

PROTOCOL FOR MONITORING TREE HEALTH

AIM

Eucalypts around Canberra, in particular Blakely's Red Gum, are being impacted on by dieback. A number of years ago the ACT Government collected data on the health of several hundred trees across the ACT.

A number of variables have been previously measured on these trees and so it is important that these are remeasured so the data is comparable (CORE DATA). There are a number of variables that are helpful extra information that it would be good to collect, but which aren't essential (ADDITIONAL DATA).



HOW TO DOWNLOAD/OPEN THE SURVEY

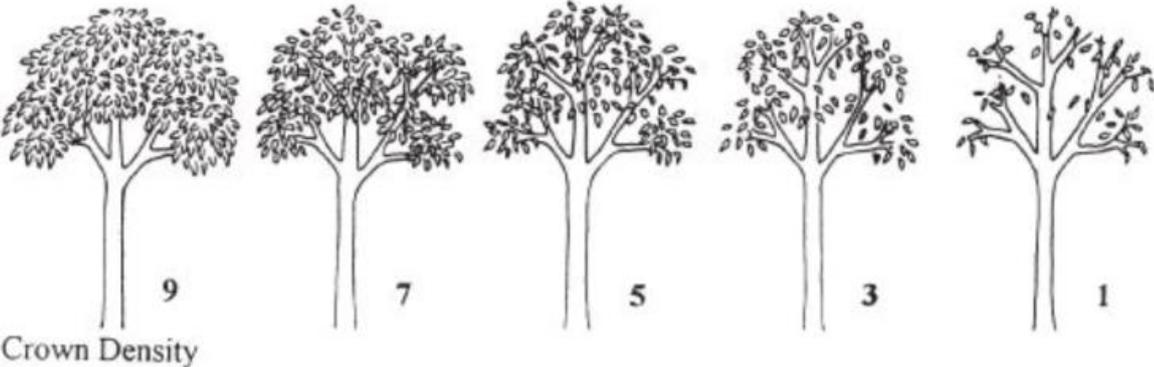
- To access the survey, you need to download the ArcGIS Explorer application on your smartphone or tablet. It is available in the Apple App Store or Google Play. It's free and looks like this: 
- In the search bar at the top of the page, search tree health. Select the **ACT Parks and Nature reserves Tree Health Survey**.
- A map will open showing a satellite image of the ACT with a number of coloured squares and circles. Squares indicate trees in the survey which haven't yet been monitored this year. Circles indicate trees which have been monitored this year.
- Select a square on the map by touching it, a panel will open on the left side of the browser. You can zoom the map by dragging the screen with 2 fingers, alternatively the map should auto locate to your current location, but selecting the arrow in the top right will also reset the map to your current location.
- The panel on the left shows the tree species. Select the blue text 'Complete Tree Survey'
- The survey will open in your web browser and you are ready to begin recording data.
- When you are ready to move to another tree, you will need to leave the web browser, go back to the ArcGIS Explorer app and repeat the above steps.

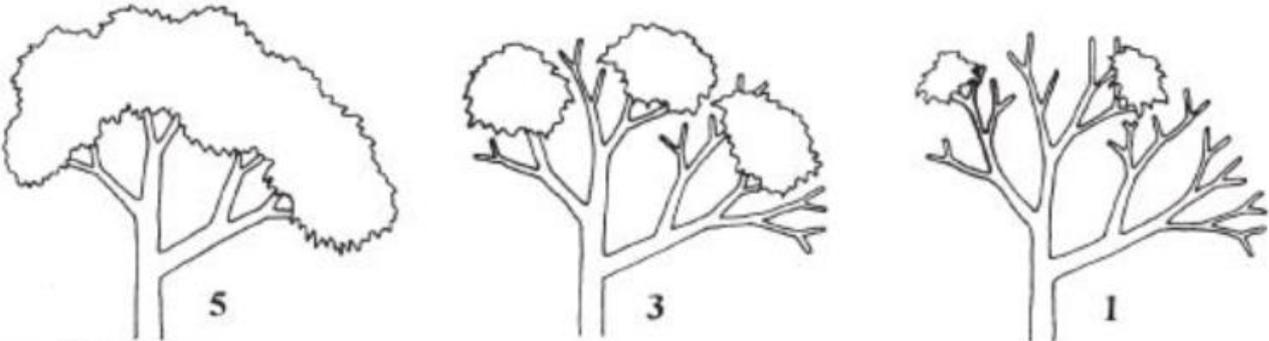
BEFORE YOU GO OUT YOU WILL NEED:

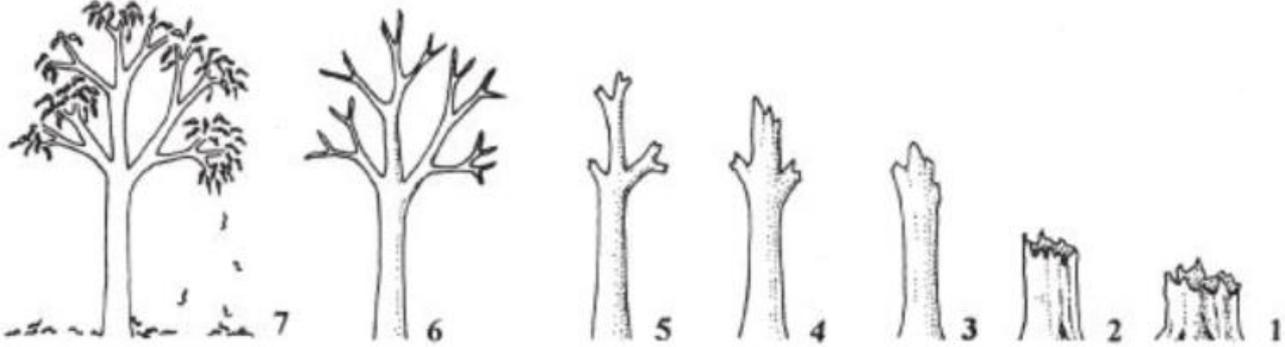
- A smartphone or tablet with a camera, GPS location and the ArcGIS Explorer app
- A DBH (Diameter at Breast Height) tape or soft measuring tape for measuring the circumference of a tree.
- A tree identification guide
- To accurately measure tree height (additional data) you will also need:
 - A tape measure (at least 4m).
 - A piece of A4 paper.
 - A notepad and pen/smartphone for recording measurements.
 - Calculator.

*Recording the core data should take up to 10 minutes, and recording the additional data should take up to 20 minutes to record. Make sure you bring enough warm clothes, snacks, water, hat, first aid equipment etc to safely and comfortably complete the survey.

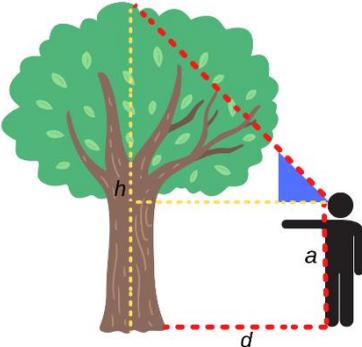
CORE DATA

1	Location	Location autofills on the map as long as you select the Collect button when you are standing at the tree. If you need to correct the location – select the map > press the button and the map will recentre on where you are standing. You can also drag the red pin to where you want the point to be.
2	Date	Select today's date by choosing from the calendar.
3	Observer	Use the same code: SACTCG
4	Species	<p>The tree species will autofill. Double check you are standing at the correct tree and the species is correct.</p> <p>Field Guide to the Plants of the Molonglo Valley or A guide to eucalypts in the Australian Capital Territory are good guides for identifying trees.</p> <p>If you think the pre-filled species name is incorrect, record this (and why) in the notes section at the end of the survey.</p>
5	Tree DBH	<p>This is the tree Diameter at Breast Height. Measure the diameter of the tree trunk at 130 cm from the ground surface (lowest side if on a slope). It is easiest to use a specially designed DBH tape (ensure you use the correct side, one side has just length in cm). Pull the tape taught around the tree and ensure it is parallel.</p> <p>If the tree has multiple trunks, measure the DBH of each. A new entry window will pop up each time you enter a DBH (limit of 4 – if more than 4 trunks, record in notes section). If the tree divides into multiple trunks at breast height, measure either just above or just below the junction depending on what makes more sense.</p> <p>Note: If you don't have a DBH tape, you can use a regular measuring tape. Measure the circumference of the tree, and divide that number by Pi π (3.14.) so Diameter = circumference/3.14</p>
6	Crown Density	<p>Use the diagram to estimate the density of the crown of the tree. If the foliage is restricted to a small part of the tree, but is still very dense, record as very dense rather than averaging it out across where you would expect the canopy to be.</p> <p>Note that the Crown Density is species specific to some degree – a Yellow Box naturally has a sparser looking canopy compared to a Blakely's Red Gum, so when estimating crown density compare it to other trees of that species that you have seen, rather than between species.</p> 

7	Dead Branches	<p>Use the diagram (and description) to estimate the dead branch score. The <i>a</i> scoring system was the original scoring system used to score branches at the height of the dieback event. The <i>b</i> scoring system is designed to score branches when trees have partially recovered.</p> <table border="1" data-bbox="467 320 1393 741"> <tr> <td>5-a</td> <td>Nil</td> <td></td> <td></td> </tr> <tr> <td>4-a</td> <td>Branchlets dead</td> <td>4-b</td> <td>A few main branches dead (others healthy)</td> </tr> <tr> <td>3-a</td> <td>Small growing branches dead</td> <td>3-b</td> <td>Some main branches dead/<u>diedback</u> (branches may be previously been completely defoliated but have since recovered somewhat)</td> </tr> <tr> <td>2-a</td> <td>Main growing branches dead</td> <td>2-b</td> <td>Many main branches dead/<u>diedback</u> (branches may be previously been completely defoliated but have since recovered somewhat)</td> </tr> <tr> <td>1-a</td> <td>A more severe case of 2</td> <td>1-b</td> <td>A more severe case of 2</td> </tr> </table>  <p style="text-align: center;">Dead Branches</p>	5-a	Nil			4-a	Branchlets dead	4-b	A few main branches dead (others healthy)	3-a	Small growing branches dead	3-b	Some main branches dead/ <u>diedback</u> (branches may be previously been completely defoliated but have since recovered somewhat)	2-a	Main growing branches dead	2-b	Many main branches dead/ <u>diedback</u> (branches may be previously been completely defoliated but have since recovered somewhat)	1-a	A more severe case of 2	1-b	A more severe case of 2
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8	Epicormic Growth Old (> 12 months)	<p>Many of the trees in the data set have had epicormic growth in the past, but the tree is now in a healthier state and the epicormic growth has grown a lot. It is still possible to distinguish this older epicormic growth, and it is important to record it as an indication of the tree experiencing past dieback. Epicormic growth is the foliage that shoots from under the bark of the tree in response to stress. It will occur in areas you wouldn't normally expect there to be foliage branching out, i.e. along the top of branches or coming straight off the trunk of the tree. It often has a large nobby bit where it joins the branch/trunk.</p> <p>Epicormic growth is quite variable and can develop at different rates so this is hard to quantify. Use your best guess, but older epicormic growth will have a well developed stem (> 2 cm diameter), and be quite long (> 60 cm). The leaves will look like the adult leaves.</p> 																				
9	Epicormic Growth New	<p>Young epicormic growth will all come out from a central point and won't yet have a developed stem. The leaves will look new and fresh and may be a brighter green and look less leathery than adult leaves.</p> 																				

<p>10</p>	<p>Dead Tree Class</p>	<p>Only record this data if the tree has died since the last measuring period.</p>  <p>Dead Tree Classification</p>
<p>11</p>	<p>Leaf Discolouration</p>	<p>This is when the leaves have turned a deep red or brown due to lerp damage i.e. not new growth on the tips or general insect damage. This is more likely to be apparent during peak lerp time – beginning of summer.</p> 
<p>12</p>	<p>Photo</p>	<p>Take one photo from directly underneath the tree, standing 1 m from the trunk, taking the photo at right angles from the trunk, i.e. perpendicular to the canopy. Choose the most representative spot.</p> <p>Take a second photo standing away from the tree, of the whole tree. Stand far enough away that you are including the whole canopy and the base. Take from a side that ensures the photo is not affected by the sun.</p> <p>e.g.</p> 

ADDITIONAL DATA

<p>1</p>	<p>General Condition</p>	<p>This is just a rough indication of the tree condition in comparison to other trees you have seen of the same species and is an overall indication of the condition. i.e. a Very Good tree would have no dead branches, no epicormic growth and a dense canopy.</p>
<p>2</p>	<p>Tree Height</p>	<p>Estimate tree height in 5 m intervals. There are a number of apps or techniques to assist in this- or you can use the method below.</p> <p><u>How to measure the height of a tree in 5 steps</u></p> <p>What you need:</p> <ul style="list-style-type: none"> • A measuring tape • A piece of paper • Notepad and pen (or notes on phone) <ol style="list-style-type: none"> 1. Measure your steps <ol style="list-style-type: none"> a) Lay out measuring tape at 4m b) Walk along 4m and see how many steps it takes (you can walk this 2-3 times so you're confident with your stride) c) And figure out how long each step is and write it down (e.g. 400cm/number of steps = cm/step) 2. Measure the height of your eyeline (a). <ol style="list-style-type: none"> a) Write that measurement down 3. Using a piece of paper, fold a right-angled triangle (90 degree angle and 2 equal sides) <ol style="list-style-type: none"> a) Make sure the bottom edge is parallel to the ground. Look up the long slope and line up the top of the tree with the top of the triangle. You might have to walk several steps backwards to line it up. b) Measure the number of steps away from the tree you are and calculate the distance (d). 4. Calculation <ol style="list-style-type: none"> a) $h=a+d$ b) where h=tree height, a= height to eyeline and d=distance from tree. 
<p>3</p>	<p>Number of Hollows</p>	<p>How many hollows are in the tree? A hollow should be at > 5 cm wide and 5 cm deep. i.e. large enough for a bird or mammal to enter. Enter zero if none (don't leave blank).</p>

4	Number of Mistletoe	<p>Mistletoe are parasitic plants which grow on some trees. They take nutrients and moisture from the tree. They are a keystone species as they provide important habitat to birds and are important in cycling nutrients. However some trees can experience very high mistletoe loads which may impact on the tree health. Mistletoe can blend into the foliage of the tree but are often a more yellowey-brown colour than the eucalypt leaves, have a big bulbous haustorium where they join the tree, have fleshier looking leaves and may have flowers or fruit. Enter zero if none (don't leave blank)</p> <div data-bbox="466 465 1390 748">  </div>
5	Psyllid Damage Tree	<p>Psyllids are a small insects which cause significant damage to eucalypts, in particular Blakely's Red Gum. The psyllid is the insect (may be seen flying around, looks a bit like a fruit fly or midges) which form a cover over themselves on the leaf, called the lerp (these are small white hemispherical caps). Damaged leaves will look very red in colour.</p> <div data-bbox="450 920 1155 1249">  </div>
6	Phyllid damage regeneration	<p>Are there any psyllids or lerps present on any eucalypt regeneration close to the tree?</p>
7	Logs	<p>Estimate the total length of any logs within the drip line of the tree. Only include logs/parts of the log that are > 30 cm in diameter.</p> <p>No need to measure, only a rough estimate is required here. If timber extends out past the drip line of the tree but is connected to the same timber within the drip line, still include it in the estimate. If timber has obviously been removed, include this in the notes section.</p>
8	Is the tree reproducing?	<p>Can you see any buds or fruit on the tree? Only select no if you are sure there is none. If you can't tell, select unsure.</p>
9	Trees/ shrubs within 20 m?	<p>Are there any trees or shrubs within 20 m of the trunk of the tree? What species are they? Approximate density.</p>
10	Regeneration within 20 m	<p>Is there any regeneration within 20 m of the tree (of the same species). Record density.</p>
11	Comments	<p>Record anything else you think is of importance. I.e. does the tree look like there has been a stock camp underneath? Are there any nests in the tree or did you see any significant birds / animals using the tree? Is there other insect damage to the tree that isn't due to lerps? Is the pre-filled species name incorrect?</p> <div data-bbox="1273 1839 1517 2047">  </div>

PICTURES TO HELP WITH SCORING