Tasmanian Vegetation Condition Method

DOCUMENT DETAILS

Method Name: Tasmanian Vegetation Condition Method

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Confidence Levels: Level 2 or Level 3

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TASMANIAN VEGETATION CONDITION METHOD 2023

Prepared by Matt Taylor of Ecotec Environmental on behalf of Forico Pty Limited as a method to be used to monitor vegetation condition for Environmental Accounts under the Accounting for Nature® Framework.

Introduction

This Method has been developed to assess the condition of native vegetation within Tasmania. The Method is readily applied at multiple scales, from small (<10ha) patches of native vegetation to regional property portfolios containing thousands of hectares of native vegetation.

This Method is based on the Tasmanian Vegetation Condition Assessment (VCA) Manual (Michaels 2006 – attached to this document as Appendix A), which is the standard method used to assess native vegetation condition across Tasmania. The Tasmanian VCA method was adapted from and is very similar to the Victorian 'Habitat Hectares' method (Parkes et al. 2003). The VCA method is the culmination of a large amount of research, including collection of empirical data from almost all Tasmanian vegetation types as well as collation of expert knowledge and opinion (Michaels 2006).

This Method is proposed to accredit the use of the Tasmanian VCA Method within the Accounting for Nature® framework, including options for both *Detailed Assessment* and *Rapid Assessment* procedures. The data collection methods and calculations align closely to the Tasmanian VCA Manual (Michaels 2006). However, we have adapted the sampling strategy to make it suitable for long-term use in environmental accounting, by defining the survey effort expected and standardising the sampling design to improve repeatability. This Method has been prepared in accordance with AfN's Guidelines for Developing Native Vegetation Methods.

Aims and Scope of Method

Purpose	This Method aims to allow the existing Tasmanian Vegetation Condition Assessment (VCA) Method (Michaels 2006) to be used to support natural capital accounting within the Accounting for Nature® framework. The existing VCA method (Michaels 2006) is already widely used by developers, land managers and environmental agencies, and provides a tool for both snapshot surveys as well as long-term monitoring of changes over time in vegetation condition.
Scope	This Method aims to be able to both provide a snapshot of baseline condition and enable repeat monitoring over time.
Expertise	The application of this method requires expertise in Tasmanian plant identification and vegetation survey techniques.
Target Audience	All Tasmanian landholders.
Decisions to inform	This Method should be used to trigger management intervention if needed, and to report long-term or coarse changes in the condition of native vegetation.
Assessment procedures	This Method provides instructions for undertaking both Detailed Assessments and Rapid Assessments of vegetation condition, which can be used to produce accounts with different degrees of confidence (see below). Detailed Assessment We recommend using this procedure for preliminary baseline assessments of condition as it can be used to produce Level 2 Accounts. However, site assessments are significantly more time consuming and most suitable for infrequent assessments (e.g. 5 yrs) and larger projects with adequate resources. This procedure can be used as a stand-alone method. Rapid Assessment This procedure can be used as a stand-alone method to produce Level 3 accounts, or as a complementary method to Detailed Assessments, by being undertaken in intervening years to increase the frequency of sampling. If used as a stand-alone method, this approach is best suited to smaller projects with fewer resources.
Confidence Level/s	**Level 2** – The Detailed Assessment Procedure has a Level 2 confidence level, as it assesses a comprehensive suite of vegetation condition indicators. Requires GIS calculation of landscape configuration indicators. **Level 3** – The Rapid Assessment Procedure has a Level 3 confidence level. It assesses the same indicators but using a less precise field evaluation and calculation procedure. Also applicable to accounts that have collected site-based data using the Detailed Assessment Procedure, but assessed landscape configuration indicators using the visual assessment approach recommended by Michaels (2006).

Application of the Method

Scale and Size	Property, Project and Aggregate Scales. This Method is readily scaleable and can be applied at very fine (<10ha) to very large (> 100,000ha) landscape scales.
Geographical application	Tasmania-wide, in areas of native vegetation (Figure 1).
Realm	The Method can be applied to the following Realms as defined in the IUCN Global Ecosystem Typology: - Land - Land/Freshwater (e.g. transition realms such as wetlands) - Land/Marine (eg. transition realms such as saltmarshes)
Biome/Functional Ecosystem Group	The Method can be applied in the following Biomes and Functional groups as defined in the IUCN Global Ecosystem Typology: T2 Temperate-boreal forests and woodlands biome - T2.3 Oceanic cool temperate rainforest - T2.5 Temperate pyric humid forests - T2.6 Temperate pyric sclerophyll forests and woodlands T3 Shrublands and shrubby woodlands biome - T3.2 Seasonal dry temperate heath and shrublands T4 Savannas and grasslands biome - T4.4 Temperate woodlands - T4.5 Temperate subhumid grasslands T6 Polar/alpine (cryogenic) biome - T6.4 Temperate alpine grasslands and shrublands FT Lakes Biome - F2.1 Large permanent freshwater lakes - F2.2 Small permanent freshwater lakes TF1 Palustrine wetlands biome - TF1.2 Subtropical/temperate forested wetlands - TF1.6 Boreal, temperate and montane peat bogs MFT Marine-Freshwater-Terrestrial - MFT1.3 Coastal saltmarshes and reedbeds MT2 Supralittoral coastal biome - MT2.1 Coastal shrublands and grasslands - MT2.2 Large seabird and pinniped colonies

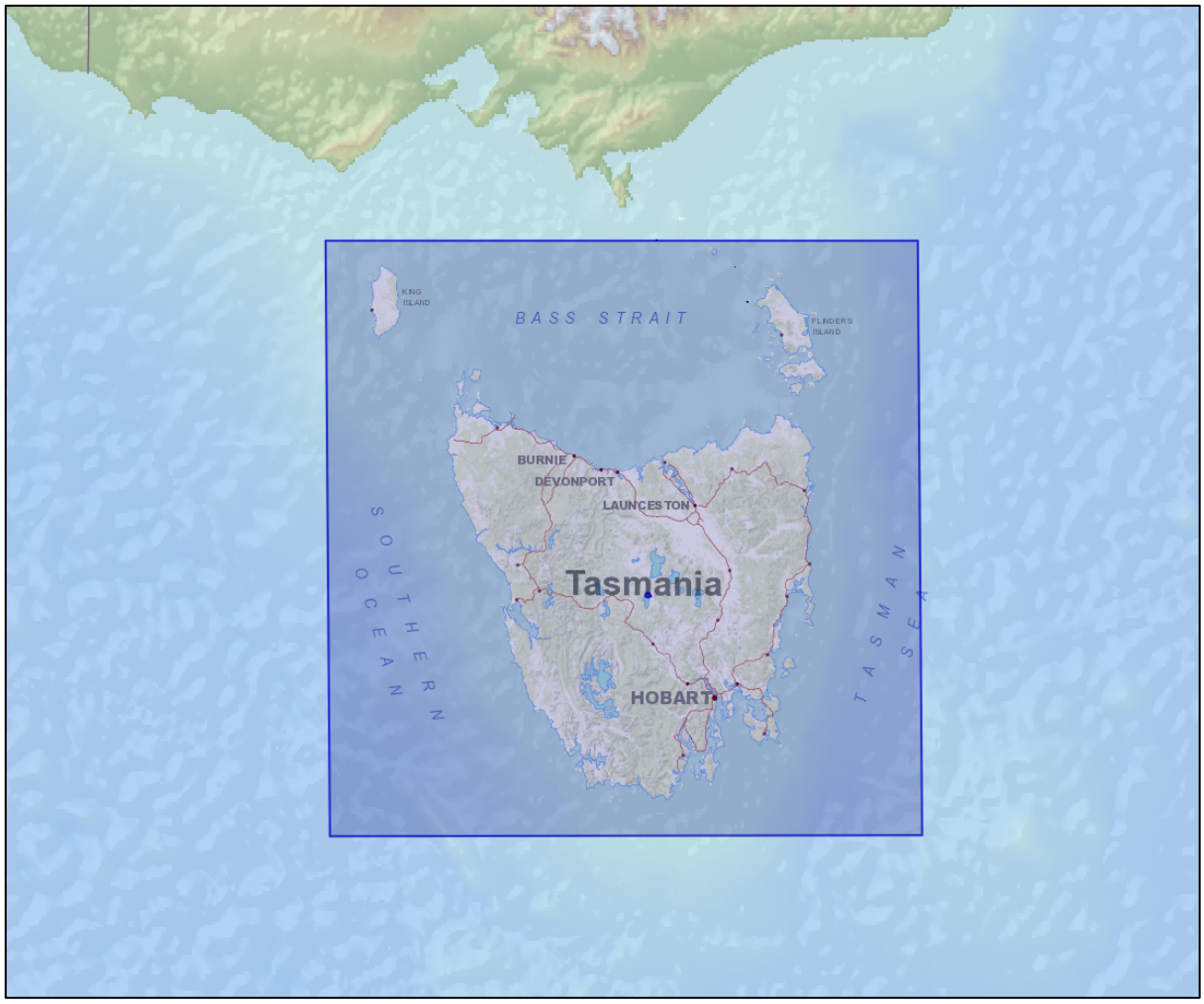

Figure 1. Map showing geographic application of the Method – all vegetated areas of Tasmania

What an Environmental account looks like

The *Accounting for Nature*® Framework requires the following information for an Environmental Account to be certified:

1. An **Information Statement** – describes in detail the Method used and the actions taken to address each element of the Accounting for Nature® Framework, including the rationale behind asset selection, choice of indicators, Method used, analysis and management of data and calculation of the Econd®.
2. The **Environmental Account** – a database (such as an excel file) that contains all the data described in Asset Tables, Data Tables, and Balance Sheets.
3. A **Verification Report** or **Self Verification Report** that verifies the Account was prepared in accordance with the approved Methods, the *AfN Certification Standard* and *AfN Audit & Verification Rules*. As part of the verification process, **supporting documentation,** such as the outputs from each step of the Method, will be required to ensure the Method has been followed correctly (refer to section on Record-keeping below).
    - A Verification Report is completed by an AfN Accredited Auditor and is required if you are seeking to have your account "Certified" (Tier 1); OR
    - A Self-verification Report contains the results of your self-verification assessment and AfN's Technical Assessment and is required if you seek to have your account "Self-verified" (Tier 2).

The Information Statement will be published on the AfN Environmental Account Registry upon account certification.

Record-keeping

Throughout the Method, each step has a designated output box, which describes the key outputs that should be generated for each step. These outputs are summarised into a checklist in Appendix C. The output of each step and a description on how it was generated is required for the Environmental Account verification and is used to confirm that the Method has been followed correctly. Proponents are therefore required to record and retain each output and provide these in confidence as part of the Environmental Account verification process.

Definitions

Asset	All native vegetation within the Account Area.
Sub-Asset	Broad vegetation groups as defined in TASVEG vegetation mapping.
Account Area	The total area of land documented in the Environmental Account.
Assessment Zone	A Sub-Asset may be subdivided into Assessment Zones based on management approach or condition state where applicable, if historic management regimes are reliably known. E.g. Native Grassland (ecological burn), Native Grassland (unburned).
Econd®	The Econd® is an index that describes the environmental condition of an asset on a scale between 0 (degraded) and 100 (undegraded/reference state). Econd® scores are constructed by aggregating Indicator Condition Scores as per the formula described in the applicable Method.

Creating the Environmental Account

This method includes the following eight steps:

Step 1	Describe purpose, scope, and accounting area
Step 2	Data collation and desktop assessment
Step 3	Stratify accounting area and identify sample sites
Step 4	Describe indicators and define reference benchmarks
Step 5	5a - Collect and analyse data – Detailed Assessment procedure 5b - Collect and analyse data – Rapid Assessment procedure
Step 6	6a - Calculate site condition scores – Detailed Assessment procedure 6b Calculate site condition scores – Rapid Assessment procedure
Step 7	Calculate landscape context scores
Step 8	Calculate the Econd®

Step 1. Describe Purpose, Scope and Accounting Area

The preliminary step to developing an Environmental Account is to **describe** the Environmental Account through defining its intended **purpose**, **scope**, **accounting area** and **assessment procedure** (Table 1).

Table 1. Elements to be included in description of Environmental Account

Purpose:	Describe the specific purpose of the account.
Scope:	Describe the scope of the account. This Method is suitable for: - *Snapshot* – a one-off assessment of condition of Native Vegetation - *Change over time* – an ongoing assessment of the change of environmental condition through time
Accounting Area:	Describe the accounting area (include location and size details). Provide a map of the accounting area that shows location and size information. For property scale accounts, the Account should apply to the entire property, including non-native vegetation types, in order to account for historic vegetation clearance. This is not a requirement of project-scale or aggregate accounts, which may apply to a defined geographic area (e.g. an Account can be limited to native vegetation areas only). NB. The accounting area must stay the same for the lifespan of the account. If the accounting area changes (such as a new area to be added, or an area to be removed), then the account description should be revised to reflect the new scope of the account.
Assessment procedure	Describe your assessment procedure. - *Detailed Assessment* – used for comprehensive but infrequent assessments and larger, well-resourced projects. - *Rapid Assessment* – used optionally for more frequent assessments on a regular (e.g. annual basis) or as a stand-alone method for smaller projects. - *Combined Assessment* – Detailed Assessment can be undertaken periodically, with complementary Rapid Assessments in intervening years. However, Detailed Assessments can also be undertaken in intervening years as an alternative to Rapid Assessments. This is our recommended approach if project resourcing allows.

Output of Step 1

- A description of the accounting area including **location** and **size.**
- A table describing the **purpose** and **scope** of the account.
- A **map** showing the accounting area.

Step 2. Data collation and desktop assessment

Data collection

Collect existing data pertaining to the accounting area, such as:

- Recent high-resolution aerial imagery covering a 5 km buffer around the accounting area
- Existing vegetation mapping for the accounting area and surrounding buffer, including:
    - The most recent TASVEG vegetation mapping (available from NRE Tas, see the NRE website).
    - Any fine-scale vegetation mapping undertaken at the site.
- Descriptions of vegetation communities present at the site, including:
    - The latest edition of TASVEG vegetation descriptions (currently Kitchener and Harris 2013, available from the NRE website).
    - The latest version of relevant TASVEG Vegetation Community Benchmarks (available from the NRE website).
- Any available data on historical disturbances within the accounting area, such as:
    - Management documents such as timber harvesting schedules, cropping or grazing details.
    - Historical aerial imagery showing the extent and approximate timing of any disturbances such as clearing, grazing, or infrastructure development.
- Spatial planning and topographic data, including cadastral boundaries, elevation contours, roads and utility easements, waterways and waterbodies.

Desktop assessment

Using the data collected above, create:

- A location map, showing the site and surrounding 5km buffer in relation to major transport links, town centres and administrative boundaries.
- Detailed site map(s) of the accounting area, with:
    - Recent aerial imagery as a base map.
    - Boundaries of the accounting area and outlines of cadastral parcels.
    - Elevation contours and relevant topographic features.
- A list or table of the TASVEG and vegetation communities expected to be present at the site. Note that TASVEG mapping is often inaccurate at the site scale, so the list should include consideration of communities present within neighbouring areas.

Output of Step 2

- Maps of the accounting area showing:
    - the location and landscape context of the accounting area.
    - existing vegetation mapping within the accounting area.
    - recent aerial imagery of the accounting area, at a scale detailed enough (e.g. 1:10 000) to detect differences in vegetation structure and disturbances such as roads.
- A folder (preferably electronic) containing all relevant spatial datasets, clearly labelled and with associated metadata completed (source, publication and download date, georeferencing information etc).

Step 3. Stratify accounting area and identify sampling sites

Stratify the account area

Divide the accounting area into sub-assets, based on broad vegetation groups (the VEG_GROUP attribute of the TASVEG mapping, comprising groups such as native grasslands, dry sclerophyll forests and woodlands etc), and then further divide each sub-asset into assessment zones

Each assessment zone must consist of a single TASVEG broad vegetation group with a similar management approach and/or average condition across its extent. Non-native vegetation communities should not be included in assessment zones. Any loss of extent of native vegetation will be addressed by calculating their proportion of the overall Account Area.

Zones do not need to be continuous and may include multiple different patches. Assessment zones may include multiple TASVEG communities, provided that they are component communities within the same TASVEG broad vegetation group. The number of zones to be assessed will depend on the variability in condition and management within each TASVEG group and the size of the accounting area.

As discussed in Michaels (2006), small areas which deviate in management or condition should be assessed separately when the accounting area is small (e.g. a 20 x 20m 'clearing' in a 1ha patch) but may be effectively ignored in larger accounting areas where their impact on the overall average condition is minor (e.g. the same clearing in a 100ha patch, representing 1% of the zone).

In order to delineate the assessment zones, it is recommended that a preliminary desktop assessment (using the data collected in Step 2) be followed by a site visit in order to confirm the TASVEG communities present and delineate the boundaries of assessment zones.

Identify sampling sites

Table 2 summarises how to select and establish sampling sites within each assessment zone.

Table 2. Overview of how to select and establish sampling sites within each assessment zone

<table>
<tr><th>Sample</th><th>Implementation</th></tr>
<tr><td>Number of sites per assessment zone</td><td>The number of sampling sites per assessment zone will vary according to the size of the zone. The Tasmanian VCA method (Michaels 2006) does not prescribe the exact number of sites per zone, however suggested minimum site numbers, derived from NSW Biodiversity Assessment Manual, are shown below (NSW Government 2020).

Large projects (>100,000ha) are likely to cover numerous assessment zones and sampling using the recommended intensity may be sufficient to achieve good spatial coverage of the project area by applying the recommended sampling intensity. However, we recommend proponents use a greater number of sample sites if adequate coverage of the project area is not achieved using the recommendations below (i.e. 50 sites would be considered adequate coverage of 100,000 ha of homogenous vegetation).

Historic datasets that have been designed for different purposes and sampling strategies may vary in intensity from these guidelines. In order to accommodate such cases, if sampling intensity of historically collected data is less than the below recommendations, environmental accounts should only be considered for Level 3 accreditation. This should be explained and justified in the information statement. Ongoing data collection should provide for additional sites in accordance with these recommendations.

A power analysis to assess statistical power to detect change, can be used to assign a confidence level, should project resources allow.

Assessment zone area (ha) — Suggested min # sampling sites
<2 — 1
2-5 — 2
5-20 — 3
20-50 — 4
50-100 — 5
100-250 — 6
250-1000 — 7
1000-10,000 — 8
10,000-25,000 — 10
25,000-50,000 — 20
50-000-100,000 — 30
>100,000 — 50</td></tr>
<tr><td>Site selection</td><td>Sites must be placed so that they are entirely located within the assessment zone in question, avoiding obvious ecotones or disturbances not consistent with the overall condition of the zone by at least 50m (where possible: may not be feasible in very small zones). Sites may be allocated to assessment zones comprising discontinuous patches of vegetation.</td></tr>
</table>

	After accounting for these requirements, sites may be located using any of the following methods: • Random coordinate generation within each assessment zone • Walking a random distance into the zone and establishing the plot • Locating plots to ensure they capture all attributes relevant to the zone (e.g. stratification by elevation, disturbance intensity etc). This is particularly relevant for larger, more variable assessment zones.
Site establishment	Each sampling site should be marked with a labelled, permanent or semi-permanent site marker at the centroid and the coordinates recorded using a GPS. The component sampling areas (see Step 4) should be centred on this marker.
Timing	The recommended time of sampling varies among TASVEG communities and is most relevant for highly seasonal vegetation types such as highland grasslands. Timing should therefore be determined with reference to the vegetation present within the accounting area, ensuring that the expected lifeforms are likely to be present. It is important that timing is consistent across survey years to eliminate the potentially confounding influence of season on the detectability and projected foliage cover of some species.
Frequency	Repeat surveys should be conducted annually where possible, to track changes in condition over time. This may be infeasible for larger accounts, where data is collected from many hundreds of sampling sites. In this case, it is suggested that sampling sites be visited on a rotational basis. The revisitation frequency may vary between accounts or among sampling sites, based on available resources for monitoring and the likelihood of rapid change (for example, sites with active management such as restoration may be prioritised for revisitation over old-growth sites with few active threats). For long term and ongoing environmental monitoring programs, analysis and reporting may take a rolling average approach, whereby data is aggregated and presented for reporting periods comprising several years (e.g. 5-yrs). This allows for management of resourcing for projects with a large number of sites (e.g. hundreds), with survey effort spread over multiple years.

Output of Step 3

- A map and table showing the **stratification** of the accounting area and identifying Sub Assets and/or Assessment Zones

Step 4. Describe indicators and define reference benchmarks

Site condition indicators

According to the Tasmanian VCA Manual (Michaels 2006), and this Method, site condition accounts for 75% of the overall condition score. In order to assess site condition, the method assesses seven indicators for forest communities, and five indicators for non-forest communities (Table 3). Forest communities include rainforest, wet eucalypt forest, dry eucalypt forest and non-eucalypt forest communities as defined under Tasmania's TASVEG classification system. It also includes woodland communities, which have modified benchmarks for some indicators such as expected canopy cover. Non-forest communities include native grasslands, wetlands and saltmarsh, moorlands and scrub, heath and coastal communities. The relevant indicators are defined in the benchmark information provided for each community (see Step 5a). These indicators and the methods used to assess them have been selected to strike a balance between scientific rigour and ease of use by assessors with a range of experience (Michaels 2006; Parkes et al. 2003; Parkes et al. 2004).

Table 3. Summary of Site Condition indicators. Note that indicators differ between forest and non-forest vegetation communities to account for differences in structural characteristics.

Indicator	Community types	Description
Large trees	Forest communities	This indicator comprises two aspects: 1. The **number of large native* trees** (including live and dead trees) per hectare. The definition of large is based on the diameter at breast height (DBH) and varies among TASVEG communities, based on the growth form of dominant canopy species. 2. The **health of the large tree canopy**, estimated as the average proportion of healthy canopy that is present (i.e. not missing due to tree death, decline, or insect attack).
Tree canopy cover	Forest communities	This indicator comprises two aspects: 1. The **projected foliage cover of the native tree canopy**, considering all trees reaching at least 80% of the mature tree height, which is defined individually for each TASVEG community type. 2. The **health of the all native canopy trees,** estimated as the average proportion of healthy canopy that is present (i.e. not missing due to tree death, decline, or insect attack).
Dominant lifeform cover	Non-forest communities	Percentage cover of the dominant life form.
Understorey lifeforms	All community types	Estimating the number of lifeforms present in the zone, and whether they are 'substantially modified', i.e. have lower than expected cover or richness of native species.
Lack of weeds	All community types	Percentage cover of all native plant species, and the proportion of this cover contributed by high-threat weed species.
Recruitment	Forest communities	Level of observed recruitment for all native woody species.
Persistence potential	Non-forest communities	The degree to which regeneration or regeneration potential is observed, as well as the presence of appropriate management/disturbance regimes and presence/absence of *P. cinnamomi.*
Organic Litter	All community types	Percent cover of organic litter in the ground layer.
Logs	Forest communities	Density (length in metres ha^{-1}) of logs >10cm in diameter, and proportion of these logs which are classified as 'large' for that vegetation type.

*NOTE – 'Native' refers to locally native species, expected to occur in that community

Landscape context indicators

Configuration and extent are important indicators of native vegetation, which are assessed at a desktop level using GIS software.

Configuration	Configuration refers to the spatial arrangement of vegetation in the area surrounding an assessment zone. Configuration affects the condition of vegetation through ecological vectors such as connectivity and edge effects. It is assessed using desktop procedures outlined in Step 7.
Extent	Extent refers to the quantity of native vegetation remaining in an Accounting Area, which often comprises both native and non-native vegetation types (e.g. plantation, pasture). Extent is incorporated into the overall condition score, by applying a weighting based on the proportion of native vegetation remaining in an Accounting Area. This is explained further in Step 8.

Output of Step 4

- A table listing the **indicators** and **reference benchmarks** for each **Assessment Zone**

Step 5a. Collect and Analyse Data – Detailed Assessment Procedure

The Tasmanian VCA method (Michaels 2006) does not prescribe a set survey method to be used to sample species richness and cover at each sampling site, instead relying on area searches and all-of-zone visual assessments. In order to standardise survey effort to allow repeat monitoring, the Method described in this document recommends establishing permanent sampling sites. At each sampling site, gather data as prescribed for each indicator. The following sections describe the detailed data collection methods to be undertaken at each sample site for each of the indicators from Table 3, summarised from Michaels (2006). Note that for several indicators, applying the methods requires information from the relevant TASVEG VCA Benchmark, which should be taken into the field with the assessor.

Additionally, when establishing new Accounts, that a set of photographs must be taken from the plot centroid, facing each of the cardinal directions, at angles of 0 degrees and 45 degrees from the horizontal. These photos should be archived with appropriate site-related metadata and provided as supporting evidence for AfN verification.

Large trees (forest communities only)

First, within an estimated 1-hectare circular plot, count the number of trees with DBH greater or equal to the definition of a 'large tree' for the TASVEG community present at the site. This definition can be found in the relevant vegetation community benchmark. Note that:

- DBH is measured over bark at 1.3m above ground level using a diameter tape. If a diameter tape is not available, use an ordinary measurement tape and multiply by 0.36 to get the approximate diameter.
- Trees may be dead or alive.
- Only genera which contribute to the tree canopy can qualify as a large tree (see vegetation community benchmark for a guide to the expected genera), and understorey trees are excluded.
- For trees with multiple stems, at least one of the individual trunks must have a DBH greater than or equal to the benchmark DBH to be included.

Second, estimate the canopy health of these large trees. This is assessed by estimating the proportion of healthy foliage cover which is present (i.e. not missing due to tree death, decline or herbivory) and comparing this to expected foliage cover if the tree had a full crown (see Figure 2).

- To estimate canopy health, visualise a circle around the crown of the tree. If all branches within the circle are bearing foliage the canopy health would be 100%. Otherwise, canopy health is the proportion of healthy crown area to total crown area.
- Sub-canopy foliage and branches are not included in the assessment, nor are fallen or missing branches.
- Dead large trees are assessed as having 0% healthy cover.
- Average this percentage across all large trees within the 1ha plot (or at least 10 trees if a very large number of trees are present) to generate an estimate of canopy health for the sampling site.

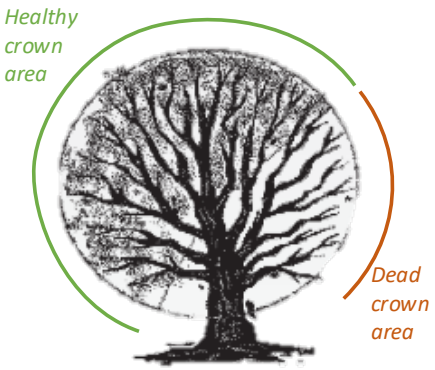

Figure 2 Schematic for assessing canopy health

Tree canopy cover (forest communities only)

Within the same 1-hectare circular plot used for large trees, first estimate the projected foliage cover of the tree canopy. Note that the canopy does not include understorey trees or large shrubs, or any individuals of the canopy species which do not reach at least 80% of mature height (as defined in the vegetation community benchmark). It does include large trees already assessed above.

Percentage foliage cover is the percentage of the ground which would be under a shadow cast by the foliage (**not** including branches) if the sun were directly above. It considers both gaps within the canopy of trees as well as the gaps between trees. Refer to Appendix 5 of Michaels (2006) for example diagrams of different canopy covers. Percent cover should be estimated at a number of locations (at least 5) within the 1-hectare circular plot, and these estimates averaged to give a value for the sampling site.

Second, as for the large tree assessment, estimate the canopy health of the tree canopy (using all trees this time). Where there are a very large number of trees in the plot, at least 10 trees should be individually assessed to derive the tree health score for the site.

Recruitment (forest communities only)

For all species of woody plants larger than prostrate shrubs (i.e. any species recorded within the small and medium shrub [S], sub-canopy trees and large shrub [T], immature tree [IT] and canopy tree categories), record whether there is evidence of adequate recruitment within the 1-hectare plot. The recruitment score will be assigned based on whether 0%, <30%, 30-70% or >70% of observed woody species exhibit adequate recruitment (refer to Michaels 2006 pp. 47-51).

- A recruit is defined as an immature plant with no flowering or fruiting material, but which has survived the initial germinant/seedling stage and survived for at least one year.
- Recruitment is defined as adequate when:
    - at least two cohorts (seedlings <2m and saplings >2m tall) are present for **canopy species** (refer to the community benchmark to define canopy species)**.** Note that all canopy species are grouped and treated as a single species for purposes of this assessment.
    - The number of immature individuals is at least 10% of the number of observed mature individuals for **woody understorey species.**

Understorey lifeforms and dominant lifeform cover

Understorey lifeform cover and species richness are estimated at each site. For each relevant lifeform listed in Table 4 (noting that not all categories are relevant for each vegetation community type – refer to relevant benchmark if unsure), record:

- Percentage foliage cover of the lifeform (including all component species)
- OPTIONAL: The scientific names of all *native* taxa observed, identified to species wherever possible.
    - Species need not be recorded for the soil crust or mosses and lichens life form categories.
    - Non-native Australian species (e.g. Australian mainland species not native to Tasmania) are not regarded as native species for this assessment.
    - Where identification to species level is not possible in the field, record the most detailed level of identification possible and take a sample or photo of the individual for identification by an expert botanist. If the sample still cannot be identified, only record it as a separate taxon if it is certain that it is not a species already sampled at the site (e.g. immature form).
    - Note that the same species can be recorded as part of two separate life forms if there are individuals of varying height.

Table 4 Understorey lifeform categories and definitions, reproduced from Michaels (2006)

Lifeform	Code	Description
Immature tree	IT	Tree canopy species >2m in height but less than two thirds of the mature canopy height (refer to relevant Benchmark description).
Tree (sub-canopy) or large shrub	T	Woody plants >2m in height that never form part of the tree canopy.
Medium/small shrub	S	Woody plants ≤2m in height
Prostrate shrub	PS	Woody plants with stems and branches that trail along the ground, some of which may form ground-covering mats. This group also includes high altitude cushion plants.
Herbs and orchids	H	Non-woody plants with non-grassy leaves.
Grass	G	All grasses (tussock and non-tussock). **Only use for forest/woodland vegetation condition assessments.**
Tussock grass	TG	A robust grass, usually with more than one flower stalk and large numbers of leaves arising from a common, often broad base or clump, greater than 5cm in height. **Only use for wetland vegetation condition assessment.**
Large tussock grass	LTG	A robust grass, usually with more than one flower stalk and large numbers of leaves arising from a common, often broad base or clump, greater than 30cm in height.
Medium/small tussock grass	MTG	A grass, usually with more than one flower stalk and large numbers of leaves arising from a common, often broad base or clump, between 5cm and 30cm in height (measured as height of vegetative material/foliage, not including flower stalks).
Non-tussock grass	NTG	A grass with leaves arranged along single, erect flower stalks, which in turn arise from rhizomes or stolons (creeping above or below ground stems), greater than 5cm in height (measured as height of vegetative material/foliage, not including flower stalks).
Tiny grass/sedge/lily	TGS	All grasses (tussock and non-tussock) and sedges and lilies less than 5cm in height (measured as height of vegetative material/foliage, not including flower stalks). This life form includes very short, grazed marsupial lawns.
Large sedge/rush/sagg/lily	LSR	A robust sedge or rush (including sagg) or lily with erect flower stalks, greater than 30cm in height (if flower stalks extend beyond foliage, measured to height of foliage/vegetative material only, not to flower height).
Medium-small sedge/rush/sagg/lily	MSR	A small sedge or rush (including sagg) or lily with erect flower stalks, from 5cm to 30cm in height (if flower stalks extend beyond foliage, measured to height of foliage/vegetative material only, not to flower height).
Ground fern and fern allies	GF	A fern-like non-flowering plant, usually with several to many fronds (ie. deeply divided into leaflets or segments) arising from a common base, and usually growing to less than 1 m in height. This group includes bracken (which may occasionally grow to heights greater than 1 m) and fern allies/club mosses (such as *Selaginella*).
Tree fern	TF	A large tree-like fern, with a distinct, fibrous or scaly trunk (made up of the persistent leaf bases) and a crown of large divided fronds or leaves.
Scrambler/Climber and Epiphytes	SCE	Woody or non-woody plants that rely on other plants (dead or alive) or other structures (rocks or logs) for support. The main difference between this category and plants described as 'prostrate', is the habit of using other plants to lean on or climb. Species in this group may form dense colonies. This group also includes epiphytes, and aerial parasites such as *Cassytha*.
Mosses and Lichens	ML	A broad grouping of non-vascular terrestrial plants, particularly ground-covering mosses and foliose lichens.
Soil Crust	SC	A hard 'crust like' layer or soft 'shiny' layer formed on the soil surface by a combination of algae/crustose cryptogrammic life forms and soil particles. Often contains no vertical structure.

Lack of weeds

First, estimate the percentage projective foliage cover of all weeds present within the plot. Weeds include all introduced species and non-native Australian species (i.e. species introduced to Tasmania from mainland Australia). Second, identify any high-threat weeds, which include any weed species which achieve >5% cover in the plot or any of the species listed in Appendix 8 of the Tasmanian VCA Manual (Michaels 2006). Estimate the proportion of the overall weed cover (estimated above) which comprises high-threat weed species.

Persistence potential (non-forest communities only)

First, assess the level of persistence potential for non-forest communities within the plot, using the criteria described in Table 5 with reference to the reference benchmark for the community being assessed. The VCA Manual (Michaels 2006) provides further guidance on assessment against persistence criteria.

To determine if *Phytophthora cinnamomi* is present, look for characteristic symptoms in understorey vegetation. These include death or disease in known susceptible species, with diseased plants showing typically red and yellow discolouration in the foliage, and differential mortality of susceptible and non-susceptible species (i.e. non-susceptible species stay healthy). There is usually also a temporal sequence to the disease, with the oldest death in the centre or upslope from more recent deaths, and sharp disease fronts may be present between infected and healthy vegetation. Refer to Appendix 7 of the VCA Manual (Michaels 2006) for more detail on undertaking a phytophthora assessment, including lists of susceptible species.

Table 5 Criteria for assessing sites as having low, medium or high persistence potential. Definitions should be applied if most of the criteria listed are met.

Low	Medium	High
Criteria: • Natural regenerative capacity is very limited and/or at risk under past and/or current land use or land management practices. • Only one or two species in the dominant life form (except in instances where this is a characteristic of the vegetation eg. saltmarsh communities). • Exotic species comprise more than half the cover in at least one layer. • High threat weeds dominate the weed species. • No space for smaller species between the tussocks or shrubs to allow smaller species to germinate and survive. • Evidence that the vegetation is heavily grazed and has been for a long time. • Evidence that the vegetation has been burned too frequently or too infrequently. • Evidence of dieback due to *Phytophthora cinnamomi.*	Criteria: • Natural regeneration modified through past and/or current land management practices. • Regenerative capacity restricted by land use/land management practices. • Native species provide more than half the cover in all the layers. • There are only a few species in the dominant life form. • There are weeds including some high threat weeds. • Little space between the tussocks or shrubs to allow smaller species to germinate and survive. • Evidence of over-grazing. • Evidence of inappropriate burning. • *P. cinnamomi* is present but <5 species are affected.	Criteria: • Natural regenerative capacity is unmodified. • No significant changes to the community from land use/land management practices. • Community entirely or almost entirely composed of native species in all its layers. • There is a mixture of species in the dominant life form. • Only occasional weeds, and no high threat weeds. • Sufficient spaces between the tussocks or shrubs to allow smaller species to germinate and survive. • No grazing or an appropriate grazing regime in place. • Appropriate burning regime in place • *P. cinnamomi* absent (susceptible vegetation only)

Organic litter

Within the plot, visually estimate the percentage cover of organic litter, defined as dead organic material which is detached from the parent plant and fallen to the ground, not including woody debris with diameter greater than 10cm or elevated organic litter (such as bark or small branches lodged in understorey shrubs). This does include litter present underneath overhanging vegetation.

Then estimate the proportion of this litter which is due to non-native species (including non-native Australian mainland plants).

Logs (forest communities only)

Within one (or more) 0.1 ha areas (20 x 50m quadrat or 18m radius circle), estimate the length of:

- Logs with diameter >10cm
- Large logs, with diameter greater than that specified in the relevant vegetation community benchmark.

For the purposes of this assessment, logs includes any dead fallen timber which is substantially detached from the parent tree (i.e. fallen to the ground), as well as cut stumps >10cm diameter and less than 1.3m tall (which are assigned a default length of 0.5m).

Output of Step 5a – Detailed Assessment Procedure

- A **data table** (e.g. a spreadsheet) containing the scores for each environmental indicator for each sampling site
- A **folder** (preferably electronic) containing any sample photographs appropriately labelled according to the Assessment Zone, sampling site and survey date*.

*NOTE: This requirement applies to accounts based on newly collected data. For accounts based on historic datasets, photo-points must be established when repeat measures are made.

Step 5b. Collect and Analyse Data – Rapid Assessment Procedure

The Detailed Assessment Procedure outlined in this document involves significant time and resources to adequately survey all lifeforms and habitat attributes. The time taken to implement varies depending on the complexity of the vegetation community. In recognition of this, the following Rapid Assessment method is designed for use in long-term monitoring programs, to provide for early detection of large changes in vegetation condition in periods between standard surveys, thus triggering management intervention or additional survey effort if necessary. For Accounts using the Detailed Assessment procedure, the use of Rapid Assessments in optional. The Rapid Assessment is largely based on the simplified 'visual assessment' approach described within the VCA Manual (Table 1, page 25 of Michaels 2006). To streamline field assessments, it is suggested that customised field checklists be prepared for the vegetation community in question: see the example field checklist in Appendix B.

The Rapid Assessment Procedure comprises:

- Photo points, to provide a visual record of changes over time at each site. These images must be stored alongside site data as supporting source of evidence on site condition.
    - Fixed photo points are installed using permanent or semi-permanent markers, and coordinates recorded using GPS. The marker is the same marker used to identify the centre of the sample site.*
    - 360^0 photospheres may be captured using dedicated cameras or a consistent function on a smartphone camera (e.g. Google StreetView app).
    - Alternatively, a pair of photos can be taken facing each cardinal direction, at angles of 0 and 45 degrees from horizontal, and labelled and stored for comparison purposes in future.
- Field checklist (see example proforma in Appendix B), comprising:
    - Space to allocate categorical scores from 1-3 for each VCA site condition indicator, with Category 1 indicating a highly modified site and Category 3 indicating a site at reference condition (see variables and categories in Appendix B). This is based on the rapid visual assessment approach described in Michaels (2006).
    - Prompts to record signs of major disturbance within the sample site and surrounding assessment zone.
    - Table 7 provides a detailed description of the approach to allocating categories for each indicator.

Output of Step 5b – Rapid Assessment Procedure

- A **data table** (e.g. a spreadsheet) containing all the scores for each environmental indicator for each sampling site
- A **folder** (preferably stored electronically) containing photospheres and/or photographs appropriately labelled according to the assessment zone, sampling site and survey date.

*NOTE: If photos have not been collected from historic monitoring programs/projects, then proponents may still produce an account so long as there is a commitment to establish photo-points when future measures are made.

Step 6a. Calculate Site Condition Scores – Detailed Assessment Procedure

Site Condition scores are calculated by comparing the indicator values measured in Step 5 to an appropriate Reference Benchmark developed specifically for the relevant vegetation community.

Reference Benchmarks

Reference Benchmarks are available for most TASVEG communities (and in some cases, for multiple recognisable variants or facets within each TASVEG community) and can be downloaded from: https://nre.tas.gov.au/conservation/development-planning-conservation-assessment/planning-tools/monitoring-and-mapping-tasmanias-vegetation-(tasveg)/vegetation-condition-monitoring.

These benchmarks were developed based on TASVEG community descriptions, literature, empirical survey data and expert knowledge, and refined based on field testing and expert input as described in Michaels (2006). For each Site Condition indicator, they represent "the *average* characteristics of a mature and apparently long-undisturbed state", where:

- the definition of mature varies according to the lifecycle of the dominant growth form, so that whereas forest benchmarks may be based on stands of 200-year-old trees, grassland benchmarks may be based on 5-year-old grass tussocks.
- the definition of undisturbed refers to an absence of unnatural disturbances such as grazing, mining, timber harvesting, land clearing, fuel reduction burning, *Phytophthora cinnamomi* infestation or other anthropogenic disturbances which alter the floristics, structure and growth stage of the community (Michaels 2006).

As such, these benchmarks are not to be interpreted as a prescribed ideal or climax state, but as a reference point from which to quantify changes in condition (Parkes et al. 2004, Michaels 2006). It is therefore important that the reference benchmark selected represents the vegetation community currently present at the site. For example, derived native grasslands should not be assessed against the reference benchmark for the forest community presumed to have originally occurred at the site (Michaels 2006).

Calculate Site Condition scores

Calculate the Site Condition score by summing the scores for each indicator (described in the following sections), to achieve a final score out of 75. Note that the maximum score possible for each indicator varies according to the weight assigned to that characteristic by the VCA Method (Table 6 below; based on Michaels (2006) - Table 2, p. 27).

Table 6 Calculation of maximum Site Condition scores by indicator for forest and non-forest community types. Note that in non-forest communities, dominant lifeform cover is substituted for large trees and canopy cover, persistence potential is substituted for recruitment, and scores for logs are not included. The raw Site Condition score for non-forest communities is therefore out of 70 and is multiplied by 1.07 to match the score out of 75 for forest communities. These weightings are defined by the VCA method (Michaels 2006).

Indicator	Forest communities	Non-Forest communities
Large trees	10	-
Tree canopy cover	5	-
Dominant lifeform cover	-	15
Understorey lifeforms	25	25
Lack of weeds	15	15
Recruitment	10	-
Persistence potential	-	10
Organic Litter	5	5
Logs	5	-
Site condition score	Subtotal (75)	Subtotal (70)*1.07 = 75

The following sections describe how to assign scores for each of the Site Condition indicators, using the data collected in Step 5a and/or 5b. The VCA method (Michaels 2006) uses a classification approach to assign scores, rather than a continuum approach where exact values are calculated, to improve data reliability and ease of use by assessors with a range of skill levels.

This approach is also adopted in recognition of natural variability in indicator score values across patches of native vegetation in equally good condition: for example, forest communities achieve a full score for the canopy indicator if observed canopy cover is between 50% and 150% of the expected value.

Note that scores are assigned at the sampling site level, and data from all sampling sites within a given zone are averaged to provide a single score for the assessment zone. This allows for reporting and tracking of differences in condition within as well as among assessment zones.

Large Trees (forest communities only)

Firstly, calculate the observed density of large trees (number of large trees ha^{-1}) as a **percentage of the benchmark large tree density**, referring to the appropriate Reference Benchmark for the TASVEG community present within the assessment zone. Then, use this percentage as well as the observed **canopy health class** to assign a large tree score using the scoring matrix below.

LARGE TREE SCORING MATRIX		Canopy Health		
		>70%	30-70%	<30%
% benchmark large tree density	No large trees	0	0	0
	>0 to 20%	3	2	1
	>20 to 40%	4	3	2
	>40 to 70%	6	5	4
	>70 to 100%	8	7	6
	≥ 100%	10	9	8

Tree canopy cover (forest communities only)

Firstly, calculate the observed projected foliage cover of the tree canopy as a **percentage of the benchmark tree canopy cover**, referring to the appropriate Reference Benchmark for the TASVEG community present within the assessment zone. Then, use this percentage as well as the observed **canopy health class** to assign a tree canopy cover score using the scoring matrix below.

TREE CANOPY COVER SCORING MATRIX		% Canopy Health		
		>70%	30-70%	<30%
% benchmark canopy cover	<10%	0	0	0
	≥10 to 50%	3	2	1
	≥50 to ≤150%	5	4	3
	>150%	3	2	1

Dominant lifeform cover (non-forest communities only)

For non-forest communities, the dominant lifeform and the corresponding benchmark cover value are defined by the Reference Benchmark. Calculate the **percentage of benchmark cover** for the expected dominant lifeform by comparing the observed projected foliage cover to the benchmark cover specified by the appropriate Reference Benchmark for the TASVEG community present at the site. Then allocate a dominant lifeform cover score using the scoring matrix below, noting that a score of zero must be applied if the dominant lifeform is recorded as having less than 10% absolute cover.

DOMINANT LIFEFORM COVER SCORING MATRIX		% cover (observed)	
		<10%	≥10%
% benchmark cover	<50%	0	5
	≥50 to ≤150%	0	9
	>150%	0	15

Understorey lifeforms

The Reference Benchmark for each TASVEG community (or TASVEG community facet) gives a list of the lifeforms expected to be present, and the benchmark cover and number of species for each lifeform. For each lifeform listed by the Reference Benchmark, use the observed cover and species richness data to determine whether each lifeform is regraded as present and/or modified according to the following rulesets:

- Lifeforms with benchmark cover of less than 10%:
  - Considered **present** if any specimens are observed.
  - Considered substantially **modified** if present (as above) and either:
    - less than 50% of benchmark species diversity is recorded.
    - no reproductively mature specimens are observed.
- Lifeforms with benchmark cover of greater than 10%:
  - Considered **present** if observed cover is at least 10% of benchmark cover
  - Considered substantially **modified** if present (as above) and either:
    - Observed cover is less than 50% of benchmark cover.
    - Less than 50% of benchmark species diversity is recorded.

Note that mosses and lichens and soil crust lifeform categories are assessed as present and modified based on cover only.

Then, calculate the percentage of benchmark lifeforms which are present, and the percentage of these present lifeforms which are modified. Use these percentages to assign the understorey lifeform score using the scoring matrix below.

UNDERSTOREY LIFEFORM SCORING MATRIX		% lifeforms present which are modified		
		none	<50%	≥50%
% benchmark life forms present	All effectively absent	0	0	0
	>0 to 50%	5	5	5
	≥50 to 90%	15	15	10
	≥90%	25	20	15

Lack of weeds

Note that this indicator is calculated directly from the observed weed cover data, as the implied reference benchmark would be a complete absence of weeds. Allocate scores based on the **observed cover of all weeds**, with penalties for the **presence and cover of high threat weeds**. High threat weeds include any weed species (including non-native Australian species) which achieve >5% cover, or weed species listed in Appendix 7 of Michaels (2006).

LACK OF WEEDS SCORING MATRIX		% weed cover comprising 'high threat' weeds		
		None	≤50%	>50%
% weed cover	>75%	0	0	0
	>25 to 75%	4	2	0
	>10 to 25%	7	6	4
	>5 to 10%	11	9	7
	≥1 to 5%	15	13	11
	<1%	15	13	13

Recruitment (forest communities only)

During field surveys (Step 4), the adequacy of recruitment is assessed for each native woody species within the small and medium shrub (S), subcanopy tree/large shrub (T) and canopy tree lifeforms. Firstly, use these data to calculate the **percentage of woody species exhibiting adequate recruitment** (i.e. number of woody species with adequate recruitment / total number of woody species recorded, expressed as a percentage) at the sampling site. Secondly, compare the total number of woody species recorded (with and without recruitment) to the benchmark number of woody species to calculate the **percentage of benchmark woody species richness** present. The benchmark number of woody species is calculated by summing the benchmark species richness for small and medium shrubs (S) and subcanopy tree/large shrubs (T) and adding 1 for canopy species (which are grouped and assessed as a single species).

Then allocate recruitment scores as per the matrix below. Full scores are only allocated if at least 70% of woody species exhibit adequate recruitment, regardless of TASVEG community type: i.e. the implied benchmark is that all native woody species exhibit adequate recruitment in all forest communities. Scores are also penalised for low species richness (scores are halved if <50% of benchmark woody species richness present). Note that if no recruitment is observed, scores are allocated differently depending on whether the TASVEG community in question usually exhibits continuous recruitment or is reliant on episodic disturbance (refer to the Reference Benchmark).

RECRUITMENT SCORING MATRIX			% benchmark woody species richness	
			≥50% (High)	<50% (Low)
% woody species with adequate recruitment	No evidence of recruitment	Community with continuous recruitment	0	0
		Episodic event-driven recruitment, no clear evidence of appropriate episodic event	0	0
		Episodic event-driven recruitment, clear evidence of appropriate episodic event	5	5
	<30%		3	1
	≥30 to 70%		6	3
	≥70%		10	5

Persistence potential (non-forest communities only)

Allocate scores based on the assessed level of persistence potential (low, medium, high), as per the scoring matrix below. Apply a penalty of -2 for low diversity, defined as having less than 50% of either the benchmark lifeforms or benchmark species richness present, as per the understorey lifeforms indicator above.

PERSISTENCE POTENTIAL SCORING MATRIX		% benchmark species richness and lifeforms	
		≥50% species richness **AND** > 50% lifeforms	<50% species richness **OR** ≤50% lifeforms
Persistence potential	Low	2	0
	Medium	6	4
	High	10	8

Organic litter

Calculate the percentage of benchmark organic litter cover by comparing the observed cover of organic litter to the benchmark for the relevant TASVEG community. Allocate scores as per the matrix below, applying a penalty of -1 for sites where the majority of the organic litter derives from non-native species.

ORGANIC LITTER SCORING MATRIX		% litter from native species	
		≥50%	<50%
% benchmark cover	<10%	0	0
	<50%	3	2
	≥50%	5	4

Logs (forest communities only)

Firstly, calculate the **percentage of benchmark log length** by comparing the observed length of all fallen logs ha^{-1} to the benchmark for the relevant TASVEG community. Secondly, calculate the **length of large logs ha $^{-1}$ as a percentage of benchmark log length**, referring to the Reference Benchmark for the definition of 'large' for the TASVEG community in question. Allocate scores as per the matrix below, applying a penalty of -1 where the length of large logs is less than 25% of benchmark value.

LOGS SCORING MATRIX		Large logs as % of benchmark log length	
		≥25%	<25%
% benchmark log length	<10%	0	0
	<50%	3	2
	≥50%	5	4

Step 6b. Calculate Site Condition Scores– Rapid Assessment Procedure

The Rapid Assessment Procedure calculates an Econd® for sample sites with less precision than the Detailed Assessment Procedure. The Rapid Assessment Procedure may be used as a standalone procedure for developing an Environmental Account, or in conjunction with the Detailed Assessment Procedure to provide interim assessments of condition between Detailed Assessments.

- To calculate site condition scores using the Rapid Assessment Procedure, the Category column containing the most accurate description for each Site Indicator is determined (Table 7).
- The range of possible Site Indicator scores which could be generated using the Detailed Assessment Procedure (Table 2 in Michaels (2006)) that is equivalent to each Rapid Assessment Category is shown in brackets in Table 8.
- This maximum possible Detailed Assessment score is adopted as the Rapid Assessment score for a given Site Indicator which meets the description for that Category.
- The overall Site Condition score is then calculated as the total of the Site Indicator scores, using only those Indicators relevant for the vegetation type present, i.e. forest or non-forest.
- For non-forest vegetation types, this total is multiplied by 1.07 to produce the Site Condition Score, as fewer site indicators are assessed.
- Note that Landscape Context scores should be calculated as described in Step 7, and may utilise visual assessments.

Differentiation between Rapid and Detailed assessments

Within the environmental account, Econd® scores based on this Rapid Assessment procedure MUST be clearly differentiated from those based on Detailed Assessments, and the information statement should clearly state how many sites were surveyed using each procedure in each zone.

Maintaining a record of photo-point data

Photo points are not used for analysis and calculation of condition scores, which is instead done based on the visual site assessment. However, photographic data of sites provides a record of site condition and evidence that can be used to support verification and audit procedures. It is therefore important that photo-points are labelled, metadata catalogued, and image files stored alongside other datasets used to produce the environmental account.

Table 7. Simplified visual assessment approach for Rapid Assessment of differences in vegetation condition, showing categories and associated condition descriptions used to score each indicator (reproduced from Michaels (2006)). To assist during Rapid Assessment, customised checklists for the vegetation community in question with the expected benchmark values can be used (see Appendix B – Rapid Assessment Proforma)

Site Indicator	Metric	Category Score 1	Category Score 2	Category Score 3
Large trees (forest)	*Number/ha*	Absent	Few – easy to count (<50% of expected #/ha)	Many – difficult to count (≥50% of expected #/ha)
Tree canopy cover (forest)	*% cover*	Absent or <10% expected cover	Present but scattered and sparse (≥10% but <50% of expected cover) **OR** Dense (>150% of expected cover)	Present and complete (≥50% of expected cover)
Dominant life form cover (non-forest)	*% cover*	Absent or <10% expected cover	Present but scattered and sparse (≥10% but <50% of expected cover)	Present and complete (≥50% of expected cover)
Understorey	*# and % cover of major life forms*	Absent – native species life-forms hard to see and <10% of expected cover	Most native species life-forms missing – limited structural diversity (≥10% to <50% total expected cover)	Most or all native species life-forms present, obvious structural diversity (≥50% total expected cover
Lack of Weeds	*% cover*	Visually dominated by exotics	Easily observed cover (≥5% but <50% cover)	Very rarely observed (<5% cover)
Recruitment (forest)*	*Extent of immature woody trees and shrubs*	Absent	Uncommon (few species and/or hard to see), mostly regeneration of overstorey spp. Evidence of episodic recruitment in <50% of overstorey species	Common (many species and/or obvious). Evidence of episodic recruitment in >50% of overstorey species
Persistence potential (non-forest)	*Extent*	No recruitment or potential for recruitment observed, inappropriate disturbance regime.	Some recruitment or potential for recruitment observed, disturbance regime not completely appropriate	Adequate recruitment or potential for recruitment observed, appropriate disturbance regime
Organic Litter	*% cover*	Absent or <10% expected cover	Low cover (≥10% but <50% of expected cover)	High cover (≥50% of expected cover)
Logs (forest)	*Extent*	Absent	Uncommon (occasional logs and/or stumps)	Common (many large logs – large logs easily seen)

*NOTE: If no recruitment is observed, scores are allocated differently depending on whether the TASVEG community in question usually exhibits continuous recruitment or is reliant on episodic disturbance (refer to the Reference Benchmark).

Table 8. Condition scores assigned for each indicator using the Rapid Assessment procedure. The procedure for assigning these scores for each indicator is outlined in Section 6b. Category score definitions for each indicator are explained above in Table 7. These condition scores are combined with Landscape Context scores (Step 7) to calculate an Econd for each site (Step 8). Ranges given in brackets represent the equivalent range of scores which would be assigned using the Detailed Assessment procedure (Step 5a).

Vegetation Type	Site Indicator	Category Score 1	Category Score 2	Category Score 3
all	Understorey	0	**5** (1-5)	**25** (10-25)
all	Lack of Weeds	0	**3** (2-3)	**15** (4-15)
all	Organic Litter	0	**3** (2-3)	**5** (4-5)
Forest	Large trees	0	**4** (1-4)	**10** (5-10)
Forest	Tree canopy cover	0	**3** (1-3)	**5** (4-5)
Forest	Recruitment	0	**3** (1-4)	**10** (5-10)
Forest	Logs	0	**3** (2-3)	**5** (4-5)
Non-forest	Persistence potential	**3** (0-3)	**6** (4-7)	**10** (8-10)
Non-forest	Dominant life form cover	0	**8** (1-8)	**15** (9-15)

Output of Steps 6a and 6b

- A **data table** (e.g. a spreadsheet) containing scores for each Site Condition indicator, and a final Site Condition score out of 75, for each sampling site.
- Data gathered using Detailed and Rapid Assessment Procedures should be clearly differentiated.

Step 7. Calculate Landscape Context Scores

As well as the Site Condition scores, the Tasmanian VCA Method (Michaels 2006) also includes a Landscape Context score which accounts for 25% of the final Econd® and incorporates landscape-scale considerations which may influence the long-term viability of the site (Parkes et al. 2004, Michaels 2006). These indicators align with the *Extent* and *Configuration* components of the AfN Vegetation Condition framework.

The Landscape Context score comprises three indicators which are assessed using aerial photography and/or spatial datasets collected in Step 2.

- Patch Size (*Configuration*) (accounts for 10% of the final Econd®).
- Neighbourhood Context (*Configuration*) (accounts for 10% of the final Econd®).
- Distance to Core Area (*Configuration*) (accounts for 5% of the final Econd®).

NOTE: GIS platforms must be used to calculate values for landscape context indicators in order to meet the confidence level requirements of Level 2 Accounts. A visual estimate (as per Michaels 2006) may be used to produce Level 3 Accounts.

Score weightings are defined by the VCA Method (Michaels 2006). These indicators are assessed at the level of the patch of vegetation surrounding each site in this Method. This differs from the VCA Manual (Michaels 2006), which specifies that this assessment is carried out at the level of the assessment zone. This alteration is to ensure that the proposed method is readily scaleable to large projects and portfolios, where one assessment zone may span a large number of discrete patches across a broad geographic area.

Indicators are assessed in the same way for both forest and non-forest vegetation. There are no vegetation community-specific benchmarks, rather the notional reference condition for each indicator score implies, continuous, undisturbed native vegetation surrounding the sample site.

Calculate Landscape Context scores

Calculation of all three indicator scores will be based on mapping of extant native vegetation in the 5km buffer area surrounding the patch of vegetation containing the site (hereafter 'focal patch'). This should be obtained and refined using the following steps:

- Review the most recent available aerial imagery and the most up-to-date version of TASVEG mapping (more accurate local mapping may be used if available). GIS software may be used to facilitate this.
- Review the vegetation within a 5km buffer around each focal patch (the GIS Clip function can be used to facilitate batch assessment of site buffers).
- Non-native vegetation types are excluded from calculations of native extent within the buffer. Note that wetlands are included within native vegetation.
- Estimate the native vegetation cover within the buffer as a percentage. Scores are assigned based on 20% increments of cover. This may be done more precisely using GIS geoprocessing analyses (e.g. *Dissolve* and *Calculate Geometry*).

Patch Size

Estimate the size of the patch of native vegetation continuous with the sampling site (i.e. the focal patch). Note that any areas which are contiguous with the focal patch but which are less than 50m wide should not be treated as part of the focal patch. Assign a patch size score as per the matrix below. If the patch size is greater than 20ha, a penalty of -2 is applied if the patch is determined to be significantly disturbed, meaning that it has been subjected to anthropogenic disturbances which have altered the floristics, structure or growth stage of the vegetation, such as grazing, mining, agricultural clearing, timber harvesting, fuel reduction burning or *Phytophthora* infestation. According to the Tasmanian VCA Manual, all patches of native vegetation within fragmented and relictual landscapes are therefore considered significantly disturbed (Michaels 2006).

PATCH SIZE SCORING MATRIX		Significantly disturbed?	
		No	Yes
Patch size (hectares)	<2	1	
	≥2 to 5	2	
	≥5 to 10	4	
	≥10 to 20	6	
	≥20	10	8

Neighbourhood

Estimate native vegetation extent and disturbance within neighbourhood buffers of 100m, 1km and 5km around the focal patch (note that buffer distances begin at focal patch boundary, not at the sampling site). For Level 2 Accounts, GIS tools must be used to make precise calculations and batch process this assessment.

Use the table below to calculate the Neighbourhood score, by summing the weighted percentage of native vegetation within each of the three buffers, (Level 2 – accurate measure from GIS, or Level 3 – estimated and rounded to the nearest 20%), then applying a penalty of -2 if at least 50% of the native vegetation in the 5km buffer is considered 'significantly disturbed', following the same assessment rules as for patch size.

NEIGHBOURHOOD SCORING		% native vegetation	Weighting	Subscore
Radius from site	100m		0.03	
	1km		0.04	
	5km		0.03	
Subtotal (round to nearest round number)				
Final score: apply penalty (-2) if neighbourhood 'significantly disturbed'				

Distance to Core Area

A core area is defined as any patch of native vegetation greater than 50 ha in size, regardless of vegetation type, condition or tenure. Filter the native vegetation shapefile (created above) by the Area field to only include patches equal or greater to 50ha. Measure the shortest distance from the focal patch boundary to the boundary of the nearest core area, and allocate a score based on the matrix below, using the same definition of 'significantly disturbed' as for Patch Size and Neighbourhood, above.

DISTANCE TO CORE AREA SCORING MATRIX		Core Area significantly disturbed?	
		No	Yes
Distance to Core Area	>5 km	0	0
	≥1 to 5 km	2	1
	<1 km	4	3
	0 km (contiguous)	5	4

Output of Step 7

- For Level 2 Accounts - an edited, georeferenced shapefile delineating all areas of native vegetation mapped within a 5km radius of each focal patch.
- For Level 3 Accounts – a table (e.g. spreadsheet) of landscape configuration values made through visual estimate
- A data table (e.g. spreadsheet) with raw values, calculated indicator scores and final landscape score for each sampling site.

Step 8. Calculate the Econd®

The Econd® is an index between 0 and 100. For the purposes of this method and in order to align with the Tasmanian VCA Method (Michaels 2006), a score of 100 describes the average condition of a mature and apparently long undisturbed site. A score of zero (0) indicates the asset is completely degraded.

Site score calculation

For this Method, the Econd® is calculated for each sampling site by summing together the Site Condition score (calculated in Step 6a and 6b) and the Landscape Context score (calculated in Step 7) to generate a final score out of 100. This approach applies to both the Detailed and Rapid Assessment Procedures, as the scoring system for both has been aligned (see Table 8 and Step 6b – Calculate Site Condition Scores – Rapid Assessment Procedure). As described in Steps 5 and 6, the indicators which comprise these two sub-scores have already been weighted according to their importance in defining vegetation condition (Michaels 2006).

Data aggregation

To aggregate site scores for assessment zones, sub-assets and assets:

- Econd® scores for each sampling site are averaged (without weighting) within each assessment zone.
- To generate a single Econd® score for each sub-asset (broad vegetation group), scores for each component assessment zone are weighted by the proportion of the total sub-asset area represented by that assessment zone.
- This weighting process is repeated to aggregate the scores for each sub-asset into a single Econd® score for all native vegetation condition within the environmental account.

Extent

To account for extent as per the AfN Native Vegetation Guidelines, the final Econd® score is weighted by the proportion of native vegetation within the project area. This is determined by undertaking a GIS analysis of TASVEG mapping of the project area and calculating the proportion of native and non-native vegetation communities in the project area.

Worked example

A simple worked example of the aggregation process is represented in Table 9.

*Table 9 Worked example, showing how Econd® scores are calculated and aggregated at each assessment level**

Sub-asset	Assessment zone		Sample site	Site Cond. score	L'scape Context score	Econd® Sample site	Econd® Assessment zone	Econd® Sub-asset	Econd® Asset
Native grasslands	GPH – unburnt	10ha	NV001	50	18	68	70	78 (70*10/15 + 95*5/15)	82.8 (78*15/35 + 85*35/50) X remnant extent (%)
			NV002	48	24	72			
	GPH - burnt	5ha	NV003	71	25	96	95		
			NV004	70	24	94			
Dry sclerophyll forests and woodlands	DDE – logged	10ha	NV005	56	18	74	74	85 (74*10/35 + 87*20/35 + 97 + 5/35)	
	DDE – unlogged	20ha	NV006	62	18	80	87		
			NV007	69	25	94			
	DRO	5ha	NV008	72	25	97	97		

*NOTE: This worked example represents stratification of a sub-asset based on management approach, creating assessment zones. This approach is provided as an indication of the scope of this method but is not required for all accounts.

Output of Step 8

- A **data table** (e.g. a spreadsheet) containing:
  - calculated scores for the Econd®, Site Condition Score, Landscape Context score and indicator scores for each sampling site.
  - Area (in hectares) for each assessment zone
  - Aggregated Econd® scores for each assessment zone, sub-asset and asset
- A **summary table** showing the Econd® scores for each assessment zone, sub-asset and asset.

Certification process

Steps 5 to 7 should be repeated at regular intervals (a minimum of every five years or where Base Year recalculation is required, as specified under the *Accounting for Nature*® Framework) to establish a trend over time.

If you wish for your account to be certified, it must be verified in accordance with the *Accounting for Nature*® *Standard*, which outlines the criteria that must be satisfied. The benefit of having an account certified is that AfN allows you to display the Certified Account logo and you are able to make public claims about your account. AfN Certified Accounts require the Environmental Account Summary and Information Statement to be made publicly available.

A Certified Environmental Account may incorporate multiple environmental assets, and always needs to include the following information:

- Information Statement and Environmental Account Summary,
- Environmental Account (including raw data tables); and;
- An **Audit Report** or **Self-verification Report** that verifies the account was prepared in accordance with the approved Methods, the AfN Standard and Audit Rules.
    - An **Audit Report** is completed by an AfN Accredited Auditor and is required if you are seeking to have your account "Certified" (Tier 1); OR
    - A **Self-verification Report** contains the results of your self-verification assessment and AfN's technical Assessment and is required if you are seeking to have your account "Self-verified" (Tier 2).

References

- NSW Government (2020) Biodiversity Assessment Method, Department of Planning, Industry and Environment, Sydney
- Michaels, K. (2006) A Manual for Assessing Vegetation Condition in Tasmania, Version 1.0. Resource Management and Conservation, Department of Primary Industries, Water and Environment, Hobart.
- Kitchener, A., and S. Harris. 2013. From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation. Edition 2, Department of Primary Industries, Parks, Water and Environment, Tasmania.
- Parkes, D., Newell, G., and Cheal, D. (2003) Assessing the quality of native vegetation: The 'habitat hectares' approach. Ecological Management & Restoration 4(s1), S29-S38.
- Parkes, D., Newell, G., and Cheal, D. (2004) The development and raison d'être of 'habitat hectares': A response to McCarthy et al. (2004). Ecological Management & Restoration 5(1), 28-29.

Appendix A – Tasmanian VCA Manual (Michaels 2006)

The TASVEG Vegetation Condition Manual can be downloaded from here:
https://nre.tas.gov.au/Documents/TASVEG-Vegetation-Condition-Manual.pdf

Appendix B – Rapid Assessment Proforma (adapted from Michaels 2006)

NATIVE VEGETATION CONDITION - RAPID ASSESSMENT PROFORMA **(Example)**

ASSESSMENT DATE:	PROPERTY:
OBSERVER(S):	SAMPLE SITE:
TASVEG VEGCODE:	DGL (Eucalyptus globulus dry forest and woodland)
FACIES:	Forest
STRUCTURE:	Coastal Facies

SITE CONDITION SCORES (VISUAL ASSESSMENT). Note that **1ha ≈ 56m radius** around site.

Site indicator	Scoring guide			Score assigned (1-3)
	1	2	3	
Large trees	Absent	Few – easy to count (<10/ha)	Many – difficult to count (≥10/ha)	
Tree canopy cover*	<3% cover	3 – 15% or >45% cover	15 – 45% cover	
Understorey	**Expected lifeforms and cover**: understorey tree/shrub (15%), grass (50%), prostrate shrub (5%), herbs and orchids (5%), sedge/rush/sagg/lily (20%), ground fern (5%), mosses and lichens (5%), scrambler/climber/epiphytes (5%)			
	Absent – native species life-forms hard to see and <10% of total expected cover	Most native species life-forms missing – limited structural diversity (≥10% to <50% total expected cover)	Most or all native species life-forms present, obvious structural diversity (≥50% total expected cover	
Lack of Weeds	Visually dominated by exotics	Easily observed cover (≥5% but <50% cover)	Very rarely observed (<5% cover)	
Recruitment *	Absent	Uncommon (few species and/or hard to see), mostly regeneration of overstorey spp.	Common (many species and/or obvious)	
Organic Litter	<4% cover	Low cover (≥4% but <20% cover)	High cover (≥20 cover)	
Logs*	Absent	Uncommon (occasional logs and/or stumps)	Common (many large logs – large logs easily seen)	
Dominant lifeform cover**	Absent (<10% cover)	10-50% cover	>50% and <150% cover	
Persistence potential**	Low cover/low diversity	Low diversity/high cover or high diversity/low cover	High diversity/high cover	

SIGNS OF DISTURBANCE (FIRE, GRAZING, CLEARING, FIREWOOD CUTTING, ILLEGAL ACCESS, PHYTOPHTHORA, CANOPY DIEBACK ETC):

NOTES:

**Assessed in forest communities only*

***Assessed in non-forest communities only*

Appendix C – Supporting Documentation Checklist for Verification

The output of each step is required to be submitted as (confidential) supporting documentation to help with account verification. Authors should include a checklist of all key outputs for each step of the Method in this appendix to help Proponents prepare their account for verification and ensure they have all supporting documentation required.

STEP	OUTPUT
1	- A **description** of the accounting area including location and size. - A **table** describing the purpose and scope of the account. - A **map** showing the accounting area.
2	**Maps** of the accounting area showing: - the location and landscape context of the accounting area. - existing vegetation mapping within the accounting area. - recent aerial imagery of the accounting area, at a scale detailed enough (e.g. 1:10 000) to detect differences in vegetation structure and disturbances such as roads. A **folder** (preferably electronic) containing all relevant spatial datasets, clearly labelled and with associated metadata completed (source, publication and download date, georeferencing information etc).
3	- A **map** and table showing the stratification of the accounting area and identifying assessment units
4	- A **table** showing listing the indicators and reference benchmarks for each assessment zone
5a / 5b	- A **data table** (e.g. a spreadsheet) containing the scores for each environmental indicator for each sampling site - A **folder** (preferably electronic) containing any sample photographs appropriately labelled according to the Assessment Zone, sampling site and survey date*. *NOTE: This requirement applies to accounts based on newly collected data. For accounts based on historic datasets, photo-points must be established when repeat measures are made.
6a / 6b	- A data table (e.g. a spreadsheet) containing scores for each Site Condition indicator, and a final Site Condition score out of 75, for each sampling site. - Data gathered using Detailed and Rapid Assessment Procedures should be clearly differentiated.
7	- For Level 2 Accounts - an edited, georeferenced **shapefile** delineating all areas of native vegetation mapped within a 5km radius of each focal patch. - For Level 3 Accounts – a **data table** (e.g. spreadsheet) of lanscape configuration values made through visual estimate - A **data table** (e.g. spreadsheet) with raw values, calculated indicator scores and final landscape score for each sampling site.
8	A data table (e.g. a spreadsheet) containing: - Calculated scores for the Econd®, Site Condition Score, Landscape Context score and indicator scores for each sampling site. - Area (in hectares) for each assessment zone - Aggregated Econd® scores for each assessment zone, sub-asset and asset - A summary table showing the Econd® scores for each assessment zone, sub-asset and asset.