Old growth forest identification

Assessment Tool

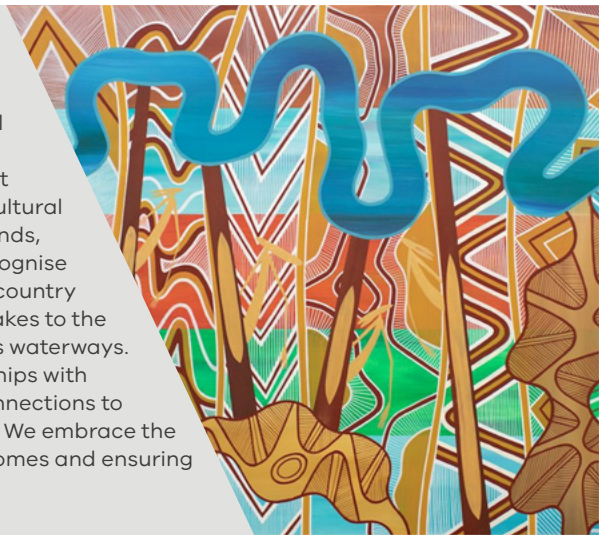
JULY 2020

CONSERVATION REGULATOR VICTORIA

Old growth forest identification Assessment Tool

Aboriginal acknowledgment

The State Government proudly acknowledges the Traditional Owners of the Victorian marine and coastal environment as the traditional custodians of the land. We pay our respects to their ancestors and elders, past and present. We recognise and respect their unique cultural heritage, beliefs and relationship to their traditional lands, which continue to be important to them today. We recognise the intrinsic connection of Traditional Owners to their country and value the contribution their Caring for Country makes to the management of the land, its coastlines, its seas and its waterways. We support the need for genuine and lasting partnerships with Traditional Owners to understand their culture and connections to country in the way we plan for and manage the coast. We embrace the spirit of reconciliation, working towards equity of outcomes and ensuring an equal voice for Australia's first people.



Content

Report produced by the Conservation Regulator

PO Box 500, East Melbourne, Victoria 8002
Telephone 136 186 conservationregulator.vic.gov.au

Version 1.0

ISBN 978-1-76105-171-5 (print)
ISBN 978-1-76105-172-2 (PDF/online/MS word)

Accessibility

If you would like to receive this publication in an alternative format, please telephone the DELWP Customer Contact Centre on 136 186, email customer.service@delwp.vic.gov.au, or via the National Relay Service on 133 677 www.relayservice.com.au. This document is also available on the internet at www.delwp.vic.gov.au

Background

The purpose of this document is to outline a step-by-step procedure that must be followed to identify old growth forest, ensuring its protection from timber harvesting operations and associated management activities.

This procedure is to be applied prior to timber harvesting throughout Victoria's State forests. It is to be applied consistently during pre-harvest surveys undertaken by harvesting entities (e.g. VicForests) and the Conservation Regulator's Forest Protection Survey Program (FPSP) and contractors. It should also be applied consistently during any old growth forest compliance assessments undertaken by the Conservation Regulator's Timber Harvesting Compliance Unit (THCU). The Conservation Regulator expects that timber harvesting operations (including all associated management activities) that occur adjacent to mapped and marked old growth forest are appropriately planned to ensure no disturbance or adverse impacts occur.

A precautionary approach should always be adopted (including during; identification of centroids to be surveyed, determination of presence/absence at each centroid, boundary delineation, timber harvesting operations that follow), with any concerns or queries directed to the Conservation Regulator (OCR@delwp.vic.gov.au).

Objective

The objective of the procedure outlined within this document is to provide a robust method for the identification of old growth forest.

Associated documents

To understand the implications of this document for timber harvesting, it should be read in conjunction with the Protection of old growth forest from timber harvesting - Regulatory Guide. Terms used in this document are defined in the Regulatory Guide.

Skills and experience required

Implementation of this procedure requires personnel with high-level skills and experience in desktop and field data collection and analysis, ecological survey techniques, flora species identification, and aerial image analysis and interpretation. It is a requirement that personnel can provide evidence of the skills and experience required to apply this procedure if requested by the Conservation Regulator.

Personnel must have the ability to recognise old growth in the desktop and field assessment and to record the required fields in the datasheets provided, including skills in:

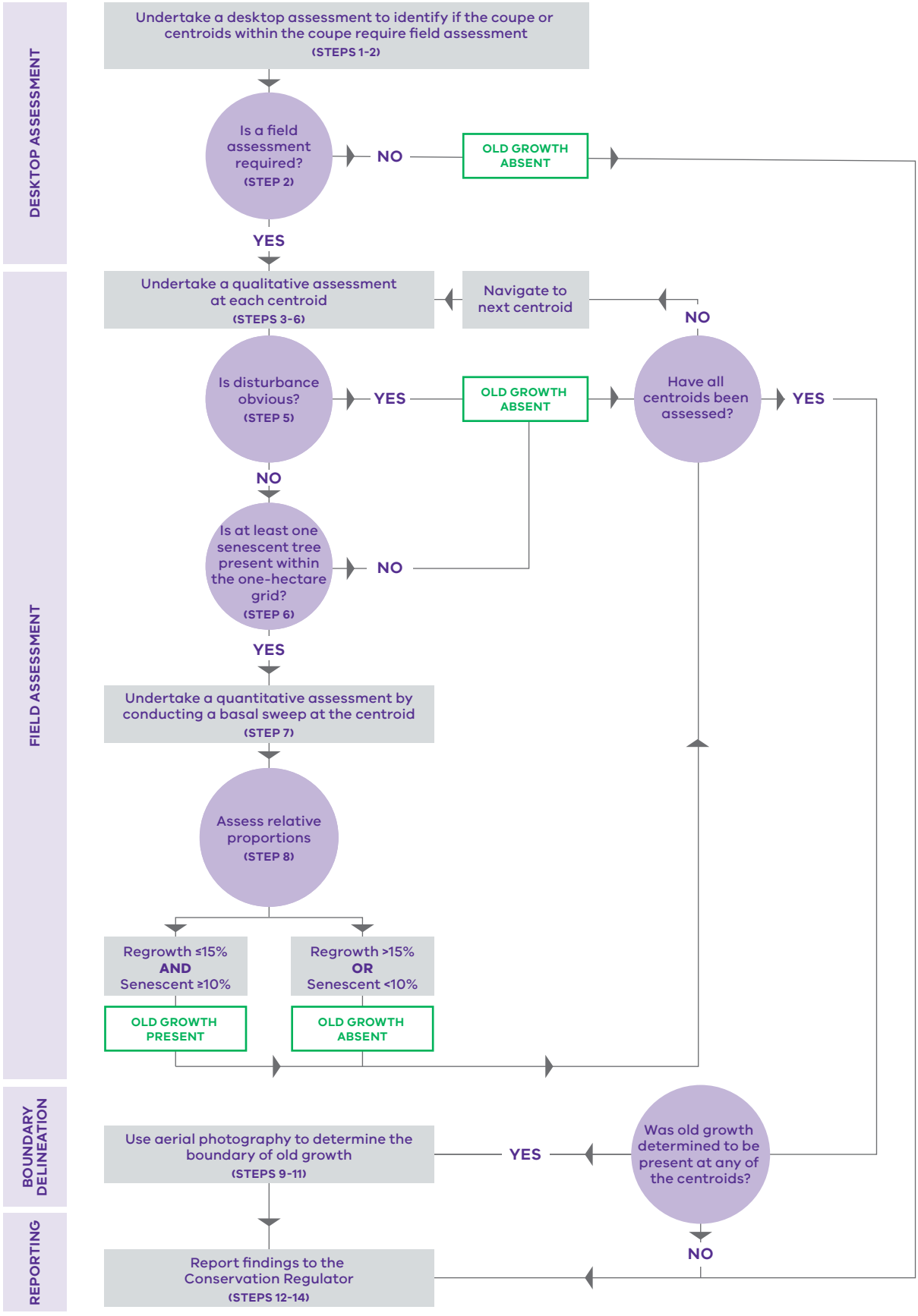
- Identification of flora species, vegetation communities and growth stages.
- Use of ecological survey techniques including: GPS, basal sweep tool and the Diameter at Breast Height Over Bark (DBHOB) measurements.
- GIS analysis and editing.
- Aerial image analysis and interpretation.

Equipment list

The following pieces of equipment are required to undertake the procedure outlined within this document.

- ☐ GPS unit
- ☐ Digital camera
- ☐ Basal sweep tool
  e.g. dendrometer, wedge prism
- ☐ Measuring tape
- ☐ Clipboard, paper and pen
- ☐ Field assessment datasheets
  or electronic recording device
- ☐ Assessment Tool – this document
- ☐ Appropriate spare batteries
  for all equipment

The procedure



Desktop assessment

Steps 1 and 2 involve a desktop assessment to obtain and review all available information on the coupe to be surveyed. This will ensure that an efficient field assessment is planned.

Steps

1 Review and obtain the following information on the coupe to be surveyed.

Available from Corporate Spatial Data Library (CSDL) or Victorian Spatial Data Library (VSDL) (obtain from www.data.vic.gov.au)

Information on coupe

- Overlay of systematic one-hectare grid, showing centroids to be surveyed
- Overlay of coupe boundaries (available from the Timber Release Plan (TRP) and the Timber Utilisation Plan (TUP) spatial databases)
- Overlay of Ecological Vegetation Class (EVC) (NV2005_EVCBCS layer), including determination of the forest type present[1]

Information used to determine centroids that do require field assessment

- Modelled Old Growth (MOG or MOG2020) layers
- State Forest Resource Inventory (SFRI) relative age data (RELAGE layer)
- Fire history (FIRE_HISTORY_LASTBURNT layer)[2]
- Harvesting history (LASTLOG25 layer)

Information used to determine centroids that do not require field assessment

- Within Forest Management Zones (FMZ) layer (FMZ100) (including Special Protection Zones (SPZ) and Special Management Zones (SMZ))
- Within State-wide rainforest (RAINFOR layer)

Available from Coordinated Image Program (CIP) (via Image Web Server (IWS))

- Any available aerial images
- Any available remote sensed imagery[3]

1 Refer to Additional Information on Page 11.
2 Layer does not include 2019/2020 fire history – this is to be obtained from FIREWEB (under Mapping, Data, Burnt Areas (for Risk Team)).
3 LIDAR is available for a patch in the Central Highlands RFA region.

2 Use the information obtained in Step 1 to determine which coupes and/or centroids require field assessment and complete the desktop assessment datasheet 1 and desktop assessment datasheet 2. If it is unclear through the desktop assessment whether old growth is potentially present or not, a field assessment is required.

Field assessment must occur at the centroid if:

Spatial data (e.g. MOG, MOG2020, RELAGE, FIRE_HISTORY_LASTBURNT and LASTLOG25) indicates possibility of old growth presence within a coupe or up to 50m outside of the coupe boundary.

Field assessment is not required at the centroid if:

- More than 75% of the one-hectare grid is located outside the coupe boundary.
- More than 75% of the one-hectare grid is in an area that is excluded from planned harvesting operations and associated management activities (note: if any future harvesting operations are planned in the area further assessment is required).
- The one-hectare grid is mapped as SPZ (area already protected from harvesting).
- The one-hectare grid is modelled (RAINFOR layer) and verified by field inspection as rainforest, or is identified in the field as rainforest (not modelled) as all rainforest is protected from harvesting.
- The one-hectare grid or the centroid have any of the following disturbance (>50% is harvested; >50% is impacted by infrastructure; >50% is impacted by high severity fire; or >50% cleared).

Note 1 If data other than that specified above is used to make decisions to conduct or not conduct a field assessment, that data must be referred to in all reports documenting the decision. Assessors are to provide details of aerial imagery or remote sensing data used to assist with decision making.

Note 2 If at completion of Step 2, no centroids are identified as requiring field assessment, refer to the reporting section and submit the completed desktop assessment datasheet 1 to the Conservation Regulator.

Field assessment

Steps 3 to 8 are completed in the field, and will enable verification of presence/absence of old growth forest within the coupe to be surveyed. This involves both qualitative and quantitative assessments.

Qualitative assessment

Steps

3 Navigate to a centroid and record the GPS location (WGS84) in field assessment datasheet 1.

Note	All assessors are required to record a GPS track log of the survey assessment, convert the track log to a GIS shapefile and submit the shapefile with the assessment data.

4 Determine the presence/absence of centroid/grid characteristics and record these in field assessment datasheet 1.

Note	Take photographs and additional field notes as required to assist with old growth determination and boundary delineation.

5 Does the one-hectare grid or centroid have any of the following disturbances:

- >50% is harvested;
- >50% is impacted by infrastructure;
- >50% is impacted by high severity fire; or
- >50% cleared?

Yes	**old growth absent**, record this in field assessment datasheet 1 and navigate to the next centroid starting back at Step 3, until all centroids identified for field assessment have been assessed.
No	**possible old growth**, record this in field assessment datasheet 1 and proceed to Step 6.

6 Is at least one senescent tree present within the one-hectare grid?

Yes	**possible old growth**, record this in field assessment datasheet 1 and proceed to Step 7.
No	**old growth absent**, record this in field assessment datasheet 1 and navigate to the next centroid starting back at Step 3, until all centroids identified for field assessment have been assessed.

Quantitative assessment

Steps

7 Conduct a basal sweep[4] at the centroid to collect 'IN' trees that have their crowns within the upper stratum, recording the species[5] and growth stage[6] of each 'IN' tree in field assessment datasheet 2.

8 Assess the relative proportion of regrowth stage and senescing stage trees within the 'IN' trees identified. If the proportions are:

Regrowth ≤15% **AND** **Senescent ≥10%**	**old growth is determined to be present**, record this in field assessment datasheet 1 and navigate to the next centroid starting back at Step 3, until all centroids identified for field assessment have been assessed.
Regrowth >15% **OR** **Senescent <10%**	**old growth is determined to be absent**, record this in field assessment datasheet 1 and navigate to the next centroid starting back at Step 3, until all centroids identified for field assessment have been assessed.

4 Refer to 'Additional Information' on Page 14.
5 'IN' trees can be any species that have their crowns in the upper stratum.
6 Refer to 'Additional Information' on Page 12.

Boundary delineation

Steps 9 to 11 enable a boundary to be delineated around old growth forest identified during the field assessment, so that the area within can be protected. The information obtained from the field assessment is integral to informing boundary delineation, supplemented by further desktop assessment.

Steps

9 **Obtain and review information collected during the desktop and field assessment, including but not limited to:**

- Field survey data including presence/absence of old growth forest and relevant tracklogs.
- Information on potential canopy signatures of old growth forest (e.g. changes in crown size, density or colour, and signs of disturbance) obtained from aerial image analysis[7] and/or analysis of remote sensed imagery[8] (available from CIP via the IWS).

10 **Using a GIS editing tool, create a polygon or group of polygons around identified old growth forest. When creating the polygon, the following must be considered:**

- The boundary **must** include all identified old growth within the coupe boundary, however, may extend outside the coupe boundary, or within areas not field assessed, to determine the minimum one-hectare size.
- The information obtained in the field and any further boundary information gained from aerial image analysis or satellite data interpretation.
- The polygon boundary should logically follow the edge of the canopy.
- More than one polygon can be created for each coupe, however small breaks or disturbances **must not** be the determining factor for this (i.e. if an access track or walking track does not cause a loss in continuity in the canopy it should be included in the one polygon).

11 **Once determination and drafting of a proposed boundary is complete, save the polygon or groups of polygons as a single shape file (*.shp) (using the spatial template provided by the Conservation Regulator) with the following minimum attributes:**

- PolygonID (unique for each polygon).
- Coupe ID.
- PackageID (FPSP only). For FPSP surveys the PackageID will be assigned.
- SurveyID (VicForests only). For all VicForests surveys please provide a unique SurveyID in the format VF_(coupe address)_survey number (e.g. VF_461-504-0003_01).
- Perimeter length (m).
- Area (ha).
- SurveyTech abbreviation (will be the abbreviation OG).

7 For assistance with aerial photographic interpretation refer to CRAFTI Aerial Photographic Interpretation Manual.
8 LIDAR is available for a patch in the Central Highlands RFA region.

Reporting

Reporting results to the Conservation Regulator ensures the ability to protect, monitor and verify old growth forest prior to timber harvesting throughout Victoria's State forests. Steps 12 to 14 outline the process required.

Steps

12 **If no field assessment was required, submit to the Conservation Regulator the completed desktop assessment datasheet 1. If centroid level assessment was required, also submit completed desktop assessment datasheet 2.**

13 **If a field assessment was required, submit to the Conservation Regulator the following:**

- Completed desktop assessment datasheet 1 and desktop assessment datasheet 2 (*.xlsx).
- Completed field assessment datasheet 1 and field assessment datasheet 2 (*.xlsx).
- Proposed boundary as a shape file (*.shp) (refer to requirements in Step 11).

14 **The following must be retained (e.g. in the coupe folder) for auditing purposes and provided to the Conservation Regulator upon request:**

- Completed desktop assessment datasheet 1 and desktop assessment datasheet 2 (*.xlsx).
- Completed field assessment datasheet 1 and field assessment datasheet 2 (*.xlsx).
- Any photographs taken (*.jpeg).
- All GPS tracklog data as a shape file (*.shp).
- Proposed boundary as a shape file (*.shp).

To arrange submission of electronic data (*.xlsx, *.shp, *jpeg) and reports please contact the Forest Protection Survey Program at fpsp.inquiries@delwp.vic.gov.au.

Additional information

Forest types

For the purpose of growth stage determination Ecological Vegetation Classes (EVCs) have been grouped into indicative forest types, being either Ash-type forest or Mixed-species forest (Table 1). This list is to be used as a guide only and is not intended to be prescriptive.

Table 1 Ecological Vegetation Classes (EVCs) grouped by forest type

Forest growth type	Ecological vegetation division	Ecological Vegetation Class (EVC)
Ash-type forest	Wet or Damp Forests	Damp Forest
		Montane Damp Forest
		Montane Wet Forest
		Shrubby Damp Forest
		Shrubby Wet Forest
		Tableland Damp Forest
		Wet Forest
Mixed-species forest	Dry Forests	Dry Valley Forest
		Grassy Dry Forest
		Heathy Dry Forest
		Herb-rich Foothill Forest
		Shrubby Dry Forest
		Shrubby Foothill Forest
		Valley Grassy Forest
		Heathy Herb-rich Woodland
		Heathy Woodland
	Heathy Woodlands	Lateritic Woodland
		Metamorphic Slopes Shrubby Woodland
		Shrubby Woodland
		Dry Creekline Woodland
		Grassy Woodland
		Hillcrest Herb-rich Woodland
		Hills Herb-rich Woodland
	Lower Slopes or Hills Woodlands	Low Rises Woodland
		Banksia Woodland
		Limestone Box Forest
		Lowland Forest
		Lowland Herb-rich Forest
		Montane Dry Woodland
		Montane Grassy Woodland
		Montane Herb-rich Woodland
		Plains Grassy Forest
	Lowland Forests	Plains Grassy Woodland
		Plains Sedgy Woodland
		Plains Woodland
	Montane Grassland, Shrublands or Woodlands	Shallow Sands Woodland

Growth stages

With the height and age of trees a function of species biology and site characteristics (e.g. tree height may be reduced in areas with poor soil fertility and low rainfall), the transition from one growth stage to another may occur over years or even decades. Similarly, differences in forest types can also impact growth stage determination, with Ash-type forests differing from Mixed-species forests.

Ash-type forests are able to be linked to events such as fire or harvesting, with large fire events in Victoria post-1900 occurring in 1905/06, 1926, 1932, 1939 and, more recently, 1983, 2009 and 2019/2020.

As such, ~80-year-old regrowth trees originating from the 1939 fires may display more mature attributes, however these are still classified as a regrowth tree rather than a mature tree given they are still actively growing and have pointed crowns. Further, trees must pass through each growth stage before progressing to the next, in other words an unhealthy tree with a dying crown may not necessarily be at the senescing phase, it may be a regrowth tree displaying senescing attributes.

For the purpose of this document growth stages have been simplified into regrowth, mature and senescing, with differences between forest types highlighted (Table 2) and photographs provided as additional visual guides (Figure 1 and Figure 2 – photographs provided by Michael Ryan).

Regrowth **Mature** **Senescing**

Figure 1 Growth stages of ash-type forests

Regrowth **Mature** **Senescing**

Figure 2 Growth stages of mixed-species forests

Table 2 Description of growth stages across forest types

Growth stage	Description			
	Ash-type forest		Mixed-species forests	
Regrowth	• Actively growing • Crown = healthy, very pointed to pointed • Height = 50-90% of potential height, <90 m • Stand density = 80-200 stems/ha • DBHOB = ~60-160 cm • Age = <120 years		• Actively growing • Crown = healthy, very pointed to becoming rounded • Height = 50-90% of potential height, <50 m • Stand density = 80-200 stems/ha • DBHOB = ~30-90 cm • Age = <120 years	
Mature	• Crown = high to moderately regular, rounded to flattened • Height = final potential reached, 65-100 m • Stand density = 50–120 stems/ha • DBHOB = ~90-250 cm • Age = 120-250 years • Hollows beginning to develop • Substantial buttressing		• Crown = high to moderately regular, rounded through to considerable distortion • Height = final potential reached, 35-60 m • Stand density = 50–120 stems/ha • DBHOB = ~70-200 cm • Age = 120-250 years • Hollows beginning to develop • Substantial buttressing	
Senescing	• Crown = irregular to very irregular, smaller and lighter in colour • Height = loss of height as crown limbs die and fall, 40-90 m • Stand density = 10-50 stems/ha • DBHOB = ~200-450 cm • Age = >250 years • Presence of bumps, burls, dead limbs		• Crown = irregular to very irregular, smaller and lighter in colour • Height = loss of height as crown limbs die and fall, 30-60 m • Stand density = 10-50 stems/ha • DBHOB = ~120-300 cm • Age = >250 years • Presence of bumps, burls, dead limbs	

Process for undertaking a basal sweep

The basal sweep, an efficient method of sampling, facilitates the collection of unbiased estimates of basal area within a forest stand, without the need to measure out a fixed area plot. Using a basal sweep tool (e.g. dendrometer or wedge prism), a sweep is undertaken to identify 'IN' trees at breast height[9]. The tool calculates basal area by means of a mathematical relationship between the sight width of the instrument and the distance held from the observer's eye, otherwise known as the Basal Area Factor (BAF). Trees will appear either 'IN' or 'OUT' according to their diameter and the calibration of the basal sweep tool (Example 1).

Process steps

1. Stand still at the centroid.
2. Using the basal sweep tool, place the tool at a calibrated distance from your eyes.
3. Establish two lines of sight, one from the left edge of the opening and the other from the right edge.
4. Maintaining the lines of sight, rotate on the spot to identify all trees at breast height that have their crowns within the upper stratum (as a guide the BAF chosen should target 10-20 'IN' trees and be consistent across the coupe where possible).
   Note: If a minimum of 10 'IN' trees cannot be identified consider moving <5m from the centroid to determine if this will meet the threshold, if after a re-count the minimum is still below 10, conduct the basal sweep and record the number of trees.
   Note: If it is unclear if a tree is either 'IN' or 'OUT', the diameter-critical distance measure should be undertaken.
5. For every 'IN' tree identified, record the species[10] and growth stage to determine the relative proportions present.

Example 1

How to determine which trees are 'IN' and which trees are 'OUT'

If at breast height the tree is larger than the fixed angle, it is classified as 'IN', however if a tree is narrower than the fixed angle it is classified as 'OUT'. In the example below, tree numbers 1, 2, 4, 7, 9, 11 and 12 are classified as 'IN', whilst tree numbers 3, 5 and 8 are classified as 'out' (Figure 3). Tree 6 would be considered borderline and would require further assessment.

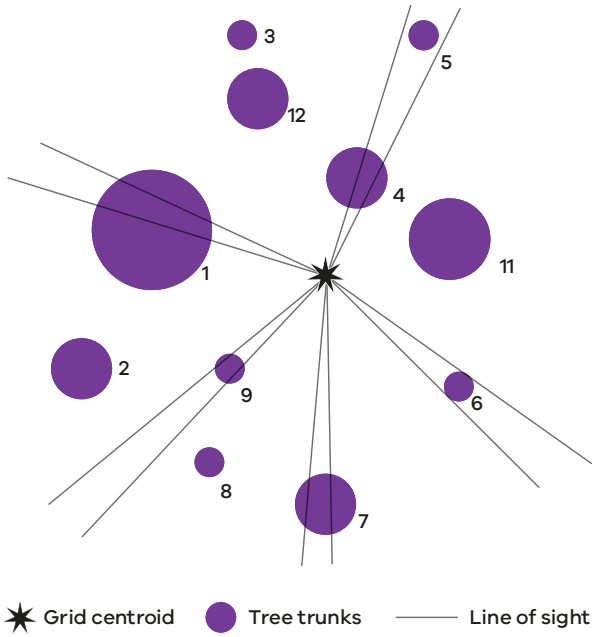


Figure 3 Basal sweep showing which trees are 'IN' and which are 'OUT'

9 Breast height is 1.3 metres above ground on the up-slope side of the tree.
10 'IN' trees can be any species that have their crowns in the upper stratum.

Process for undertaking the diameter critical distance measure

If a tree cannot be classified as 'IN' or 'OUT' whilst undertaking a basal sweep, the tree is considered 'borderline'. To determine if a borderline tree is 'IN' or 'OUT' both the observer's distance from the tree (in this case the distance from the centroid to the borderline tree) and the diameter of the tree (Diameter at Breast Height Over Bark (DBHOB) refer to Example 2) is required. The diameter of the tree is then multiplied by the Plot Radius Factor (PRF), which corresponds with the Basal Area Factor (BAF) used during the basal sweep, to obtain the limiting distance.

If the observer's distance from the tree is less than or equal to the limiting distance, then the borderline tree is considered 'IN', otherwise it is considered 'OUT'.

Process steps

1 Stand still at the centroid.

2 Identify the borderline tree for assessment.

3 Use a measuring tape to determine the distance (m) from the centroid to the borderline tree.

4 Use a measuring tape to determine the DBHOB (cm) of the borderline tree (refer to Example 2).

5 Determine the PRF using the below equation.

$$\text{PFR (m/cm)} = \sqrt{\frac{0.25}{\text{BAF (m}^2\text{/ha)}}}$$

6 Multiply the DBHOB of the tree (obtained in process step 4) with the PRF (obtained in process step 5) to calculate the limiting distance (m).

7 Compare the distance from the centroid to the borderline tree (obtained in process step 3) with the limiting distance (obtained in process step 6).

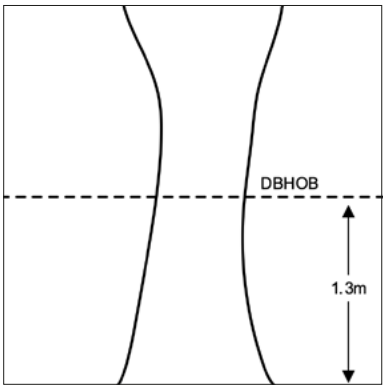
8 If the distance from the centroid to the borderline tree is less than or equal to the limiting distance, the borderline tree is considered IN', otherwise it is considered 'OUT'.

Example 2

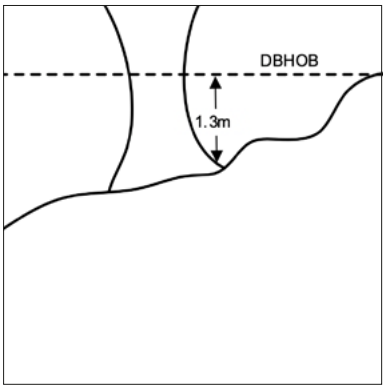
How to measure the DBHOB of a tree

The DBHOB of a tree is measured on the up slope at a height of 1.3m. The example below demonstrates how to measure this under various circumstances (Figure 4). In box 6 (Figure 4), the DBHOB of each stem is combined, with a single value obtained using the following equation.

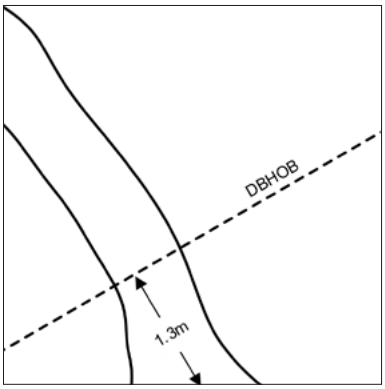
$$\text{Total DBHOB} = \sqrt{(\text{DBHOB})_1)^2+(\text{DBHOB})_2)^2}$$



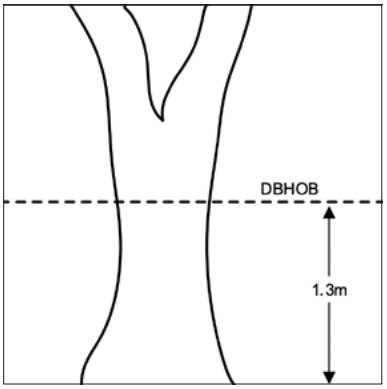
Box 1 Tree on level ground



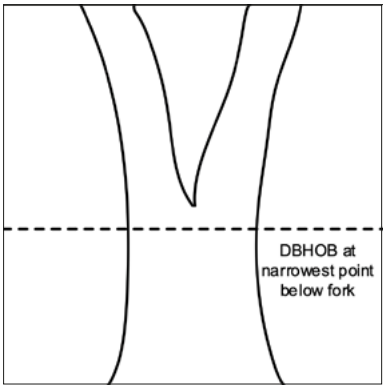
Box 2 Tree on sloping ground



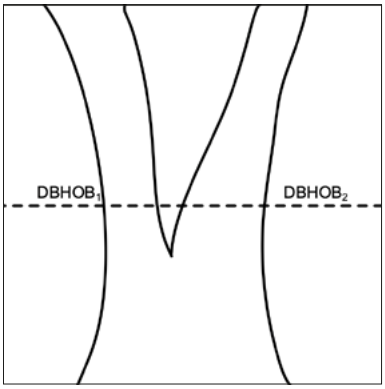
Box 3 Tree leaning on level ground



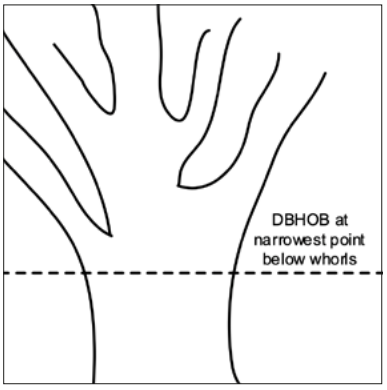
Box 4 Tree fork above 1.3m



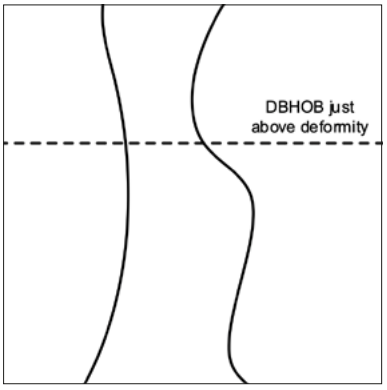
Box 5 Tree fork at 1.3m



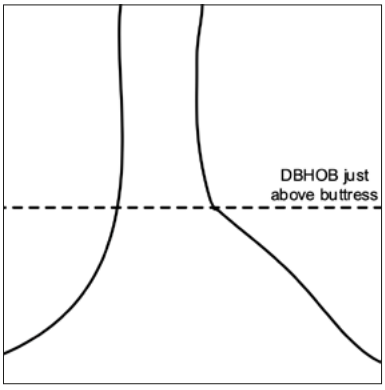
Box 6 Tree fork below 1.3m



Box 7 branch whorls 1.3m



Box 8 Tree deformed at 1.3m



Box 9 Buttress at 1.3m

Figure 4 Process for measuring DBHOB of trees

Desktop assessment datasheet 1

Assessment date:

Assessor names:

Contact email:

Is a field assessment required within the coupe?

Coupe ID	Modelled Old Growth (MOG) layer	Fire history (FIRE_HISTORY_ LASTBURNT) layer	Harvesting history (LASTLOG25) layer	State forest resource inventory (RELAGE layer)	Does spatial data indicate the possibility of old growth presence? If yes, then a field assessment is required (Y/N)
	Does the layer indicate the possibility of old growth? (Y/N)	Does the layer indicate recent fire history? (Y/N)	Does the layer indicate recent harvesting? (Y/N)	Does the layer indicate the possibility of old growth? (Y/N)	

Desktop assessment datasheet 2

Assessment date:

Assessor names:

Contact email: **Coupe ID:**

Which centroids require field assessment?

Centroid ID	Determine the forest type present for growth stage determination (use the NV2005_ EVCBSC layer)? (Ash/MS)	Is old growth predicted to occur (use the MOG layers)? (Y/N)	Is there history of fire (use the FIRE_ HISTORY_ LAST BURNT layer)? (Y/N)	Is there history of harvesting (use the LASTLOG25 layer)? (Y/N)	Is old growth predicted to occur (use the RELAGE layer)? (Y/N)	Is more than 75% of the one-hectare grid located outside the coupe boundary? (Y/N)	Is more than 75% of the one-hectare grid in an area that is excluded from planned harvesting operations and associated management activities? (Y/N)	Is the one-hectare grid mapped as SPZ? (Y/N)	Is the one-hectare grid modelled and verified as rainforest? (Y/N)	Does the one-hectare grid or centroid have any of the following disturbance (>50% is harvested, >50% is impacted by infrastructure, >50% is impacted by high severity fire, or >50% cleared)? (Y/N)	Is field assessment required? (Y/N)

Field assessment datasheet 1

Coupe ID: **Date:** **Personnel:**

Centroid ID	Centroid GPS		Centroid/grid characteristics present/absent (Y/N)					Basal sweep proportions (%)		
	Easting	Northing	More than 50% of the one-hectare grid is harvested	More than 50% of the one-hectare grid is impacted by infrastructure	More than 50% of the one-hectare grid is impacted by high severity fire	More than 50% of the one-hectare grid is cleared	At least one senescent tree is present within the one-hectare grid	Proportion of senescent stage trees	Proportion of regrowth stage trees	Is old growth determined to be present? (Y/N)

Field assessment datasheet 2

Date:

Coupe ID: **Centroid ID:**

BAF (m²/ha): **PRF (m/cm):**

Tree #	Species	Growth stage	Borderline trees (if required)			
			Tree distance from centroid (m)	DBHOB (cm)	Limiting distance (m)	'IN' or 'OUT'

conservationregulator.vic.gov.au