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Ecosystem Research Infrastructure

Ecological Field Monitoring Protocols Manual

Using the Ecological Monitoring System Australia

Fire Severity Module – PROCEDURE ONLY

NCRIS
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Version

Readers are advised that all modules of the Ecological Field Monitoring Protocols Manual regularly undergo revision. Readers should check the website emsa.tern.org.au/documents to ensure they are viewing the current version.

Version 2

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Acknowledgements and contributors

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The information contained in this document comprises information and instructions for implementing ecological monitoring field surveys. The reader is advised that TERN has made best efforts to ensure instructions are comprehensive enough to fulfil the tasks required to the standards required at the time of publication. All field surveys must be carefully planned to ensure the safety of personnel is paramount and that the required scientific permits and wildlife licences are obtained from the appropriate jurisdictions and conditions strictly adhered to. Such requirements may go above and beyond those listed in this manual. TERN, including the project personnel, are excluded from all liability to any person for the consequences, including but not limited to all losses, damages, costs, expenses, and any other compensation arising directly or indirectly from using this publication (in part or in whole) and any information or material contained in it.

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Main front cover photograph: *Eucalyptus obliqua* woodland resprouting after fire, Belair National Park, South Australia.

Version control

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The version history of this module is identified below. The version history of the Ecological Field Monitoring Protocols Manual, the methods and data implications, both historical, current and future interpretations of data, are available from the TERN website. Enquiries should be directed to tern@adelaide.edu.au

Version	Date	Version update overview
1	21 July 2023	First published version
2	7 January 2025	Improved paragraph text throughout; updated complementary related modules section; updated equipment list to align with the Cover Module.

1 Fire Severity Protocol

1.1 Field collection

1.1.1 Pre-requisites

- Plot Selection and Layout Module – The point-intercept transect grid is aligned to the plot points along the plot defined boundaries.
- Floristics Module – Species data are recorded using naming consistent with the flora species identifications/assigned field names and growth forms recorded in the Floristics Module.

1.1.2 Time requirements

- Allow an additional 30–60 minutes to the time required to complete the Cover Module to collect additional fire severity data at each of the 404 point-intercepts.
- Allow up to 20 minutes to collect the trunk char height data.

1.1.3 Personnel requirements

Number of personnel and skills:

- Point-intercept surveys are best conducted with two personnel, one making the point-intercept observations, and the other recording the data directly into the app and assisting with tree height measurements.
- The surveyor that conducted the Floristics module should be involved to ensure consistent nomenclature.
- The surveyor making the observations should be familiar with and experienced in identifying the characteristic features of burnt vegetation, as well as the characteristic identifiable features of flora species and how to distinguish one species from another. If surveyors are not confident, time should be dedicated to practising, using field reference guides, and seeking advice before conducting this protocol.
- Point-intercept surveys do not involve interference with vegetation or wildlife. Therefore, scientific permits and wildlife ethics approvals are unlikely to be required but always check with your local authority. Access permissions are required.

1.1.4 Equipment

- Mobile device (tablet/phone) with the Monitor app
- 100 m tape measures
- Graduated staff with 10 cm markings (continually adjustable painters pole that can be easily adjusted to different surveyors eye heights)
- GRS Densitometer™ with the ability to be mounted on top of staff (required for use on plots with overstorey tree canopy cover; instructions for building the mount can be found in the supplementary document *Densitometer mount information sheet*)
- Laser pointer with spare batteries (mounted/taped to staff at 1.5 m and pointing downwards)
- Forestry rangefinder (e.g. Nikon Forestry Pro II) or another tool for measuring tree height (e.g. clinometer, 'Arboreal – Tree Height' mobile device app)
- Pegs to mark ends of transects and hold the surveyor tape measures in place
- Flagging tape (brightly coloured to make sighting transect ends easier).

1.1.5 Instructions and procedures

Fire severity point-intercept

1. Ensure the Plot Selection and Layout Module has been completed to mark out the plot boundary and define the current plot and visit in the Monitor App.

2. Ensure the Floristics Module has been completed to ensure species data are recorded using naming consistent with the flora species identifications/assigned field names and growth forms recorded in the Floristics Module.
3. Ensure you are familiar with the instructions and procedures and guidelines outlined in the Cover Module.
4. For each transect lay out a 100 m tape using pegs to secure it in place (Figure 1), ensuring the tape is orientated to align with the plot grid, is as straight as possible, and laid on the ground and not draped over shrubs.
5. Move to the 0 m mark of the first transect you wish to complete. It does not matter which order, or which direction each transect is completed, as your start position will be recorded in Step 9.
6. In the Monitor app, select the Fire Severity Module and then the relevant protocol (*Cover + Fire Enhanced* or *Cover +Fire – Standard*), depending on which Cover protocol you are required to undertake for your project. If you are undertaking the Cover – Enhanced protocol, the fire severity data fields will only be accessible when completing the four standard point intercep transects (Figure 1), and the following steps relate only to those transects. The *trunk char height* component will also appear below the point-intercept component in the Monitor app. Trunk char height is recorded at the locations where the four transects intersect
7. Record the *fire ignition date* so the time since fire can be calculated. This date may be based on on-ground knowledge and/or available datasets (e.g. interactive online natural resources GIS datasets).
8. If the date is an estimate, check the *estimate date* checkbox and select the *date accuracy* level (month or year) and record the *fire ignition date estimate*. If, after completing the survey, you acquire a more accurate ignition date, you may go back into the Monitor app and edit the fire ignition date in the Fire Severity Module (see 4.1 Time since fire).
9. Record your *transect start point* (i.e. N2, N4, S2, S4, E2, E4, W2 or W4). This records the *transect* you are on and the *sampling direction* you are travelling in (e.g. 'N2' means you are starting at the northern end of transect 2 and moving from north to south, while 'S4' means you are starting at the southern end and of transect 4 and moving from south to north). The *transect point* (0–100) beginning at 0 is also recorded.
10. Place the bottom of the staff at the 0 m mark of the tape measure. Ensure the staff is vertical and the laser pointer is pointing downwards so the laser beam will intercept the ground near the base of the staff.
11. For each point-intercept, begin by recording the nature of the *substrate* that is intercepted by the laser beam. Press the button on the laser pointer. If the laser beam is intercepted by vegetation, move the vegetation aside so that the laser beam reaches the substrate. Flag the substrate as *charred* or *scorched* where relevant (see Appendix 2).
12. If undertaking the Enhanced Cover protocol, record the vascular plants that are intercepted with the laser pointer, touching the staff between the laser pointer and the densitometer, and/or intercepting the vertical line of sight through the densitometer. Where a part of a plant of the same species and growth form is being intercepted at different heights, the uppermost intercept is recorded as a hit and all lower intercepts are ignored. This rule holds true for multiple intercepts of the same species and growth form (see Appendix 3). Record the plant's *floristic voucher* and *growth form* along with the uppermost *height* at the point of the point-intercept. Intercept height should be recorded in meters rounded to the nearest centimetre from the markings on the staff.
13. If undertaking the Standard Cover protocol, record the *fractional cover* (photosynthetic vegetation, non-photosynthetic vegetation, branch) of the vascular plants that are intercepted with the laser pointer, touching the staff between the laser pointer and the densitometer, and/or intercepting the vertical line of sight through the densitometer, along with the height of each intercept.
14. If the intercepted plant is dead, flag as *dead*.

15. Flag if the part of the plant being intercepted is *charred* or *scorched* (Table 1; Figure 2).

Figure 1. Charred tree trunk (left); Scorched leaves (right).

16. If no part of the foliage or branches are sighted in the cross hairs of the densitometer but the vertical line of sight is still within the canopy boundary of live plants only, flag as *in canopy sky*.
17. Flag if the part of the plant being intercepted is resprouting following fire. Record if the *resprouting type* is *basal*, *epicormic* or *apical* (Table 1; Figure 3).

Figure 2. Basal resprouting (left); Epicormic resprouting (middle); Apical resprouting (right).

18. If undertaking the Enhanced Cover protocol and the plant is *dead*, *charred* or *scorched* and you cannot determine what the species is, record the growth form and flag it as *dead*, *charred* or *scorched*.
19. Repeat steps 12 to 18 for all other plant species that are intercepted.
20. Repeat steps 11 to 19 at every 1 m interval along the transect. This will give a total of 101 point-intercepts for the transect.
21. Repeat steps 9 to 20 for each of the remaining fire severity point-intercept transects until all 4 have been completed. This will give 404 point-intercepts for the plot.
22. At the completion of the point-intercept data collection, select *finish point-intercept*.
23. Leave the four transects laid out so the trunk char height measurements can be taken at the four locations where the transects intersect. Otherwise, mark these locations with tent pegs and flagging tape before packing up the transects.

Trunk char height

1. The *trunk char height* component appears below the *fire severity point-intercept* component in the app.
2. Move to the first trunk char height sampling location you wish to complete (NE, NW, SE, and SW; see Figure 1) It does not matter which order the sampling locations are surveyed in.
3. Record the location from the drop-down list (NE, NW, SE or SW; see Figure 1).
4. Record if there is charred trunks visible at this location. If there are no charred trunks visible, save the obervation and move to the next location. If there are charred trunks visible, rotate through a complete 360° sweep and record the maximum trunk char height observed in metres.
5. Repeat steps 3 and 4 at each sampling location.
6. When all four sampling locations have been surveyed, complete the survey compnent, review the *summary of your collected data* and *queue the collection for submission*.

1.1.6 Additional guidelines

Efficiency

- Laying out a set of tape measures along multiple transects, rather than one transect at a time, is more efficient. This is particularly the case if the survey team comprises more generalist surveyors and/or volunteers who can lay out the tapes while the vegetation specialist commences the point-intercept transects.
- Tape measures should ideally be labelled metrically on both sides for ease of reading.

Rules for determining a 'hit'

- Where a part of a plant of the same species and growth form is being intercepted at different heights, the uppermost intercept is recorded as a hit and all lower intercepts are ignored. This includes plants that are intercepted with the laser pointer, touching the staff between the laser pointer and the densitometer, and/or intercepting the vertical line of sight through the densitometer.
- If part of a tree or shrub intersects the vertical line of sight through the densitometer, this is recorded at a hit.

Cover – Enhanced protocol

- If you intercept a dead, charred or scorched plant and can determine what the species is, this is recorded as hit for that species but flagged as *dead*, *charred* or *scorched*.
- If you intercept a dead, charred or scorched plant but you cannot determine what the species is, this is recorded as the growth form (pre-recorded field names; e.g. *shrub*, *tree*) and flagged as *dead*, *charred* or *scorched*.

Cover – Standard protocol

- If you intercept a dead, charred or scorched plant, this is a hit and recorded as *non-photosynthetic vegetation*.

Using the GRS Densitometer™

- Ensure the graduated staff is adjusted so that the densitometer is at eye-level.
- Level both of the densitometer bubble-levels and then look through the instrument so that the sighting marks (cross hairs and circle) are aligned.
- If working in bright sunlight, a piece of coloured cellophane can be placed over the top of the densitometer and secured with a rubber band to reduce glare.

In canopy sky

- The Cover Module illustrates when to apply *in canopy sky* (ICS).
- Where the vertical line of sight through the densitometer projects onto bare sky that is fully enclosed within a canopy, ICS is recorded.

- Where the vertical line of sight through the densitometer projects onto bare sky that is not within a canopy, nothing is recorded.
- The canopy perimeter (from an aerial or vertical perspective) is the extent of the outer layer of leaves of an individual tree or shrub.

Cover – Enhanced protocol

- Where the vertical line of sight through the densitometer projects onto bare sky that is within the canopy of a dead, charred or scorched tree and you can determine what the species is, ICS is recorded for that species but flagged as *dead*, *charred* or *scorched.*
- Where the vertical line of sight through the densitometer projects onto bare sky that is within the canopy of a dead, charred or scorched tree, but you cannot determine what the species is, ICS is recorded for a *shrub* or *tree* (pre-recorded field names) and flagged as *dead*, *charred* or *scorched*.

Cover – Standard protocol

- Where the vertical line of sight through the densitometer projects onto bare sky that is within the canopy of a live tree, this is a hit and recorded as *photosynthetic vegetation* and flagged as *in canopy sky*.
- Where the vertical line of sight through the densitometer projects onto bare sky that is within the canopy of a dead tree, this is not a hit and nothing is recorded for the canopy.

Estimating vegetation, tree, char and scorch height

- Heights significantly above the height of the staff should be estimated using a forestry rangefinder for rapid and accurate height measurements.
- When using a rangefinder, the distance and the angle to the top of the tree are measured at the same time, and then the distance angle to the base of the tree are measured at the same time. The internal calculator will then calculate the height. Ensure you are far enough from the tree, at least the distance of the height of the tree, and can see the top and base of the tree.
- Where a rangefinder is not available, tree height can be estimated using the following methods:
  - Clinometer and tape
  - Mobile phone applications.
- When using a clinometer, find a place to stand where you can see the top of the tree. Your distance from the tree should at least be equal to the height of the tree. Measure the distance between yourself and the tree and measure the height from your eye to the ground. Look through the clinometer with one eye and at the tree with the other eye. Line up the crosshair in the clinometer with the top of the tree. Read the value on the percent scale. This gives you the tree's height as a percentage of the distance from the tree (e.g. a reading of 50% means the height of the tree is half the distance you are from the tree).
  - Calculate the height of the tree using the equation:

    Tree height = clinometer reading / 100 x distance to tree + eye height
  - On sloping ground, two readings will need to be taken (treetop (reading 1) and tree base (reading 2)). When the surveyor is above the level of the tree base, the two percent values are added. Calculate the height of the tree using the equation:

    Tree height = (clinometer reading 1 + clinometer reading 2) / 100 x distance to tree
  - When the surveyor is below the level of the tree base, the tree base percent is subtracted from the treetop percent. Calculate the height of the tree using the following equation:

    Tree height = (clinometer reading 1 - clinometer reading 2) / 100 x distance to tree
  - See Appendix 4 for diagrams for using a clinometer in each situation.

There are several mobile phone applications that provide an estimate of tree height. Like the clinometer guidelines above, a measurement of the distance to the tree is required to estimate the height.

We at TERN acknowledge the traditional owners and their custodianship of the lands on which TERN operates. We pay our respects to their ancestors and their descendants, who continue cultural and spiritual connections to country.

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