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Wandoo**Recovery**GROUP

Surveying wandoo crown decline A guide for assessors



A declining stand of wandoo trees.

Introduction

Wandoo crown decline has been observed in many areas throughout the trees' natural range, which extends over the medium and lower rainfall areas of the south west of Western Australia.

Although the reasons for the decline are unclear, a number of factors including reduced soil moisture, salinity and possibly changed fire regimes are seen as potential contributors. Wood boring and crown defoliating insects are also likely to be causes, but are thought to be secondary.

Though possibly secondary in nature, the wood boring and crown defoliating insects are thought to cause the 'flagging' which identifies the initial stages of wandoo crown decline. The upper and outer leaves in the tree crown brown and start to die off. The tree responds by sprouting epicormic shoots (new foliage) along the trunk and lower branches. These epicormic shoots may also die, resulting in progressive downward movement of the tree crown and redistribution of the canopy. Over several years there can be a noticeable decline in the tree canopy, sometimes culminating in the death of the tree.

This guide describes a simple survey procedure for assessing wandoo crown decline. The survey is based on assessment of individual trees within a woodland block or along a road verge.

Purpose of the surveys

These surveys will help to develop understanding of the geographic extent and severity of wandoo decline, and its progression over time. The widespread and ongoing use of a common assessment procedure will provide information that is locally informative, but also substantially contributes to knowledge of the decline. The data will be collated by the Wandoo Recovery Group and made available for research and monitoring.

Community groups, land managers, students and researchers are encouraged to adopt this survey procedure as a simple addition to their investigations of wandoo decline and to compile and communicate the results.

We stress the importance of consistency in the methodology and timing of survey, so please follow the instructions contained in this guide as accurately as possible. Multiple copies of the survey sheet will be needed. File all information in a safe place for future reference. Please forward copies of your completed surveys to the Wandoo Recovery Group (see address at the end of the guide).

Assessment of crown decline stage

Wandoo crown decline can progress through a number of stages, including periods of short-term recovery.

Large, old trees commonly bear dead branches and scars from fire and wind damage. These are not relevant in assessing this current decline.

The line drawings are generalisations of a single decline event in wandoo. Not all trees observed will fall clearly into this classification scale.

Your understanding of these factors, together with careful analysis of each tree, will enable valid assessments of the crown condition to be produced from the survey.

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Your guide to completing the survey

Equipment

You will need:

- this guide,
- a 50-metre tape,
- a GPS,
- coloured surveyor's tape,
- a rod/stick with marked measurements at 10, 25, and 50 centimetres,
- a pencil or pen,
- an eraser; and
- survey sheets and line drawings.

Survey procedure

Time of year

- To assess progression of decline accurately, surveys should be taken three times a year in April/May; August/September; December/January and repeated annually as close as possible to the previous survey date e.g. 15th day of the month.
- If it is only possible to survey once a year, then do this in April/May, when active decline (flagging) is most prevalent.

Overview

Have sufficient copies of the survey sheets and crown decline line drawings to conduct the survey. Two people working together would require one copy of the line drawings and one survey sheet per 100-metre transect.

Select your site

Choose a site that is large enough to do a number of transects and readily accessible for ease of ongoing assessment. Avoid obvious waterlogged or salt affected sites. Accurately GPS the transect location, or record the distance and bearing from a mapped feature, so it can be relocated for future surveys.



Suitable and fun for everyone. Mark and record the start/finish of the transect line, then assess each tree.

For each tree:

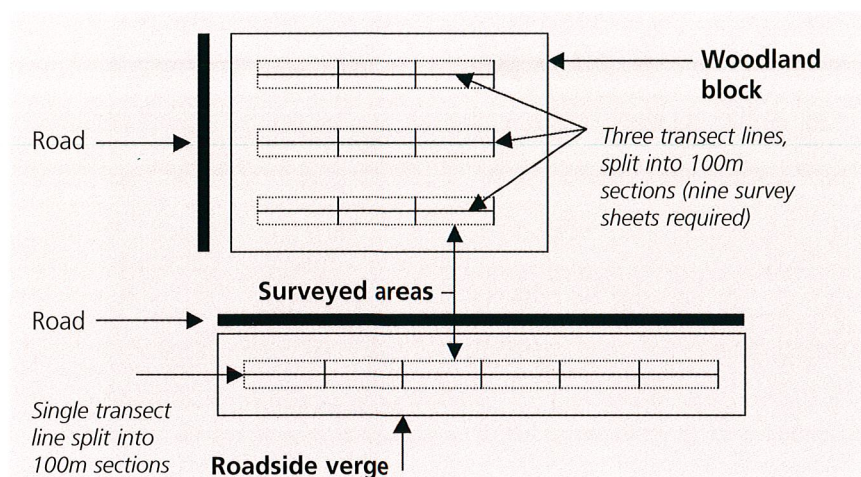
- estimate the tree diameter;
- assess the crown decline stage;
- assess the amount of flagging in the crown;
- place a tick in the appropriate box; and
- once the transect is complete, count the ticks and summarise for each column and row.

Site layout

- 1) Accurately measure out a 100 metre transect line, clearly marking the start and finish with coloured surveyors tape.
- 2) Draw a map on the back of the

survey sheet showing orientation and location of the transect line.

- 3) Assess each tree growing 10 metres either side of the transect line and record the assessment on the survey sheet (using a tally system in the appropriate boxes).
- 4) The transect line can be extended in 100 metre increments. Use a new survey sheet for every 100-metre section.
- 5) If possible, repeat this process a minimum of three times to gain a random coverage of the site. See two examples below:



Survey Sheet – Wandoo Crown Decline

Return completed surveys to Wandoo Recovery Group, Department of Conservation and Land Management, PO Box 1167 Bentley Delivery Centre, BENTLEY WA 6983

Date	Transect length	Transect location (Please also draw a map on the back of this sheet) GPS reference: Name of recorder:
Tree Species		

Crown decline stage	Diameter 10 - 25 cm				Diameter 25 - 50 cm				Diameter > 50 cm				Totals
	% of crown currently flagging				% of crown currently flagging				% of crown currently flagging				
	0%	< 20%	20 - 50%	50 - 100%	0%	< 20%	20 - 50%	50 - 100%	0%	< 20%	20 - 50%	50 - 100%	
C1 No decline													
C2 Some terminal foliage absent													
C3 Most terminal foliage absent													
C4 All terminal foliage absent													
C5 Epicormic death													
C6 Dead tree													
Totals													

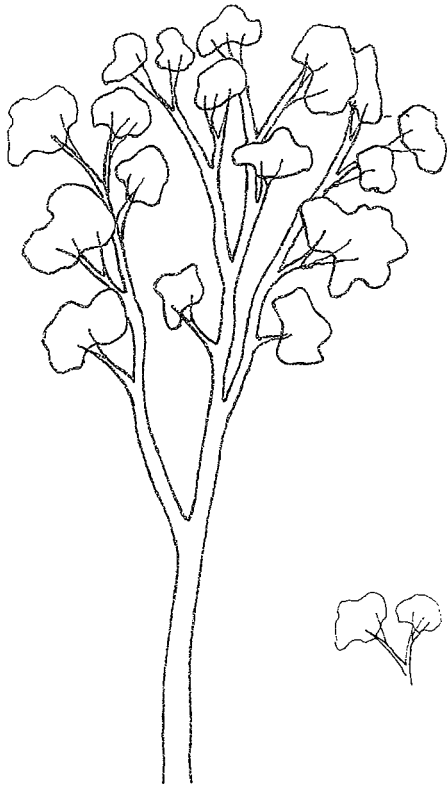
Survey Sheet – Wandoo Crown Decline

Map of survey site:

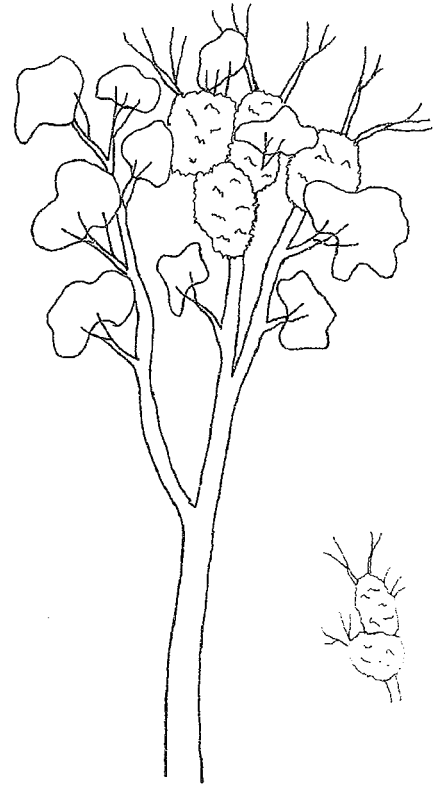
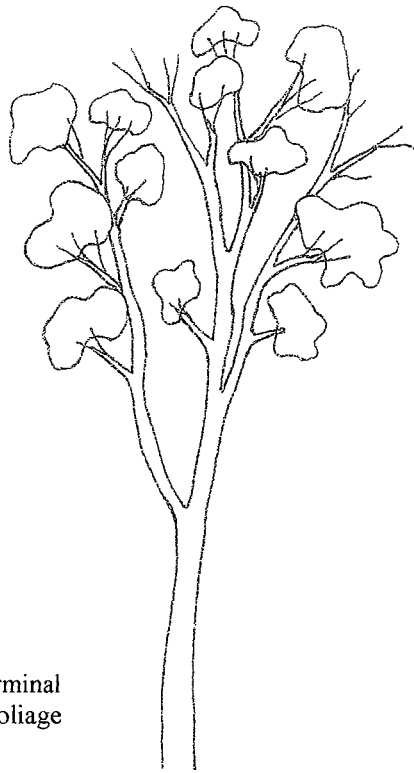
Additional observations: (eg. Site history, topography, unseasonal climatic conditions; fire; severe insect activity; or human impact.)

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Crown Decline Stages



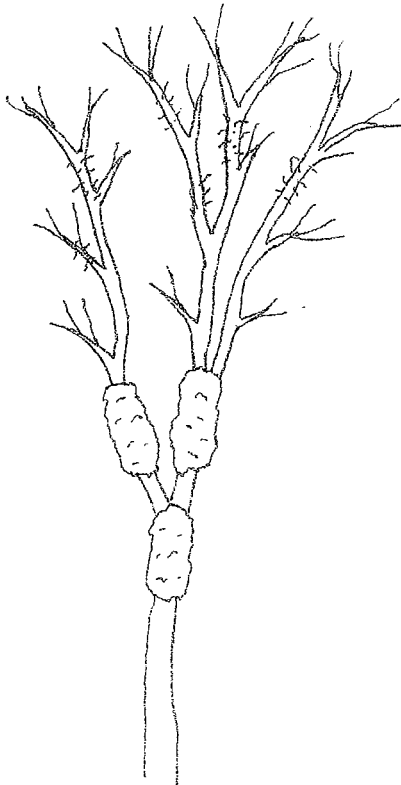
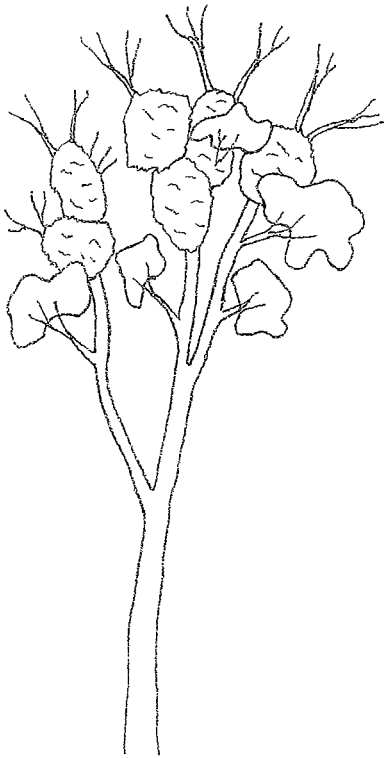
Terminal foliage



C1 Scruffy but healthy crown. All terminal foliage intact.

C2 Some terminal foliage lost.

C3 Most terminal foliage lost. Epicormic growth begun.



**DEAD
Tree**

C4 All terminal foliage lost. Growth of epicormic clusters.

C5 Dead epicormic clusters. New epicormics lower down.

C6 Death of tree. No green foliage present.

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Tree species

- 6) Assessment of different species (e.g. wandoo, powderbark, jarrah, flooded gum, etc.) **must** be recorded on separate survey sheets and the tree species clearly indicated at the top of the sheet.

- Be aware that powderbark and wandoo look similar but are unrelated and must be recorded separately. Powderbark (*E. accedens*), has white to pink powdery smooth bark.

Tree diameter

- 7) Measure or estimate the diameter of the tree at a point 1.3 metres above ground level (at chest height). A rod/stick with marked measurements from 0 to 50 centimetres can be placed horizontally against the trunk to estimate diameter.
- 8) Exclude or avoid lumps, bumps and scars on the trunk.
- 9) If the trunk is burnt out, scarred or hollowed, estimate what the diameter of the whole tree would have been.
- 10) If the tree is multi-stemmed, count as one tree and measure the largest stem.



Measuring tree diameter (1.3m from the ground).

Crown decline stage

- 11) Determine the crown decline stage for each tree by comparing the tree with the line drawings and descriptions C1 to C6.
- 12) Ignore old dead branches.
- 13) The density of leaves in wandoo crowns varies widely. Do not consider leaf density in making these assessments.
- 14) The drawn sequence may not adequately or fully describe all decline. Pick the drawing that best represents the stage of decline.



Example of C4 with epicormic clusters.

Crown decline stages

<p>C1</p> <p>Terminal foliage</p> <p>No decline, typical scruffy but healthy crown. No dead branches or a few dead branches low in the canopy.</p>	<p>C2</p> <p>Some decline evident. Some terminal foliage (leaves at tips of branches) absent; some dead branches in upper part of canopy.</p>	<p>C3</p> <p>Most terminal foliage absent. Most foliage is epicormic (new shoots sprouting along lower branches); dead branches emergent from canopy.</p>
<p>C4</p> <p>All terminal foliage absent. Growth of epicormic clusters, dead branches emergent from the canopy.</p>	<p>C5</p> <p>Death of initial epicormic clusters. New epicormic foliage evident further down stems.</p>	<p>C6</p> <p>Dead tree</p> <p>Death of tree. No green foliage.</p>

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Current flagging

15) Estimate the proportion of the leaves in the crown that are 'flags' (yellowing or browning off and appear to be dying) at the time of the assessment. Walk around the tree when estimating proportions to see the whole canopy.

16) Does flagging make up:

- 0% (no flagging leaves)
- < 20% (less than a fifth of the leaves on the crown)
- 20%–50% (between a fifth and a half of the leaves on the crown)
- 50%–100% (more than half of the leaves in the crown)

Recording

17) For each tree, mark the box on the survey sheet based on the tree's
a) diameter,
b) crown decline stage, and
c) percentage of the leaves in the crown that are flagging.

Use a tally system within each box.

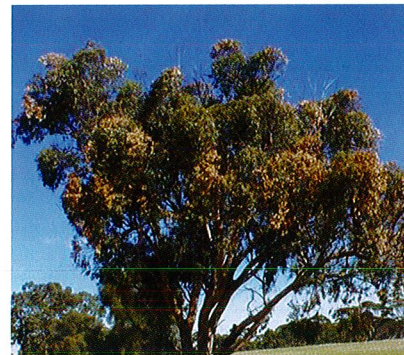
Summarising the results

18) Tally the marks in each row and column, and enter the sum in the totals rows and columns.

- Calculate the percentage of trees



Initial flagging (less than 20%).



Moderate flagging (20%–50%).

in each of the crown decline stages. Divide the totals for each row by the total number of trees assessed, then multiply by 100.

- Calculate the percentage of trees in each of the diameter classes. Divide the totals for each column by the total number of trees assessed, then multiply by 100.
- These values can be used to compare the structure of stands of trees on different sites and to compare the impact of the disease on different sites.

Photographic record

19) Photos of a single reference tree will help to provide an accurate picture of the decline process. Ensure that photos are taken from the same reference

point with the date recorded.

Additional observations

20) Wandoo watching can be done outside of the regular survey period. On the back of the survey sheet record other observations such as site history; when flagging/decline was first noticed; unseasonal climatic conditions; fire; severe insect activity; or human impact.

Return the survey sheets

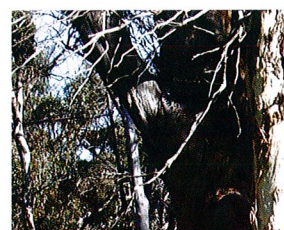
21) Return the completed survey sheets by mail to:
Wandoo Recovery Group
Department of Conservation and Land Management
PO Box 1167
Bentley Delivery Centre
Bentley WA 6983

Acknowledgments

This document was prepared by Kim Whitford, Allan Wills and Liz Manning and brings together contributions from several sources. The survey procedure is based on the work of Allan Wills, and ideas and comments from Frank Batini, Roger Underwood and members of the Wandoo Recovery Group.

References

- White, P., Manning, E., 2005. Wondering about Wandoo. *LANDSCOPE*, Vol.20, No. 3, pp 17-21.
- Wills, A., 2005. Crown decline in Wandoo: Observations from Wundabiniring Brook 1999-2005. Unpublished report, Department of Conservation and Land Management, Perth.
- WRG Bulletins No 1 (2004); and 2 (2005). Department of Conservation and Land Management, Perth.



For more information or training on how to use this guide, contact the Wandoo Recovery Group's Executive Officer, Liz Manning, on 0427 441 482.