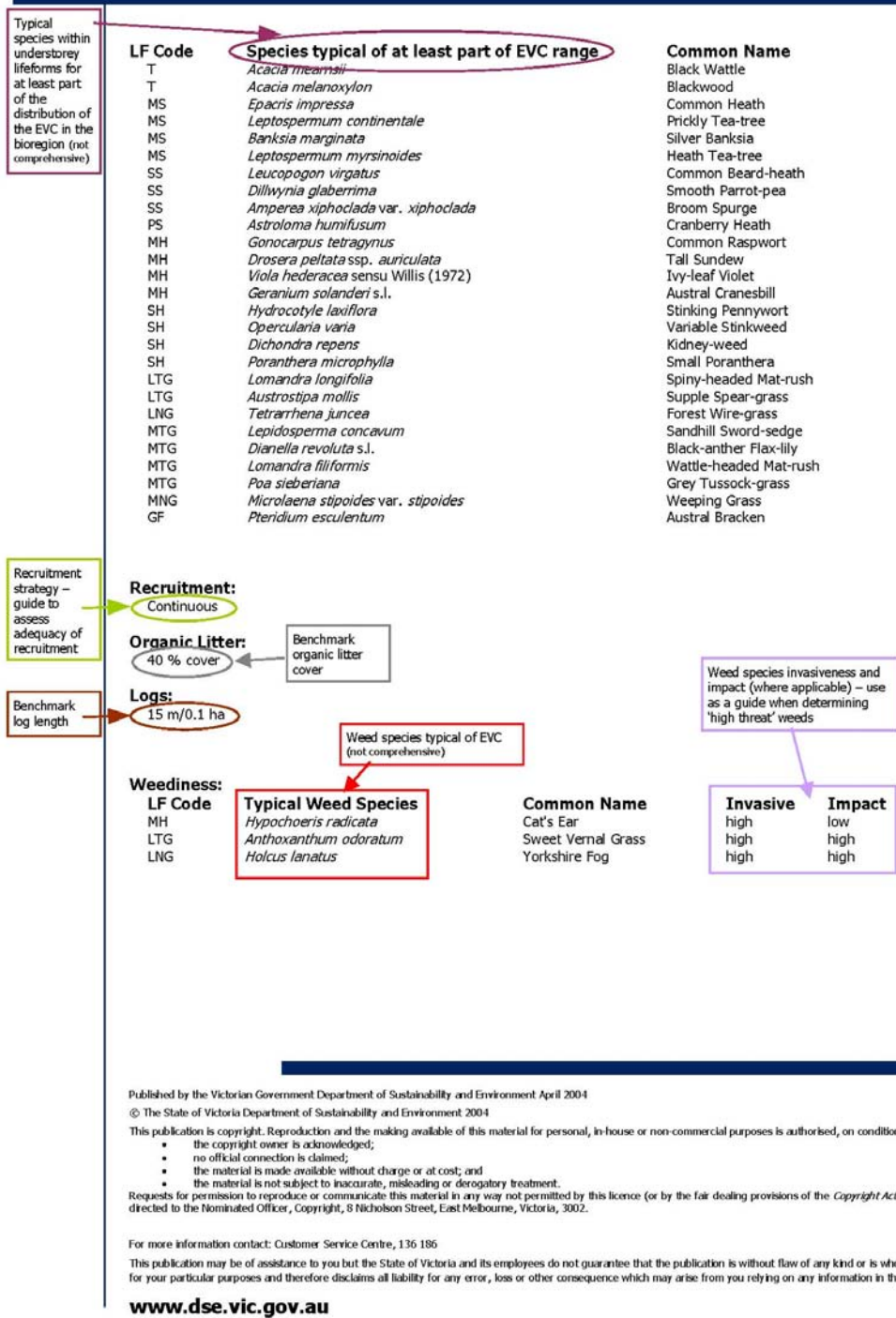
1. An aerial photograph of the site. If this available as a Geographic Information System (GIS) layer then this allows 'zooming down' to the site scale and the addition of layers such as cadastral boundaries, roads, streams, scale/direction to assist with orientation in the field and assessment of area-based habitat components (e.g. large trees[5]).

2. Tree cover map at an appropriate scale. In general, tree cover maps have been used to derive the extant EVC layer, so an EVC map will usually suffice.

3. A transparency marked with 'landscape context' radii (1 km & 5 km) at the appropriate scale of the EVC or tree cover map (1:100 000 or 1:25 000) for use in determining the neighbourhood score.

4. Field assessment equipment as required – GPS, habitat hectare field sheets or hand-held computer for data collection, diameter tape measure, linear length tape measure, compass, clinometer, vegetation quality quick reference guide (Appendix 3), projective foliage cover diagrams (Appendices 4 and 5) and life form definitions (Appendix 6).

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[5] The large tree assessment requires an estimate of the size (in hectares) of the habitat zone being assessed. A scaled aerial photograph will greatly assist with determining this although the final area should be calculated using GIS-based tools.
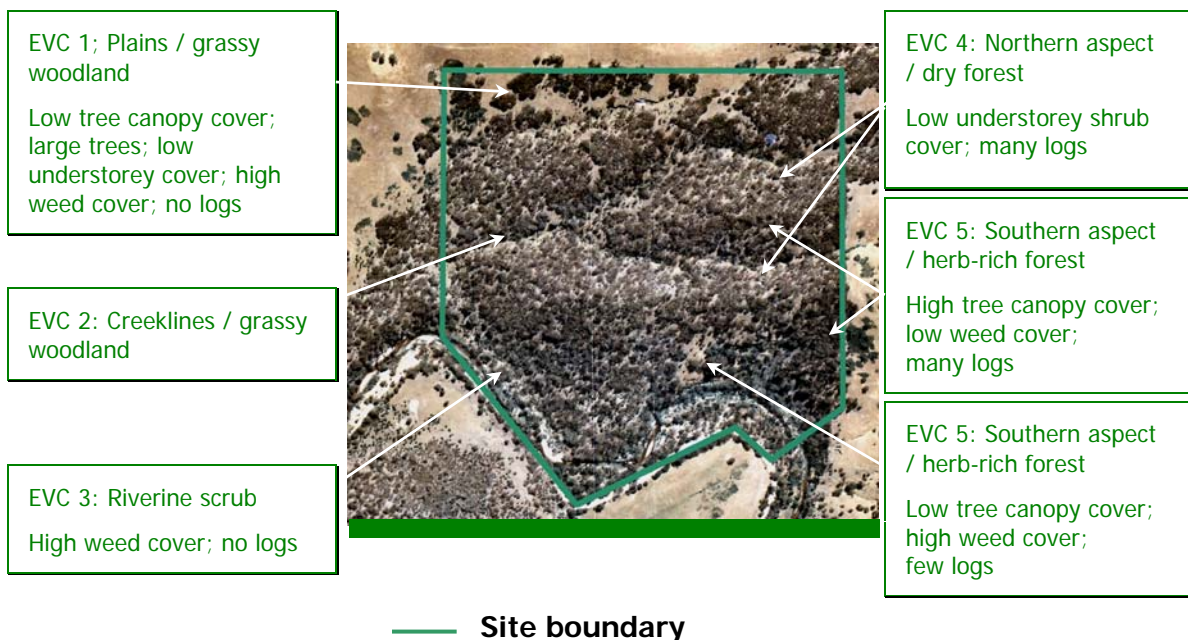
5. Site Inspection

Overview of the site

Whether assessing a large public land block or a small remnant on private land, the first step to conducting a habitat hectare assessment is to determine the extent, distribution and complexity of the area(s) proposed for assessment. A walk or drive around the site will not only help the assessor determine the scale, orientation and terrain of the site but it also presents an opportunity to identify the likely EVCs and quality differences within the observed patch(es). This will in turn provide information on the scale of the assessment (ie. approximately how many habitat hectare assessments will be required).

During the overview inspection, the assessor should take account of the following:

1. The spatial distribution of native vegetation patches across the site.

2. The identification and distribution of EVCs within these patches.

3. Areas of observable quality difference within these EVCs (see below – assessing quality differences within an EVC).

4. Any other notable physical features that may assist with the conduct of the site assessment and/or identification of threats affecting the quality of the vegetation.

Figure 3 presents an example of the type of information that may be collected during the site overview.

Figure 3: Example of a site overview with notes on the type and quality of the vegetation

EVC 1; Plains / grassy woodland

Low tree canopy cover; large trees; low understorey cover; high weed cover; no logs

EVC 2: Creeklines / grassy woodland

EVC 3: Riverine scrub

High weed cover; no logs

EVC 4: Northern aspect / dry forest

Low understorey shrub cover; many logs

EVC 5: Southern aspect / herb-rich forest

High tree canopy cover; low weed cover; many logs

EVC 5: Southern aspect / herb-rich forest

Low tree canopy cover; high weed cover; few logs

—— Site boundary

Assessing quality differences within an EVC

There are a number of 'visual triggers' that can be used to help determine whether there has been sufficient change in vegetation quality to warrant a different habitat hectare assessment. In general, these are readily observed differences within those habitat components assessed as part of the site condition assessment.

Table 1 provides a guide to identifying potential quality differences within EVCs to assist with this process. In general these are based on observable differences in the cover or 'naturalness' of each habitat component assessed against the EVC benchmark and reflect typical differences that can be readily observed within these components.

The decision as to whether such observable differences then warrant a different habitat hectare assessment will require further consideration of the scale and extent of the observed area in relation to the remnant patch being assessed and the context of the assessment (*see below – estimating the required number and size of habitat zones*).

Habitat Components						
Large trees	**Tree Canopy Cover**	**Understorey**	**Lack of Weeds**	**Recruitment**	**Organic Litter**	**Logs**
Number / ha	% cover	Number & % cover of major life forms	% cover	Extent of immature woody trees and shrubs	% cover	Extent
Absent	Absent (<10% of expected cover)	Absent – indigenous life forms difficult to observe (<10% of total expected cover)	Visually dominated by exotics (≥50% cover)	Absent	Absent (<10% of expected cover)	Absent
Few – easy to count (<50% of expected #/ha)	Present but scattered and lacking (≥10% but <50% of expected cover)	Most indigenous life forms missing (e.g. shrubs) – limited structural diversity (≥10% to <50% total expected cover)	Easily observable at high cover (≥25% to <50% cover)	Uncommon (few species and/or difficult to observe) – mostly overstorey regeneration	Low cover (≥10% to <50% of expected cover)	Uncommon (occasional logs and/or cut stumps)
Many – difficult to count (≥50% of expected #/ha)		Most or all indigenous life forms present - obvious structural diversity (≥50% total expected cover)	Observable at low cover (≥5% to <25% cover)			
	Present and complete (≥50% of expected cover)		Very rarely observed (<5% cover)	Common (many species and/or obvious)	High cover (>50% of expected cover)	Common (many logs – large logs readily observed)

Table 1:   Guide to determining vegetation quality differences within an EVC using a simplified 'visual assessment' approach.

A different habitat hectare assessment may be required when there is:

- a one category difference in the majority (4 or more) of the above 'visually assessed' condition components; or
- two categories difference in any one of these 'visually assessed' components.

Estimating the required number and size of habitat zones

Remnant patches of native vegetation can vary in size from very small (< 1 ha) to large (> 1000 ha). Apart from the physical periphery of a vegetation patch, other boundaries may be recognisable within the patch. Patches of native vegetation are often not homogeneous. They may be comprised of several different EVCs or of a single EVC that has been subjected to noticeably different disturbance regimes expressed in the current vegetation quality.

The habitat hectares approach should be constrained to a single EVC of similar quality. Each unique EVC/quality combination is referred to as a *habitat zone*. A patch of native vegetation may contain one or more habitat zones.

The number and size of habitat zones assessed will be dependent on a number of factors including the size of the patch being assessed, the variability of the vegetation proposed for assessment and the context of the assessment.

Each one of these issues is discussed below, however in all cases it will be at the discretion of the assessor to decide on the size and number of habitat zones to be assessed and to be able to support that decision where necessary.

Size of the patch

The size of the patch being assessed will influence how much variability can be tolerated before a decision is made to identify another habitat zone and undertake a separate habitat hectare assessment.

This is best illustrated using the example of a 20 x 20 m 'clearing' within a patch of native vegetation. The response to the presence of this and its impact may be different within a 100 ha patch in comparison to a 1 ha patch. Within the larger patch, the assessor may decide that the presence of the clearing could be effectively ignored and incorporated into an averaged score whereas they may choose to treat it separately in the smaller patch because of its area in relation to the overall size of the assessment patch and its proportional influence on the overall score.

Spatial context/variability of vegetation

The spatial context in which the EVC typically occurs and the degree of complexity of the vegetation will influence the size and number of assessments required. In some cases, an EVC (e.g. Lowland Forest) may exist as a broad-ranging unit over thousands of hectares subjected to a similar disturbance history across its distribution in a particular area. In other cases, an EVC (e.g. Plains Grassy Wetland) may only exist as a small, discrete area (< 0.25 ha) within a broader native vegetation matrix. Similarly, many endangered EVCs that may have once been part of a broader vegetation unit now exist only as small, fragmented remnants and even small areas may still warrant identification as a habitat zone.

Context of the assessment

The purposes of the assessment and any consequences arising from the outcomes will strongly influence the size and number of habitat zones required. For example, a consultant acting for a client seeking planning approval for the construction of a new infrastructure easement will need to take this into consideration when determining the habitat zone configuration on a site, so that the easement can be best placed to minimise the loss of native vegetation.

In contrast, biodiversity investors wishing to gain a generalised understanding of the quality of native vegetation in a particular bioregion may adopt a different assessment strategy.

Deciding on the appropriate EVC benchmark to use

In most cases, native vegetation quality should be assessed using a bioregional benchmark that reflects the current and pre-1750 vegetation on the site. In such cases, this benchmark represents the most appropriate reference point for assessing the current condition on the site and provides the most appropriate direction for quality gains through improved management into the future.

In some circumstances, past or present management or changed site conditions may have resulted in derived native vegetation occurring on a site that appears quite different from the assumed pre-1750 vegetation that occupied the area. In such cases, deciding on the appropriate benchmark to use in a habitat hectare assessment should be undertaken with reference to whether the land manager has direct influence over the expression or appearance of the vegetation or whether site externalities are the major drivers influencing the vegetation on the site.

For example, past clearing and intensive grazing may have resulted in derived vegetation that is both structurally simplified and species-poor in comparison to the original vegetation of the site. Nevertheless, in this example the land manager still has control over the expression and condition of the vegetation and the pre-1750 EVC represents the appropriate benchmark against which quality should be assessed. This benchmark also provides the most appropriate pathway for assessing quality gains through management.

Conversely, a site containing derived vegetation that has established as a result of changes to catchment hydrology or increased salinisation may be beyond the control of the land manager and the site should be assessed against the closest EVC equivalent as this now represents the most appropriate pathway for improvement.

EVC mosaics and complexes

Some parts of Victoria may be mapped as EVC mosaics or complexes. In general, these are mapping units that have been established because finer resolution of the vegetation could not be achieved at the scale of mapping. In the case of EVC mosaics[6], it is usually possible to separate the mapping unit into its constituent EVCs at the site scale. In such cases, the assessment should proceed as per the habitat hectares method using the relevant benchmarks for the EVCs that make up the mosaic.

For EVC complexes[7], this usually implies that the mapping unit cannot be separated into the influential EVCs even at the site scale. In most cases, this will entail assessing the site against the appropriate EVC complex benchmark.

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[6] An EVC mosaic is a mapping unit containing two or more defined EVCs that cannot be differentiated at the scale of mapping.
[7] An EVC complex is a mapping unit with influences of two or more defined EVCs that cannot be differentiated at the site scale.

EVCs that exhibit structural variation

Some EVCs and EVC mosaics and complexes exhibit structural variation across their range within a bioregion. For example, *Sandstone Ridge Shrubland* is described as an EVC that may occur as a low, open mallee with shrubby understorey or shrubland with scattered emergent mallees. In such cases, the benchmark indicates those habitat components that should be applied to the recognised structural variants.

In the case of some EVCs and EVC mosaics and complexes such as those that exist largely as fragmented and often isolated remnant patches, it may be difficult for the assessor to know the natural structure for any one particular patch. In such situations, the current site characteristics can be used to determine which benchmark habitat components should be assessed.

For example, sites mapped as *Plains Grassland / Plains Grassy Woodland Mosaic* (essentially a woodland that may naturally contain grassy 'openings' from hundreds of square metres to many hectares in size) will require the assessor to observe the presence or absence of trees (past or present) to determine the appropriate benchmark to use. That is, currently treeless sites should be assessed as treeless vegetation (and the site condition score appropriately standardised – see Section 9 – *Assessing treeless vegetation*) while currently treed sites or sites that exhibit evidence of being treed in the past should be assessed using the relevant 'treed' habitat components (see Figure 4 below).

Refer to the EVC benchmark for clarification as to which EVCs and EVC complexes typically exhibit such structural variation.
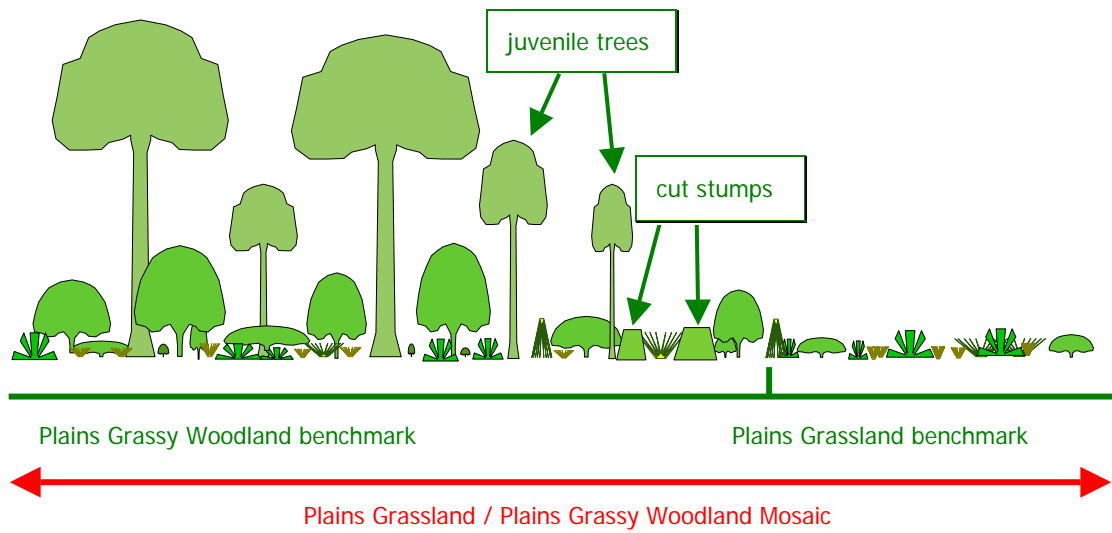
Figure 4: Using site-based information to identify the appropriate benchmark to apply within EVCs and EVC mosaics and complexes that typically exhibit structural variation across their range.

6. Habitat Hectares Scoring System

The habitat hectares assessment approach involves assigning a habitat score to a habitat zone that indicates the quality of the vegetation relative to the EVC benchmark. This habitat score can then be multiplied by the area of the habitat zone (in hectares) to determine the quality and quantity of vegetation (in habitat hectares).

The components of the 'habitat score' and their relative weightings are shown in Table 2. The components are divided into two groups, reflecting assessments of both 'site condition' and 'landscape context'. Each of these components has been developed to be assessed in the field. However, the 'landscape context' components (ie. patch size, neighbourhood and distance to core area) can also utilise information from other sources if available (e.g. maps and GIS layers) and GIS-based tools are increasingly available to assist with this task.

Table 2:   Components and weightings of the habitat score.

	Component	Score
	Large Trees	10
	Tree Canopy Cover	5
'Site	Understorey	25
Condition'	Lack of weeds	15
	Recruitment	10
	Organic Litter	5
	Logs	5
'Landscape	Patch Size *	10
Context'	Neighbourhood *	10
	Distance to Core Area *	5
	Total	**100**

* these components can be derived on-site or with the assistance of maps and other information e.g. GIS)

7.   Assessing 'Site Condition' Components

Introduction

The habitat hectares method has been designed where possible to account for natural variation within native vegetation types, to reduce subjectivity and variability between assessors and to minimise the time taken during the assessment process.

The approach has been developed to strike a balance between scientific rigour and ease of use by a broad audience. Inevitably with such approaches there is a trade-off between accuracy and efficiency and the habitat hectares method uses a classification approach rather than a continuum approach in part because of the higher transaction costs associated with the collection of complete or more accurate data and the level of skill this requires.

In most cases, habitat zones will be placed comfortably within a habitat component category that would unlikely change even if further data were to be collected. There will be times however, where greater accuracy is important and assessors should be aware of such situations and refine their assessment strategy accordingly to ensure greater consistency and accuracy of outcomes. This may be particularly the case where sites may be at or near a category threshold for one or more habitat components or where the overall score may be at or near a 'habitat quality' threshold that may have consequences for further decision-making regarding the site (see - Victoria's Native Vegetation Management Framework: A Framework for Action, NRE 2002).

In such cases, assessors should ensure that the information collected is as accurate as possible and ensure that an appropriate audit trail exists to defend the decision-making process where required.

Useful tips

- Exercise due care when assessing habitat components that are at or near a category threshold or in habitat zones that are at or near a habitat quality threshold that may have consequences for further decision-making.

- Collect more information or check collected information to ensure greater accuracy and finer-scale resolution where required.

The habitat hectares approach requires assessors to collect a range of visually assessed information across the habitat zone and to then analyse this to calculate the Habitat Score for the area. While the Habitat Score is made up of a number of independently assessed components, for reasons of practicality and efficiency it is preferable that this information be collected simultaneously during the assessment. By inference, this means that assessors should be aware of the range of information that needs to be collected and develop a system that efficiently gathers this information. A quick reference guide to conducting habitat hectare assessments is given in Appendix 3 and this may be useful as a reference in the field.

It should also be noted that while knowledge of all species at a site is considered unrealistic, assessors should be able to identify common plant species, particularly those that are typical of that EVC. They also need to be able to estimate the number of different species within each of the life forms present and be able to identify high threat regional weed species (see Appendix 1 - Expertise level for Assessors). This level of expertise will often be essential for the correct identification of the EVC, one of the first steps in the assessment process.

The habitat hectares approach includes some habitat components that reflect recent past management (e.g. recruitment) while others convey an assessment of future risk (e.g. weed assessment). Despite this, one important overriding factor that is relevant to the assessment approach is that the observer assesses the current condition of the vegetation, not what may be presumed to be present at some time in the future or what may have been present in the past.

For example, while it would be easy to interpret a high density of tall *Eucalyptus* saplings as providing the potential for a future tree canopy, they would not qualify for inclusion under the tree canopy component *at the current point in time*. These saplings should be included as part of the understorey life form assessment and possibly also as part of the recruitment assessment depending on their height. This rule applies equally to the understorey assessment where the life forms at the site are assessed according to their current appearance and height, not according to their predicted mature expression.

It should be noted that under some circumstances, the approach does require the assessor to consider what is being (or not being) observed in order to satisfactorily assess and score some habitat components. For example, when assessing largely seasonal understorey life forms at an inappropriate time of year or when estimating the amount of tree recruitment required to be considered adequate.

Useful tips

- "Assess what you see, not what you expect to see." That is, assess the current condition of the vegetation <u>not</u> what may be present in the future or what may have been present in the past.

- Ensure that the decision-making rules are applied consistently across all habitat components to reduce the risk of assessor variance.

Large Trees

The large tree component assessment involves estimating the number of large trees (dead or alive) in the habitat zone in comparison to the EVC benchmark number per hectare and then qualifying this score depending on the health of the large trees in the habitat zone.

Large trees are defined by a minimum DBH[8] threshold measurement as indicated in the EVC bioregional benchmark. Note that only those genera that contribute to the tree canopy of the EVC can qualify as a large tree (see EVC benchmark as a guide to the large tree genera). Understorey trees are excluded from the large tree assessment. For EVCs that lack large trees (e.g. grasslands, heathlands and shrublands), the large tree component is not assessed and the final habitat score should be standardised accordingly (see Section 9 – *Assessing treeless vegetation*).

In general, it is a good idea for assessors to initially accurately measure a few 'large-looking' trees with a diameter tape to determine their DBH until this can confidently be determined by 'eye'. Many large trees will also contain other characteristic large or old tree features that can aid in the identification process, such as fire scarring, dropped limbs and spurs. However, to ensure greater consistency between assessors, only trees at or above the DBH threshold should be included as a large tree even where other old-aged characteristics may be observable.

Trees with multiple trunks need at least one trunk to be equal or greater than the benchmark DBH to qualify as a large tree. This applies to either woodland or forest trees that have regrown following previous cutting or naturally occurring mallee-form trees. In the case of the latter, the mallee EVC large tree benchmark will have a DBH value where applicable that reflects this natural structure.

Step 1

The large tree component is scored by first determining the number of large trees in the habitat zone and comparing this to the number of large trees/ha identified in the EVC benchmark. The vegetation should then be placed in the appropriate large tree number/ha category (Table 3).

Useful tips

- For each new habitat zone assessment, use a diameter tape to initially assess trees at or near the benchmark DBH until these can be confidently assessed by 'eye'.

- Only trees of canopy genera that are at or greater than the large tree DBH should be included in the large tree assessment. Understorey tree species do not qualify as a large tree (refer to the EVC benchmark for clarification).

- The size of the habitat zone (in hectares) will need to be determined in order to assign the habitat zone to a large tree density category. A scaled aerial photograph will greatly assist with determining this although the final area should be calculated using GIS-based tools.

- Include any dead trees that obtain the large tree DBH benchmark but do not forget to include these in the 'health' assessment (see below).

- When there are a high number of large trees in the habitat zone, pay particular attention to accurately measuring and counting to ensure that the vegetation is appropriately placed in a large tree number/ha category.

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[8] DBH = Diameter at Breast Height (i.e. measured over bark at 1.3 m above ground level)

Step 2

Once placed in a large tree number/ha category, the large trees in the habitat zone are then assessed for their health according to the estimated proportion of canopy cover that is present (i.e. not missing due to tree death, decline, insect attack or mistletoe infestation).

The proportion of large tree canopy cover present should be assessed by estimating the *average* projective foliage cover of the large tree component in the habitat zone and comparing this to the expected 'healthy' projective foliage cover. Effectively, this is a measure of how far the small leaf bearing branches that make up the canopy are from maximum foliage carrying capacity. Note that absent or fallen branches do not necessarily correspond to reduced tree health and as such are not accounted for as part of the tree health component. Loss of foliage on sub-canopy branches and lower limbs is similarly not included in the assessment. Refer to Appendix 4 as a guide to assessing proportional canopy cover.

Once the large trees density category has been determined then the health of the large trees is assessed and assigned an appropriate health class to determine the large trees component score for the habitat zone (Table 3).

Useful tips

- Ensure that the large tree health assessment is the average of all the large trees in the habitat zone.
- Include any large dead trees that meet the benchmark DBH in the health assessment (dead trees should be assessed as having 0% of their 'healthy' canopy cover).
- Do not account for loss of foliage due to absent or fallen branches in the tree health assessment.
- Do not include sub-canopy foliage and branches in the tree health assessment (i.e. lower limbs that do not form part of the canopy).

Large Trees Assessment Summary

1. Determine the boundaries and the size of the habitat zone
2. Refer to the EVC bioregional benchmark diameter at breast height and number of large trees / ha.
3. Identify the number of large trees in the habitat zone and place it in the appropriate large tree density category (below).
4. Estimate the average proportion of expected large tree canopy cover that is present and place in the appropriate large tree canopy health class (below).

Table 3: Criteria and scores for the number and health of large trees present in the habitat zone.

Category & Description	% Canopy Health*		
	> 70%	30-70%	< 30%
None present	0	0	0
> 0 to 20% of the benchmark number of large trees/ha	3	2	1
> 20% to 40% of the benchmark number of large trees/ha	4	3	2
> 40% to 70% of the benchmark number of large trees/ha	6	5	4
> 70% to 100% of the benchmark number of large trees/ha	8	7	6
≥ the benchmark number of large trees/ha	10	9	8

* Estimated proportion of an expected healthy canopy cover that is present (i.e. not missing due to tree death or decline, or mistletoe infestation.)

Tree Canopy Cover

The tree canopy cover component assessment involves estimating the projective foliage cover of the tree canopy in the habitat zone in comparison to the EVC benchmark percentage cover and then qualifying this score depending on the health of these canopy trees in the habitat zone.

This component uses an assessment of the projective foliage cover of canopy trees only and is aided by referring to diagrams that illustrate different levels of projective foliage cover (see Appendix 5).

Canopy trees are defined as the uppermost stratum of woody vegetation (at least 5 m tall) that contributes to, or forms the vegetation 'canopy'. As a guide, the benchmark lists species and genera that typically form part of the tree canopy cover for the EVC. Trees contributing to the canopy layer are defined as those reaching 80% or more of the mature height[9], as defined within the EVC benchmark description. This definition also includes large trees of sufficient height that may have been assessed as part of the previous component and acknowledges that these trees are being assessed here for their contribution to the tree canopy rather than their large size characteristics. For EVCs that lack a tree canopy (e.g. grasslands, heathlands), the tree canopy cover component is not assessed and the final habitat score should be standardised accordingly (see Section 9 – *Assessing treeless vegetation*).

Any canopy-genera trees that fall below the 80% mature height, that is immature trees, saplings or seedlings, are not included within this canopy layer even though they may be the same species. These should be included as part of the understorey and recruitment components depending on their height. Understorey trees or large shrubs (see EVC benchmark as a guide) are not assessed as part of the tree canopy cover component even where they reach the canopy height.

Step 1

The tree canopy cover component is scored by first identifying those canopy trees in the habitat zone that reach at least 80% of the EVC benchmark mature height and then estimating the projective foliage cover of these trees in comparison to the EVC benchmark.

To facilitate greater consistency with cover estimates, it is suggested that assessors stand at the edge of the crown of a number of individual canopy trees (i.e. at the drip line) and look up through the foliage towards the apex of each tree (see Figure 5 following). Then using the diagrams in Appendix 5[10] as a guide, estimate the projective foliage cover of each tree. It should be noted that these cover diagrams provide an indication of the height and spacing between trees to help the assessor place the habitat zone being assessed. Having estimated the cover of a number of individual trees, the assessor should then consider the distance between individual canopy trees and the size of 'gaps' that may occur in the canopy cover, and then place the habitat zone in the appropriate tree canopy cover category (Table 4).

Note that the habitat hectares approach refers to change from the tree canopy cover benchmark. By inference, this means that habitat zones need to be assessed for their over-abundance as well as under-abundance of tree canopy cover. However, habitat zones that have an over-abundance of tree canopy cover in comparison to the benchmark can never score zero for tree canopy cover.

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[9] The mature canopy height provided in the EVC benchmark description (see Figure 2 as an example) is the height at which the canopy tree species in the EVC are considered mature rather than a measure of the maximum height to which the tree canopy species may grow. In most cases, the maximum canopy height will be greater than the benchmark mature canopy tree height.

[10] Appendix 5 contains a number of different projective foliage cover / tree height / tree spacing combinations using the 'edge of crown' assessment technique. The projective foliage cover values have been adjusted to account for the angle of view and the assessor can use these images to identify the combination that is most relevant to the habitat zone they are assessing. Note that the difference between the 'angle of view' and projective foliage cover values is greatest when the canopy height is lowest (see Appendix 5).
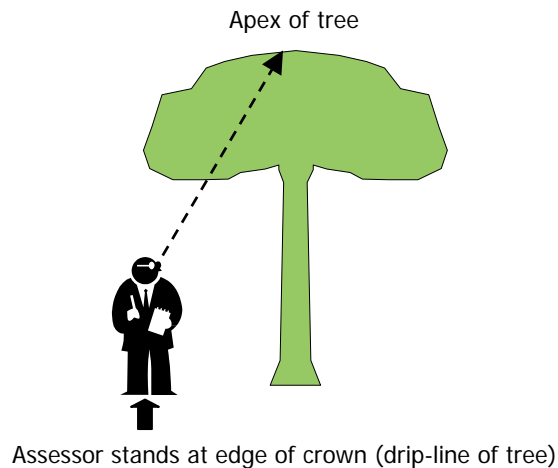
Apex of tree

Assessor stands at edge of crown (drip-line of tree)

Figure 5: **'Edge of crown' technique for estimating the projective foliage cover of an individual canopy tree in combination with cover estimate diagrams**

(see Appendix 5).

Useful tips

- Ensure that only those canopy trees that reach at least 80% of the benchmark mature height are assessed as part of the tree canopy cover component (include any large trees assessed previously that reach minimum canopy height).

- Projective foliage cover estimates should take account of the gaps within the canopy of each tree and the gaps between trees.

- The tree canopy projective foliage cover is effectively the percentage area of the habitat zone that would be under a shadow cast by the foliage of the canopy trees if the sun were directly above.

- Use of a digital camera in combination with diagrams that illustrate differing amounts of projective foliage cover and tree height (see Appendix 5) can help with estimates of cover.

- Remember to assess tree canopy cover for over and under-abundance in comparison to the benchmark. Note that habitat zones with an over-abundant tree canopy cover can never score zero.

Step 2

The tree canopy component is also assessed for its health in a similar way to which large tree health is assessed using a measure of the current projective foliage cover against a predicted 'healthy' projective foliage cover potential. It effectively involves the assessment of the missing foliage cover due to tree decline, mistletoe infestation or insect attack. This 'health' estimate should also include the health of any large trees that reach sufficient height that may have been assessed previously while noting that the loss of foliage due to absent or fallen branches is not considered.

Once the tree canopy cover category has been determined then the health of the tree canopy is assessed and assigned an appropriate health class to determine the tree canopy cover component score for the habitat zone (Table 4).

Tree Canopy Cover Assessment Summary

1. Refer to the EVC bioregional benchmark tree canopy cover.

2. Estimate the tree canopy cover in the habitat zone and place it in the appropriate tree canopy cover category (below).

3. Estimate the average proportion of expected tree canopy cover that is present and place in the appropriate tree canopy cover health class (below).

Table 4:   Criteria and scores for the cover and health of the tree canopy cover in the habitat zone.

Category & Description	% Canopy Health *		
	> 70%	30-70%	< 30%
< 10% of benchmark cover	0	0	0
< 50% or > 150% of benchmark cover	3	2	1
≥ 50% or ≤ 50% of benchmark cover	5	4	3

* Estimated proportion of an expected healthy canopy cover that is present (i.e. not missing due to tree death or decline, or mistletoe infestation.)

Understorey

The understorey assessment involves estimating the number of understorey life forms present in the habitat zone in comparison to the EVC benchmark and then assessing their modification for either diversity or cover. Life forms are defined here as groupings of plant species that share a similar three-dimensional structure and overall dimensions. Life forms often represent discrete structural layers, and several major groupings are recognised (see Appendix 6 for a description of life forms used in habitat hectare assessments and Appendix 7 for some representative examples).

For the majority of understorey life forms, the observer should assess what is present at the time of the assessment, and not what may be present in the future or what may have been present in the past. For example, grazed down 'large tufted graminoids' may be recorded as a 'medium to small tufted graminoids' at the time of the assessment, and therefore 'large tufted graminoids' would be considered absent (although these may be recorded as present at a later stage if there is adequate growth following the removal of grazing).

The presence and abundance of some life forms will be dependent on seasonal factors and life forms whose presence is largely dependent on ephemeral species are identified in the EVC benchmark as a guide. In such cases, assessments conducted at a time of year when the life form would be expected to be present should assess the life form for its presence and degree of modification. Whereas, a precautionary principle could be applied when assessing the same site at a time of year when the life form would likely be absent. In such cases the assessor has the discretion to record the life form as 'present' and 'unmodified' after consideration of other threatening processes (e.g. weed invasion, grazing).

For example, in many mallee EVCs annual species make up the majority of species within the small and medium herb life forms and these species are rarely visible in late Summer or Autumn and appear to be absent. If a remnant patch of mallee is being assessed in February/March and no annual species are observed, then these could be assumed to be present and unmodified after consideration of any observed grazing or weed threats. Conversely, if that same patch were being assessed in September/October and those annual species were still not present, then it is reasonable to assume them to be absent.

Assessments of the understorey components include indigenous plant species *only*[11]. While weed species may have value as habitat for some fauna, overall habitat value (for flora and fauna) is closely linked to the cover and diversity of indigenous species at a site. Similarly, 'native' (but not-indigenous) life forms not appropriate to the EVC should not be assessed as understorey.

It should be noted that both immature tree (Life Form Code 'IT' – see Figure 2) and understorey trees or large shrubs (Life Form Code 'T' – see Figure 2) are assessed as part of the understorey life form component. Immature trees are post-juvenile individuals of the canopy species on the site (usually saplings or regrowth) that are greater than 5 m in height but less than 80% of the mature canopy height. Understorey trees/large shrubs are species in this life form that never form part of the canopy (e.g. *Acacia melanoxylon* in *Wet Forest*) – see Appendix 6 for life form definitions. Juvenile canopy tree species (< 5 m tall) individuals should be assessed as part of the small or medium shrub life forms depending on their height.

Useful tips

- Only indigenous species should be considered as part of the understorey component assessment.

- In general, the understorey component should be assessed according to what is currently observed not what may be assumed to be present in the future.

- Where the life form consists largely of annual or seasonal species (refer to EVC benchmark as a guide) and the life form is not observed, consider the time of year of the assessment and assess the presence/absence of the life form as appropriate after consideration of any threatening processes.

- Cover refers to the projective foliage cover in the habitat zone.

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[11] This may include planted 'indigenous' species considered appropriate to the EVC and site.

Step 1

The understorey component is scored by first determining the range of life forms present in comparison to the EVC benchmark by applying the following rules:

1. For life forms with a benchmark cover of less than 10%, the life form must contain at least one specimen of any species to be considered present.

2. For life forms with a benchmark cover of 10% or greater, the life form must occupy at least 10% of the benchmark cover to be considered present.

Step 2

Those understorey life forms assessed as 'present' in the habitat zone are assessed for their modification for either diversity or cover in comparison to the benchmark according to the following rules:

1. For life forms with a benchmark cover of less than 10%, a life form is considered substantially modified where it contains less than 50% of benchmark species diversity **or** no reproductively-mature specimens are observed.

2. For life forms with a benchmark cover of 10% or greater, a life form is considered substantially modified where it contains less than 50% of the benchmark species diversity **or** occupies less than 50% of the benchmark cover **or** occupies at least 50% of the benchmark cover due largely to immature canopy specimens but the cover of reproductively-mature specimens is < 10% of the benchmark cover.

Assessors will need to ensure that they score the understorey against the full complement of expected life forms and the degree of modification within each based on the observed diversity and cover (Table 5).

Useful tips

- Only those life forms considered present are assessed for their degree of modification. A life form considered 'effectively absent' cannot be considered substantially modified.

- One species may occupy more than one life form depending on the height of individuals within the habitat zone.

- The expected (benchmark) number of species in the immature tree (IT) life form corresponds to the number of canopy tree species observed in the habitat zone.

- The presence and degree of modification of Bryophytes/Lichens (BL) and Soil Crust (S/C) life forms are assessed relative to their cover only.

- Life forms with an over-abundant cover in comparison to the benchmark should not be assessed as substantially modified. In such cases, the over-abundance of one life form (e.g. Bracken in regularly burnt areas) will generally result in the absence or modification of other life forms.

Understorey Assessment Summary

1. Refer to the EVC bioregional benchmark understorey life forms.

2. Identify the number of species within the observed understorey life forms and the cover occupied by these life forms.

3. Determine the number of understorey life forms that are present in comparison to the EVC benchmark number and place in the appropriate understorey 'presence' category (below).

4. Determine the proportion of 'present' life forms that are modified and place in the appropriate modification category (below).

Table 5:   Criteria and scores for the presence and modification of indigenous understorey life forms in the habitat zone.

Category & Description		Value
All strata and life forms effectively absent		0
Up to 50% of life forms present		5
≥ 50% to 90% of life forms present	of those present, ≥ 50% substantially modified	10
	of those present, < 50% substantially modified	15
≥ 90% of life forms present	of those present, ≥ 50% substantially modified	15
	of those present, < 50% substantially modified	20
	of those present, none substantially modified	25

Definitions of present and modified

Present	For life forms with benchmark cover of < 10%, considered 'present' if: • any specimens within life form are observed. For life forms with benchmark cover of ≥ 10%, considered 'present' if: • the life form occupies at least 10% of benchmark cover.
Modified apply only where life form is considered 'present'	For life forms with benchmark cover of <10%, then considered substantially 'modified' if: • the life form has < 50% of the benchmark species diversity; or • no reproductively-mature specimens are observed. For life forms with benchmark cover of ≥ 10%, then considered substantially 'modified' if the life form has either: • < 50% of benchmark cover; or • < 50% of benchmark species diversity; or • ≥ 50% of the benchmark cover due largely to immature canopy specimens but the cover of reproductively-mature specimens is < 10% of the benchmark cover.

Lack of Weeds

The lack of weeds component is assessed according to an estimate of the total percentage weed (projective foliage) cover in the habitat zone and the proportion of this cover due to high threat weeds. This approach not only provides information on the current quality of the site but also the risk posed by weeds in the immediate future.

Note that in general for the purposes of habitat hectare assessments, *those weed species considered to have a high impact are considered high threat.* High impact and hence *high threat weed species* in a habitat zone are defined as introduced species (including non-indigenous 'natives') with the ability to out-compete and substantially reduce one or more indigenous life forms in the longer term assuming on-going current site characteristics and disturbance regime.

A list of commonly occurring weed species is included within most EVC benchmarks. These lists provide a guide to the level of invasiveness and impact of each weed species in the EVC under an assumed natural disturbance regime. It should be noted however, that these lists are not absolute and the assessor should determine the threat posed by any observed weed species in the habitat zone not listed in the EVC benchmark or review the threat status of listed weed species as a result of additional site based disturbance information.

Step 1

The lack of weeds component is scored by first estimating the average percentage projective foliage cover of all weeds in the habitat zone and then placing the vegetation in the appropriate weed cover category (Table 6).

Step 2

The weed species in the habitat zone are assessed for their level of threat and the proportion of the total weed cover due to 'high threat' species is estimated.

Once placed in a weed cover category, the proportion of the total weed cover due to high threat weed species is estimated and the habitat zone is then placed in the appropriate threat class to determine the overall lack of weeds score (Table 6).

Useful tips

- Weeds include introduced and non-indigenous native 'weed' species.

- Weed cover is the estimated average percentage projective foliage cover of all weed species in the habitat zone.

- High threat weeds are those considered to have a high impact on indigenous life forms regardless of their invasiveness.

- If total weed cover is negligible (< 1%) and high threat weed species are present then the habitat zone scores '13'.

Lack of Weeds Assessment Summary

1. Determine the weed species present and estimate the total cover of weeds in the habitat zone and place in the appropriate weed cover category (below).

2. Assess the threat posed by identified weeds using the EVC bioregional benchmark as a guide where necessary.

3. Estimate the proportion of the total weed cover due to high threat weed species and place in the appropriate threat class (below).

Table 6: Criteria and scores for the cover and threat of non-indigenous plant species present within the habitat zone.

Category & Description	Value 'high threat' weeds*		
	None	≤ 50%	> 50%
> 50% cover of weeds	4	2	0
25 - 50% cover of weeds	7	6	4
5 - 25% cover of weeds	11	9	7
< 5% cover of weeds**	15	13	11

* Proportion of weed cover due to 'high threat' weeds – see EVC benchmark for guide

** If total weed cover is negligible (< 1%) and high threat weed species are present then the habitat zone scores '13'

Recruitment

The recruitment component assesses the presence of recruitment in the habitat zone and then qualifies this score depending on the adequacy (and diversity) of this recruitment. In this context, 'adequate' is considered to be sufficient recruitment to replenish natural attrition of individual plants and species within the various life forms found in the habitat zone, to maintain or improve the site condition.

To reduce the risk of assessor and seasonal variation, the recruitment assessment focuses upon species within woody perennial life forms taller than prostrate shrubs. This approach recognises that recruits of larger woody perennials are generally less susceptible to short term spatial and temporal changes and are generally easier to observe. For the purposes of this assessment, 'recruitment' is defined as the establishment of individual plants beyond the initial seedling (or early germinant) stage and survival for at least one year since germination or first establishment. Recruitment can also include older, suppressed individuals that would likely function as recruits if competition were reduced through some stochastic event.

Note that a different approach for assessing recruitment in some treeless EVCs is applied where these lack woody species (see Section 9 – *Assessing treeless vegetation*).

Recruitment strategy

Recruitment in most EVCs in Victoria is driven by periodic events such as climatic changes, fire or soil disturbance to some extent. However, for the purposes of habitat hectare assessments, those EVCs where on-going recruitment of woody life forms would be expected to continue in between disturbance events are considered to exhibit a *continuous* recruitment strategy.

For some EVCs however, recruitment of many species of woody trees and shrubs may be infrequent and/or episodic and/or unpredictable. For this reason recruitment can only be assessed relative to the frequency of the disturbance event that initiates recruitment (e.g. fire, flooding, etc.) and such EVCs are considered to exhibit an *episodic* recruitment strategy.

In the case of episodically driven recruitment, no recruitment can reasonably be expected in the absence of such a recruitment event. However, if a recruitment event is known to have occurred recently and no recruitment can be detected after a reasonable length of time, or the recruitment that has occurred is considered to be 'poor' or 'sporadic', then this may constitute a serious problem for the long-term viability of the vegetation remnant. In contrast, the absence of recruitment *without* appropriate recruitment events or stimuli would *not* be considered a recruitment failure.

The EVC benchmark identifies whether the EVC relies on continuous or episodic recruitment. If recruitment is dependent on episodic disturbance, the type and desirable period of such disturbance is also provided as a guide to assist the assessor to determine whether recruitment should reasonably be expected to be observed.

Step 1

The recruitment component is first assessed by determining whether there is any recruitment cohort observed in the habitat zone. A recruitment cohort represents a group of woody plants established at the same time. If there is evidence of a recruitment cohort then the assessor must determine the proportion of native woody species present exhibiting adequate recruitment (go to Step 2). Note that in the case of *episodic* EVCs, some observed recruitment at very low levels could be assessed as 'no evidence of a recruitment cohort' and scored appropriately according to Table 7.

If no recruitment is observed then the assessor must determine whether the EVC is dependent on episodic recruitment and if so, whether there has been a suitable disturbance event within the desirable recruitment period and score this appropriately (Table 7). Refer to the EVC benchmark as a guide.

Useful tips

- Only species within woody life forms taller than prostrate shrubs are assessed for their recruitment.

- For understorey life forms, a recruit is defined as an immature woody plant that contains no evidence of flowering or fruiting material.

- Refer to the EVC benchmark as a guide to whether the EVC exhibits continuous or episodic recruitment.

Step 2

Where recruitment has been observed, determine whether recruitment is adequate for each woody species in the habitat zone for both the canopy and understorey.

For the canopy, treat multiple eucalypt species as a single species. Adequate recruitment of the tree canopy constitutes the presence in the habitat zone of at least 2 cohorts (a group of seedlings *and* a group of saplings < 5 m tall) unless otherwise indicated in the benchmark[12].

In addition, where the current tree canopy cover is less than the benchmark cover, adequate recruitment will constitute sufficient recruitment to return the tree canopy cover to benchmark cover over time (assuming complete survivorship of all recruits observed in the habitat zone). For example, where the tree canopy cover of a habitat zone is less than 50% of the EVC benchmark, then adequate recruitment would constitute enough seedlings and saplings to fill the gaps in the canopy over time.

For each woody understorey species, adequate recruitment requires that the number of immature individuals of each species observed in the habitat zone should be at least 10% of the number of observed mature individuals of that species.

Useful tips

- Treat multiple eucalypt canopy species as a single species.

- Adequate recruitment of the tree canopy requires at least 2 cohorts to be present (a group of seedlings, a group of saplings < 5 m tall) **and** where the current tree canopy cover is less than the benchmark cover, sufficient recruitment to return the tree canopy cover to benchmark cover over time (assuming complete survivorship of all recruits) taking into account the presence and abundance of any immature canopy trees in the habitat zone.

- Adequate recruitment of woody understorey species requires that the number of immature individuals of each species observed in the habitat zone should be at least 10% of the number of observed mature individuals of that species.

- Immature individuals are those plants that do not exhibit any evidence of flowering, fruiting or other reproductive material.

Step 3

Once the recruitment of each woody species has been assessed for its adequacy, then the proportion of total woody species considered to be adequately recruiting in the habitat zone can be calculated and assigned to a percentage category (Table 7).

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[12] Note that continuous recruitment of the canopy species is not expected in some otherwise continuously recruiting EVCs (e.g. Wet Forest, Red Gum-dominated riverine forests, and various mallee EVCs). In such cases, assessment of canopy species recruitment can be ignored if no recruitment is observed – refer to EVC benchmark as a guide.

Step 4

The final step for scoring the recruitment component involves comparing the number of woody species present in the habitat zone (both recruiting and non-recruiting) against the benchmark number of woody species within the applicable life forms and expressing this as a percentage to assign the recruitment component to a diversity class (Table 7). Immature Trees (IT) and multiple eucalypt species should be treated as one species.

Useful tip

- To determine the benchmark number of woody species add up the total number of species in the understorey trees/large shrub (T), medium shrub (MS) and small shrub (SS) life forms in the benchmark and then add one for the combined eucalypt canopy and immature canopy tree life form.

Recruitment Assessment Summary

1. Determine whether at least one recruitment cohort is present in the habitat zone.

2. If recruitment is not observed then refer to EVC bioregional benchmark recruitment strategy and where applicable decide whether an appropriate episodic recruitment event has occurred within the desirable disturbance period.

3. Place in the appropriate recruitment class within the *no evidence of a recruitment cohort* category (below).

4. If recruitment is observed then determine the proportion of woody species present that have adequate recruitment and place in the appropriate recruitment class within the *evidence of at least one recruitment cohort* category (below).

5. Determine the total number of woody species (small shrub and taller and counting the eucalypt canopy and immature canopy tree species as one species) observed in the habitat zone (both recruiting and non-recruiting) and compare this to the number of species within the applicable woody life forms in the EVC benchmark.

6. Determine the woody species diversity and place in the appropriate diversity class (below).

Table 7: Criteria and scores for the adequacy of recruitment of *woody perennial native species* present within the habitat zone.

Category & Description			High diversity*◊	Low diversity*◊
No evidence of a recruitment 'cohort'+	within EVC not driven by episodic events		0	0
	within EVC driven by episodic events^	clear evidence of appropriate episodic event	0	0
		no clear evidence of appropriate episodic event	5	5
Evidence of at least one recruitment 'cohort' in at least one life-form	proportion of native woody species present that have adequate recruitment◊	< 30%	3	1
		30 - 70%	6	3
		≥ 70%	10	5

+ 'cohort' refers to a group of woody plants established in a single episode (can include suppressed canopy species individuals)
^ refer to EVC benchmark for clarification
* high diversity defined as > 50% of benchmark woody species diversity
◊ treat multiple eucalypt canopy species as one species

Organic Litter

The organic litter assessment involves estimating the percentage cover of the organic litter in the habitat zone in comparison to the EVC benchmark percentage cover and then qualifying this score depending on the proportion of this litter due to native species.

Litter is defined as organic material detached from the parent plant, including both coarse and fine plant debris, and material such as fallen leaves, twigs and small branches less than 10 cm diameter present at ground level. It does not include branches or wood greater than 10 cm diameter (included in logs component assessment) nor does it include elevated organic litter such as bark and small branches that may have lodged in understorey trees and shrubs.

Step 1

The organic litter component is scored by first estimating the percentage cover of organic litter across the habitat zone and comparing this to the benchmark cover. Note that this cover can include organic litter that may be present under overhanging vegetation and this should be accounted for. The vegetation should then be placed in the appropriate organic litter cover category (Table 8).

Note that the habitat hectares approach refers to percentage difference from the organic litter cover benchmark. By inference, this means that sites need to be assessed for their over-abundance as well as under-abundance of organic litter cover. However, habitat zones that have an over-abundance of organic litter cover in comparison to the benchmark can never score zero for organic litter cover.

Useful tips

- Organic litter is defined as organic material detached from the parent plant, including both coarse and fine plant debris, and material such as fallen leaves, twigs and small branches less than 10 cm diameter present on the ground.

- Organic litter percentage cover estimates should take account of the litter that may exist under overhanging vegetation.

- Remember to assess organic litter cover for over and under-abundance in comparison to the benchmark. Note that habitat zones with an over-abundance of organic litter can never score zero.

Step 2

Once the appropriate organic litter cover category has been determined then the proportion of this organic litter cover that is due to native species is assessed and the habitat zone is then placed in the appropriate dominance class to determine the overall organic litter component score (Table 8).

Useful tip

- To assist with the assessment of how much of the organic litter cover may be due to native species, consider the proportion of native and introduced species in the habitat zone and their overall likely contribution to the organic litter cover.

Organic Litter Assessment Summary

1. Refer to the EVC bioregional benchmark organic litter cover.

2. Estimate the percentage cover of organic litter within the habitat zone in comparison to the benchmark cover and place in the appropriate organic litter cover category (below).

3. Determine whether the organic litter cover is dominated by 'native' or 'non-native' organic litter and place in the appropriate dominance class (below).

Table 8:   Criteria and scores for the cover of organic litter present within the habitat zone.

Category Description	Dominated by native organic litter	Dominated by non-native organic litter
< 10% of benchmark cover	0	0
< 50% or > 150% of benchmark cover	3	2
≥ 50% or ≤ 150% of benchmark cover	5	4

Logs

The logs assessment involves estimating the length of logs present in the habitat zone and comparing this to the EVC benchmark log length. The logs score is further qualified depending on whether the length of large logs present in the habitat zone is greater than 25% of the EVC benchmark log length.

Logs are defined as dead timber fallen to the ground (substantially detached from the parent tree) with a diameter ≥ 10 cm. They are assessed against the benchmark length of logs within a 1000 m^2 (50 m x 20 m or equivalent) area. Note that large habitat zones may require a number of log assessments across the habitat zone to score the log component appropriately.

Note that cut stumps (≥ 10 cm in diameter at the base) less than *breast height* (1.3 m tall) are also included in the log assessment and for expediency these are assigned a default length of 0.5 m per stump.

Large logs are defined as logs that have a diameter of at least half the large tree DBH, as defined in the EVC benchmark. For EVCs that do not contain a large tree component, no large log class is required and the log assessment is dependent solely on the combined length of logs greater than 10 cm diameter in comparison to the EVC benchmark (see Section 9 – *Assessing treeless vegetation*).

In general, it is a good idea for assessors to initially accurately measure a few logs with a diameter tape until they can confidently determine the 10 cm and large log diameter thresholds by 'eye'. Depending on the size of the habitat zone being assessed, log lengths should be assessed in one or more 0.1 ha sample areas and averaged across the habitat zone to determine the final logs component score.

Step 1

The logs component is scored by first identifying those logs in the habitat zone that are equal to or greater than 10 cm diameter. These then need to be measured and compared to the EVC benchmark length. The habitat zone should then be placed in the appropriate log length category (Table 9).

Useful tips

- For each new habitat zone assessment or sample assessment area, use a diameter tape to initially assess logs at or near 10 cm and the appropriate large log diameter threshold until this can confidently be estimated by 'eye'.

- Pay particular attention to logs in the 10-20 cm diameter size class as these can often be overlooked or difficult to observe in some vegetation types.

- Use a default length of 0.5 m for any cut stumps (≥ 10 cm diameter at the base) that are less than breast height.

- Unlike tree canopy cover and organic litter, logs can never be assessed as over-abundant.

Step 2

Once the appropriate log length category has been determined then the logs in the habitat zone are assessed according to whether large logs are present or effectively absent and assigned to the appropriate presence/absence class to determine the logs component score for the habitat zone (Table 9).

Large logs are assessed as present if large logs reach ≥ 25% of benchmark log length or effectively absent where they do not reach this threshold.

Useful tip

- Large logs are defined as logs that have a diameter of at least half the large tree benchmark diameter at breast height (DBH) for the EVC.

- Large logs are considered present where they make up at least 25% of the EVC benchmark log length.

- EVCs that do not contain a large tree component do not require a 'large logs' assessment. Such sites should be scored as if 'large logs present' (see Table 9).

Logs Assessment Summary

1. Refer to the EVC bioregional benchmark log length/0.1 ha.

2. Determine the size of the of the habitat zone or sample area(s).

3. Estimate the average length of logs within the habitat zone or sample area(s) in comparison to the benchmark length and place in the appropriate log length category (below).

4. Estimate the average length of large logs within the habitat zone or sample area(s) and determine whether large logs are considered 'present' (according to the definition) and place in the appropriate large log class (below).

Table 9:   Criteria and scores for the length and size of logs present within the habitat zone.

Category Description	Large logs[^] present*	Large logs[^] effectively absent[#]
< 10% of benchmark length	0	0
< 50% of benchmark length	3	2
≥ 50% of benchmark length	5	4

[^] **large logs** defined as those with diameter ≥ 0.5 of benchmark large tree dbh

* **present** defined as present if large log length is ≥ 25% of EVC benchmark log length

[#] **effectively absent** defined as absent if large log length < 25% of EVC benchmark log length

8. Assessing 'Local Landscape Context' Components

Introduction

Aside from assessing the site condition components, the habitat hectares approach also relies on an assessment of other factors that influence the patch, including its size and position in the vegetated landscape.

These 'landscape context' components are to be assessed beyond the habitat zone and are best calculated using Geographical Information Systems (GIS) for optimal accuracy and consistency. The Department of Sustainability and Environment (Biodiversity and Natural Resources Division) has developed the GIS capacity to calculate the 'landscape context' for any point in the landscape with reference to geographic information layers such as tree cover, wetlands and streams[13]. Nevertheless, it is possible to undertake a simplified form of these assessments in the field with the aid of maps and scoring templates, and the guidelines are designed to allow this.

Patch Size

A habitat zone being assessed may form part of a patch that includes a range of other vegetation types of differing quality across a range of different land tenures. For habitat hectare assessments, the patch is defined as the area of native vegetation[14] (irrespective of EVC, quality or tenure) that is continuous with the assessment area (habitat zone). A patch often has a defined physical boundary such as cleared land.

For the purposes of habitat hectare assessments, vegetation corridors and linkages such as road reserves connecting larger areas of native vegetation are considered part of the larger patch where they have a minimum width of 50 m. Vegetation that is contiguous with a larger patch but which is less than 50 m wide should be treated as a different patch.

Step 1

While the boundary of a patch can sometimes be determined on-site relatively easily, this is not always the case. A convenient approach to assess the size of the patch in the field is to use a scaled aerial photograph or tree cover/EVC map and then score the patch size according to Table 10.

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[13] Contact DSE Biodiversity and Natural Resources Division for further information on the landscape context assessment.

[14] Native vegetation is defined for the purposes of the landscape context component of the assessment as vegetation that is on cursory inspection dominated by local indigenous species or is predominantly of native species.

Step 2

Note that when patch size reaches 20 ha or more, its score is qualified according to whether the patch is considered significantly disturbed. The definition of 'significantly disturbed' uses a similar approach to that applied under the Regional Forest Agreement Old Growth analyses where significant un-natural disturbance was considered as European disturbances that have altered the primary attributes (ie. floristics, structure and growth stage) of the native vegetation. In general, this refers to actions such as grazing, mining, agricultural clearing, timber harvesting, fuel reduction burns and other disturbances such as road-making and *Phytophthora* infestation. Effectively, using this definition, all patches of native vegetation in fragmented and relictual landscapes are considered significantly disturbed.

Useful tip

- Vegetation corridors such as road reserves connected to and linking large areas of native vegetation should be at least 50 m wide to be considered as part of the same patch.

Table 10:   Criteria and scores for the area of the nominated patch.

Category & Description	Value
< 2 ha	1
between 2 and 5 ha	2
between 5 and 10 ha	4
between 10 and 20 ha	6
> 20 ha but 'significantly disturbed'*	8
> 20 ha but 'not significantly disturbed'	10

* as defined in the Regional Forest Agreement Old Growth analyses

(note: effectively all remnants in the fragmented and relictual rural landscapes are classified as 'significantly disturbed')

Neighbourhood

The neighbourhood score represents the amount and configuration of native vegetation within proximity of the habitat zone being assessed. The approach estimates the amount of native vegetation present within three 'neighbourhood' radii (ie. 100 m, 1 km, 5 km) that are nested within each other around the habitat zone (Figure 6). The centre of the scoring circles is located at the centroid (centre point) of the habitat zone being assessed. The question asked of the observer for each neighbourhood is: "What proportion of the area within each radius of the site is made up of native vegetation?"

It should be noted that native vegetation in the neighbourhood analysis includes any EVC (treed or treeless) regardless of type, quality or tenure and can also include natural wetlands, lakes, estuaries and rivers present within the three radii.

It should also be noted that tree cover/extant EVC maps may underestimate the extent of treeless and some open woodland vegetation types. In such situations where vegetation of this type is known to exist in the neighbourhood, then some field-based estimates of native vegetation within the three neighbourhood radii may be required.

When assessing near coastal vegetation, the shape of the neighbourhood 'boundaries' should be adjusted to coincide with the low tide mark thus excluding the open sea / ocean (Figure 7).

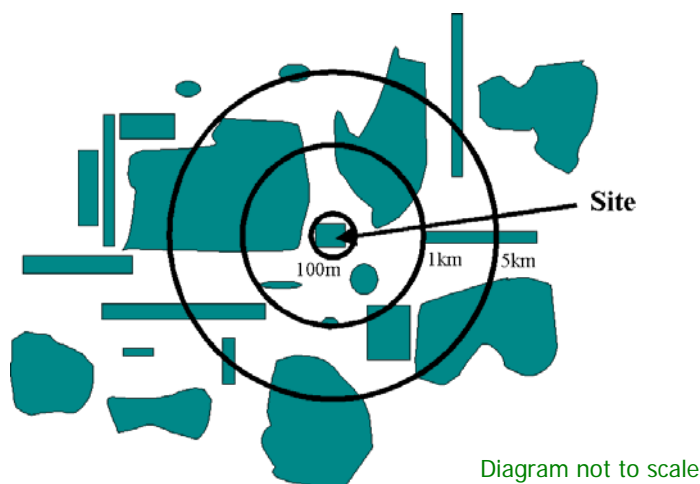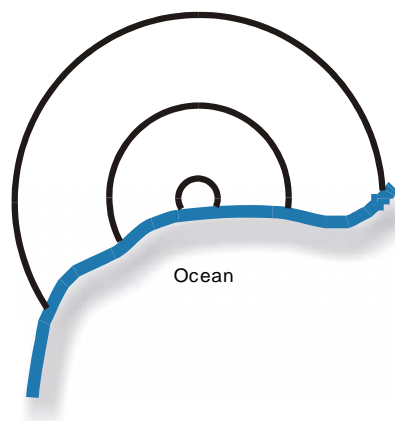**Figure 6:   The principle of neighbourhood analysis for habitat hectare assessments.**

Diagram not to scale

Figure 7:   Neighbourhood analysis of near coastal vegetation.

Ocean

Step 1

Assess the amount of native vegetation by rounding up or down to the nearest 20% (ie. 0%, 20%, 40%, 60%, 80% and 100%) for each of the three neighbourhood radii. This analysis will be most accurately and consistently performed using the GIS tool but can also be estimated using a transparency marked with 'landscape context' radii at the same scale of the map or remotely-sensed image being used in the field.

Multiply the percentage native vegetation value for each radius by the appropriate radius weighting (see Table 11) to determine the score for each of the three neighbourhood radii.

Step 2

Once the neighbourhood radii scores have been determined, the level of disturbance to native vegetation within the neighbourhood needs to be considered. Subtract two from the neighbourhood score if the native vegetation in neighbourhood is considered 'significantly disturbed' according to the Regional Forest Agreement Old Growth definition of significantly disturbed as applied previously to patch size.

Sum the three neighbourhood radii scores from step one (and subtract two for the 'disturbance score' where appropriate) and round off to calculate the final neighbourhood score.

Useful tips

- If the percentage of native vegetation within a radius is considered at least half way to the next 20 percentile, then round up to the nearest 20%. If less than half, then round down.

- The minimum total neighbourhood score is zero. Negative scores should be rounded up to zero.

- Natural wetlands and lakes (i.e. not artificial impounds), estuaries and rivers should be considered 'native vegetation' for the purposes of the neighbourhood assessment. The open sea / ocean is not considered native vegetation.

Table 11: Example calculation of the neighbourhood component for the site shown in Figure 6. *Italicised values indicate those estimated in the field.*

Radius from site	% native vegetation *	Weighting	
100 m	*80*	0.03	*2.4*
1 km	*40*	0.04	*1.2*
5 km	*40*	0.03	*1.2*
	subtract 2 if the neighbourhood is 'significantly disturbed'		*-2.0*
	Add Values and 'round-off'		*3.0*

* to nearest 20%

multiply % native vegetation x Weighting for each radius from the site (e.g. 40% x 0.03 = 1.2); add values to obtain total Neighbourhood Score and subtract 2 if neighbourhood vegetation is considered 'significantly disturbed'.

Distance to Core Area

The final component of the landscape context assessment is an estimation of the distance to the nearest 'core area'. For habitat hectare assessments, a 'core area' is defined as any patch of native vegetation greater than 50 ha regardless of type, quality or tenure. Where a habitat zone is part of a remnant patch greater than 50 ha, the distance to core area would be considered contiguous.

Step 1

Determine the shortest distance from the edge of the habitat zone being assessed to the edge of the nearest core area and place the vegetation in the appropriate core area distance category (Table 12).

Step 2

Determine whether the core area is considered 'significantly disturbed' according to the Regional Forest Agreement Old Growth definition of significantly disturbed as applied previously to patch size and neighbourhood components. Place in the appropriate disturbance class (Table 12).

Table 12: Criteria and scoring relating to the distance to core area.

Distance	Core Area not significantly disturbed*	Core Area significantly disturbed*
> 5 km	0	0
1 to 5 km	2	1
< 1 km	4	3
contiguous	5	4

* defined as per RFA 'Old Growth' analyses

9. Assessing Treeless Vegetation[*]

Introduction

Habitat hectare assessments of EVCs that may naturally lack one or more of the habitat components normally assessed require that only those habitat components applicable to the EVC be assessed against the relevant benchmark. The final *site condition* score then needs to be standardised to make it equivalent to a treed EVC site condition score.

Following is a summary of the assessment and standardisation requirements for particular habitat components as they apply to various treeless vegetation types of different structure. Assessors should also consult the relevant EVC benchmark as a guide to which habitat components need to be applied to particular EVCs.

Large Trees Component

Note that most grasslands, shrublands and scrubs do not include a large tree component, however emergent or isolated trees may sometimes be present. In general, these can be ignored when conducting a habitat hectare assessment and considered in the context of specific large tree accounting where required (see NRE 2002). In such cases the large tree benchmark applicable to the nearest treed-relative of the treeless EVC should be applied. For example, for *Damp Heathland*, use the *Damp Heathy Woodland* large tree benchmark DBH to account for large trees.

As previously described, some EVCs and EVC mosaics and complexes may exhibit a range of natural structural variation from treed to treeless (see Section 5 – *Site Inspection*). In such cases, the assessor will be able to apply the appropriate benchmark based on the observed structural characteristics of the habitat zone being assessed.

Canopy Cover Component

Applicable to some shrublands and scrubs and assessed in accordance with the habitat hectares method for assessing tree canopy cover in treed EVCs – refer to EVC benchmark.

Understorey Component

Applicable to all EVCs and assessed in accordance with habitat hectares method for assessing understorey in treed EVCs.

Lack of Weeds Component

Applicable to all EVCs and assessed in accordance with habitat hectares method for assessing lack of weeds in treed EVCs.

Recruitment

For EVCs with *woody* life forms, recruitment is assessed in accordance with the habitat hectares method for assessing recruitment in treed EVCs except for the eucalypt overstorey, which is lacking.

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[*] Refers to all vegetation types without a tree overstorey (although may include taller shrublands and scrubs) and structurally dominated by either woody or non-woody life forms. May also include vegetation types with occasional emergent trees.

For EVCs with *herbaceous* life forms (i.e. no woody understorey life forms taller than a prostrate shrub in EVC benchmark), recruitment is not assessed directly (as with woody vegetation) but rather the area available for recruitment is estimated effectively as an assessment of *recruitment potential.*

The recruitment potential is a measure of the space available for recruitment where this comprises all areas (excluding surface rocks) not covered by vascular vegetation (native or introduced – including over-hanging vegetation) or organic litter and takes account of cover due to bare ground, bryophytes/lichens and soil crust.

The habitat zone is placed within a recruitment class depending on the cumulative cover of bare ground, bryophytes/lichens and soil crust. The native herb diversity in the habitat zone is then compared to the benchmark herb diversity and scored according to Table 13.

Table 13: Assessing recruitment in EVCs with no woody understorey life forms.

Percentage cover of recruitment area#	High native herb diversity*	Low native herb diversity*
0 to 5% cover	0	0
> 5% to 20% cover	6	3
> 20% to 40% cover	10	6
> 40% to 60% cover	6	3
> 60% to 90% cover	3	1
> 90% cover	0	0

cumulative % cover of bare ground, bryophytes/lichens and soil crust

* high native herb diversity defined as ≥ 50% of benchmark diversity within 'herb' life forms

Organic Litter Component

Applicable to all EVCs and assessed in accordance with the habitat hectares method for assessing organic litter in treed EVCs.

Logs Component

Applicable to some shrublands and scrubs and assessed in accordance with the habitat hectares method for logs in treed EVCs (refer to EVC benchmark as a guide).

Note that most shrublands and scrubs do not contain a large tree component and hence a large log assessment is not required (refer to EVC benchmark as a guide). Such EVCs should be scored as if 'large logs present' according to Table 9.

Final 'site condition' score

The final site condition score from the habitat hectare assessment must be standardised to make it equivalent to a treed-EVC site condition score using the following information, where:

- the total site condition score for treed EVCs = *75*

- the maximum total site condition score for treeless EVCs = *A*
  (always < 75 and dependent on the number of habitat components requiring assessment – see Table 14 for a guide) and

- the treeless EVC site condition score for habitat zone = *B*

And then applying the following formula:

(75 / A) X B = standardised site condition score

This standardised site condition score is then combined with the landscape context score to determine the final habitat score for the treeless EVC. Examples of scoring various treeless EVCs using a multiplier to standardise the 'site condition' score are given in Table 14 below.

Table 14:   Examples of scoring site condition in different treeless EVCs.

Vegetation type	Habitat Components / Score								multiplier required to standardise
	LTs	TCC	US	W	R (W)	R (H)	OL	Logs*	
Sand Heathland	na	na	25	15	10	na	5	na	(75/55) or 1.36
Swamp Scrub	na	5	25	15	10	na	5	5	(75/65) or 1.15
Escarpment Shrubland	na	5	25	15	10	na	5	5	(75/65) or 1.15
Plains Grassland	na	na	25	15	na	10	5	na	(75/55) or 1.36
Creekline Tussock Grassland	na	na	25	15	na	10	5	na	(75/55) or 1.36
Woodland or Forest (for comparison)	All habitat components								1

LTs   Large trees
TCC   Tree canopy cover
US   Understorey
W   Lack of weeds
R (W)   Recruitment assessed according to woody species
R (H)   Recruitment assessed according to herbaceous species
OL   Organic litter
Logs*   Logs (note that large log assessment is not required)

10. Final Habitat Score

The final habitat score out of 100 for the habitat zone is determined by summing all the scores from each site condition and landscape context component. This score can be converted to a score out of 1.00.

The final habitat hectare value is a measure of both the quality (habitat score) and quantity (hectares) of the vegetation, and therefore requires consideration of the total number of hectares present. It is determined by multiplying the habitat score (as a decimal) of the habitat zone by the number of hectares in the habitat zone (Table 15).

Table 15: Example calculation of overall *habitat hectares* of a patch of remnant vegetation composed of three habitat zones.

Habitat Zone	EVC	Area (ha)	Habitat Score	Calculation	Habitat Hectares
1	1	5.9	0.83	5.9 *x* 0.83	4.9
2	1	6.8	0.43	6.8 *x* 0.43	2.9
3	2	4.3	0.27	4.3 *x* 0.27	1.2
		17		*Total Patch habitat hectares*	9.0

11. References

NRE (2002). *Victoria's Native Vegetation Management: A Framework for Action.* Department of Natural Resources and Environment, East Melbourne.

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