FIELD SAMPLING PROTOCOL FOR THE MEASUREMENT OF INDICATORS IN RAINFOREST REPLANTING

For use with the Rainforest Replanting Methodology for the Cassowary Credit Scheme

Version 1.0

July 2024

Before going into the field

If this is a repeat survey and the Monitoring Plots have been set up previously, review information and descriptions in previous data sheets (especially #1-8, 10, 11, 17-18) about the location of the Monitoring Site and Plots. Check the values of Indicators in previous survey(s), including the lists of native recruits (#25) and non-native plants (#20). Record relevant information on a new data recording sheet (see below).

If this is the first (baseline) survey, use information about the size of the Management Unit to determine how many Monitoring Sites are needed (Table 1). Use information about the shape of the Management Unit, topography, infrastructure and so on to identify where you might locate the Monitoring Plots (this may need to be adapted in the field). Note that two (2) 20x50 m Monitoring Plots are needed for each Monitoring Site.

Record a unique short **code for each Monitoring Plot** (#3). The code should be something that relates to the property or owner, the Methodology Area (e.g., RR for Rainforest Replanting Methodology), the Management Unit (e.g., planting year), Monitoring Site and Monitoring Plot[1]. Every Monitoring Site will have 2 Monitoring Plots; Management Units larger than 4.4 ha will have more than one Monitoring Site and > 2 Monitoring Plots (Table 1). Write down the codes of other Monitoring Sites within the same Management Unit. Monitoring Site codes include all the information from the Monitoring Plot code, except the final Monitoring Plot number.

Prepare aluminium tags with the code for each Monitoring Plot clearly marked.

For all surveys:

- On the data recording sheet, fill in the information about the **property and owner details** (#1-2) and the Monitoring Site and Plot codes (#3).
- Review equipment needed (see list below) and mark or paint with bright colour any relevant equipment (for visibility).

Tip: It is generally safer to have more than one person present for field work. The field survey will also be quicker and more efficient with 2 people.

[1] An example code could be SMIRR26ES1P1 for a Project on Smith's property, in the Methodology Area where the Rainforest Replanting Methodology is applied, in the Management Unit to be planted in 2026 using Ecological Planting techniques, Monitoring Site 1 Monitoring Plot 1.

Table 1. The number of Monitoring Sites required for the size of the Management Unit. The number of Monitoring Sites increases with the size of the Management Unit. There are two (2) Monitoring Plots in each Monitoring Site.

MANAGEMENT UNIT SIZE (HA)	MINIMUM # MONITORING SITES	MINIMUM SAMPLE AREA (HA)
0.2-4.4	1	0.2
4.5-10	2	0.4
11-20	4	0.8
21-40	6	1.2.
41-80	10	2.0
81+	12	2.4

Equipment

List of equipment needed to survey 1 Monitoring Site (note that there are 2 Monitoring Plots in each Monitoring Site)

- 1 x 50 m tape
- 1 x 10 m tape or 10 m rope. It can be helpful to attach a carabiner to the middle of the rope so that it can be clipped in place while you're marking out the Monitoring Plot
- 4 x aluminium tags, 2 for each Monitoring Plot with the code marked (if this is the first survey), plus spare tags and an implement to mark the code on the tags
- Stainless steel tie wire
- 2 types of markers are needed:
    - Type 1: 4 markers needed. A highly visible, permanent marker to mark the beginning and end of the transect (e.g., star picket, steel reinforcing bar ("reo") or similar strong material). Paint/mark the top ends with a bright colour. Ensure the pickets/metal spikes have somewhere to affix an aluminium tag and safety caps.
    - Type 2: 32 markers needed, plus extras. A permanent marker that needs to be seen from within the Monitoring Plot (e.g., small bamboo/survey markers/metal stakes/pin or flagging tape, all with flags or painted a bright colour; it is generally quickest to use pigtail posts or bamboo stakes as these are easier to install than flagging tape and are less likely to need replacing over time).
- 1 x dolly or mallet to bang in posts/markers
- Extra flagging tape
- Waterproof marker pen (contrasting colour to flagging tape)
- Clipboard and hard copies of blank data sheets
- Pencils
- Compass OR compass app on mobile phone (charged)
- Mobile phone (charged) with Geographic Positioning System (GPS) capability OR GPS (with charged batteries)
- 2 x 2.5 m poles or sticks (e.g., small diameter PVC pipe) marked at 10 cm, 20 cm, 50 cm, 1 m and 2.5 m (top painted for visibility)
- Phone or camera (charged) to take photos

Tip: use brightly coloured paint on survey equipment (especially any sticks) to make them easier to find in the field.

Before setting up the Monitoring Plots

- If you didn't do this before arriving, fill in the information about the **property and owner** (#1-2)
- Fill in the **Monitoring Plot code** and check that it is the same as on the aluminium tag (#3)
- Fill in **date and the name(s) of assessor(s)** (#4-5)
- Record the age of the planting (see Rainforest Replanting Methodology for definition of Planting Age) (#6)
- Record the reason for conducting the field survey (e.g., Compulsory Field Measurement Year) (#7)
- Select (or re-find) the starting point of the 20x50 m Monitoring Plots.
- Provide a **sketch and make notes** about the Management Unit (#8) that could help with locating the Monitoring Site and Monitoring Plots at a later date. These will be most detailed when the Monitoring Site is first set up, but there might be new information on repeat visits. Use the information below when selecting locations for Monitoring Sites and Monitoring Plots.
- Record whether this is an **established or new** Monitoring Site (#9).

Tip: Be prepared to relocate established Monitoring Sites or Monitoring Plots in cases where they are no longer representative of the broader Management Unit (e.g., if cattle have damaged an area within a Monitoring Plot).

Selecting locations for Monitoring Sites

Monitoring Sites comprise two (2) rectangular Monitoring Plots (20x50 m), with several sub-plots for surveying specific indicators (Figure 2).

Monitoring Sites should be placed so they include areas representative of the area to be replanted, including minor variation characteristic of the Management Unit. Where possible, Monitoring Plots should not be placed close to edges of plantings because the values of Indicators in these areas is likely to be different from those in the interior of the planting, although in narrow replanting projects it will not be possible to avoid edges.

In Management Units that are wide, Monitoring Plots may be scattered throughout the area (Figure 1a.). In narrow Management Units, Monitoring Plots may need to be set up lengthwise (Figure 1b.). If possible, do not locate Monitoring Plots closer than 20 m to one another (Figure 1c-d.). In some areas it may be necessary to alter the layout of the Monitoring Plot. For example, in a very narrow part of a Management Unit, the Monitoring Plot could be split into two (2) 10x50 m sub-plots (Figure 1e.). Monitoring Plots may also be bent or broken to fit into the shape of the Management Unit or to avoid non-representative areas, as long as a total area of 0.1 ha (across both sub-plots) is sampled.

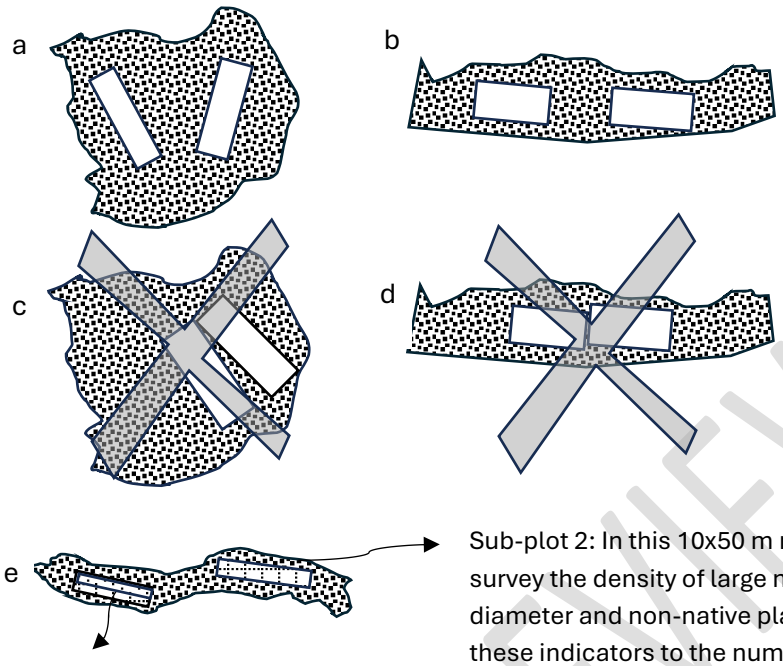


Figure 1. Guidance for choosing locations for Monitoring Plots. a-b) distribute Monitoring Plots through the Management Unit if possible; c-d) aim to separate Monitoring Plots by at least 20 m; e) alter the layout of Monitoring Plots if needed, for example in narrow Management Unit areas. Monitoring Plots can also be bent or broken to accommodate the shape and other characteristics of Management Units. A minimum of two (2) Monitoring Plots will be surveyed in each Management Unit.

Overview of survey instructions

Monitoring Sites comprise two rectangular Monitoring Plots, each 50x20 m, with several sub-plots for surveying specific indicators (Figure 2). Each Monitoring Plot is based around a central 50 m transect and sub-plots are centred around various points along this transect:

- canopy cover is measured 6 times in each plot, at alternating corner points of the 10x10 m sub-plots, every 10 m at 0 m, 10 m, 20 m, 30 m, 40 m and 50 m.
- the cover of non-native grasses is measured 6 times in each plot at points either side of the transect every 10 m at 0 m, 10 m, 20 m, 30 m, 40 m and 50 m.
- the number of native plant recruits is counted in a 5x50 m sub-plot.
- the number of medium native stems 20-50 cm diameter is counted in a 10x50 m sub-plot.
- the number of large native stems >50 cm diameter is counted in the 20x50 m plot.
- the cover of non-native plants is measured in the 20x50 m plot.

To do the survey you will walk up and back along the transect (setting up and then taking measures of canopy cover and grass cover). Then you will walk back towards the finish point searching the 10x50 m sub-plot for medium diameter native stems and the whole 20x50 m plot for non-native plants and large-diameter native stems, before returning to the starting point while searching the 5x50 m sub-plot for native recruits and collecting the 50 m tape.

- Locate the place you intend to set up the Monitoring Plot. Walk approximately 50 m in the direction you intend to lay the transect, looking 10 m either side. If there are large obstacles or areas that are very different from what is typical of the Management Unit, realign the Monitoring Plot.
- Bang in Type 1 permanent marker (e.g., star picket/reo) at the starting point. Affix aluminium tag with the Monitoring Plot code to the permanent marker. Attach a piece of flagging tape and write “0m START” on flag.
- **GPS coordinates of the 0 m start point** (#10). There is space to record the location as either Easting and Northing OR in decimal degrees.

You are going to measure the 50 m central transect and install Type 1 markers at the beginning and end. On the way, use 4 x Type 2 markers to mark every 10 m along the central transect i.e., at 10 m, 20 m, 30 m and 40 m from the start. You will use the rope and 10 Type 2 markers to mark the corners of each of the 10x50 m sub-plots centred on the 10 m points. It is not necessary to mark the edges of the whole 20x50 m Monitoring Plot. Only large-diameter native stems and non-native plants will be surveyed in the outer edges of the Monitoring Plot (i.e., 5-10 m from the central transect). Large-diameter stems will only be present in older planting sites and will generally only be present in relatively small numbers. When a large-diameter stem or a non-native plant is estimated to be within the 20x50 m Monitoring Plot, it is quicker to use the measuring tape to confirm it is within 10 m of the central transect, rather than setting up permanent markers. At the end of the survey, you will collect any rope or measuring tape.

- At the 0 m point, lay out the 10 m rope/tape perpendicular to the central transect, with the centre (i.e., 5 m mark) of the rope/tape at the 0 m start point. If you have attached a carabiner to the centre of the rope, clip it to the Type 1 marker at the 0 m start point. Using Type 2 markers, mark the points 5 m either side of the transect. Collect the rope and take it with you.
- Affix the 50 m tape to the 0 m marker. From the 0 m point, walk in a straight line, unrolling the tape until the 50 m point is reached. Make the transect as straight as possible.

- As you go, insert a Type 2 marker at the 10 m point, and – as you did at the 0 m point - again lay out the 10 m rope/tape perpendicular to the central transect, with the centre of the rope/tape at the 10 m point on the central transect. If applicable, clip the carabiner on the centre of the rope to the Type 2 marker or 50 m tape at the 10 m point. Mark the points at 5 m either side of the central transect with Type 2 markers. Repeat this step at the 20 m, 30 m, 40 m and 50 m points.
- At the 50 m point, insert a Type 1 marker. Affix an aluminium tag with the Monitoring Plot code to the marker and attach a piece of flagging tape with "50 m FINISH" written on it.
- Record the **GPS coordinates of the 50 m finish point** (#11).
- Leave the 50 m tape in place until you've finished collecting all of the data.

Start to collect canopy cover and non-native grass cover measurements as you walk back towards the start of the transect.

- Take measurements of canopy cover and non-native grass cover 5 m either side of the central transect (Figure 2). Alternate right to left between points, i.e., at 50 m sample 5 m to the right of the central transect then at 40 m, sample 5 m to the left of the central transect. Continue taking canopy cover and grass measures at 30 m, 20 m, 10 m and 0 m, alternating from left to right 5 m from the central transect (Figure 2).
- If some vegetation is taller than 2.0m in height: (a) take a **canopy photo** (#12); (b) make a visual estimate of the **total percent canopy cover** (#13); (c) make an estimate of what percent of this total canopy cover consists of **non-native species** (#14); and (d) record the **native canopy cover percent** by subtracting the non-native canopy cover from the total canopy cover (#15).
- If the vegetation is shorter than 2.0m (i.e., in very young sites): record canopy cover as zero (#15).
- Record the **percent non-native grass cover** (#16) at each of the six points.
- When you are back at the 0 m start, record the **compass bearing** from the 0 m point along the tape towards the 50 m point. Write down the compass bearing (#17).
- Take **photo of the Monitoring Plot** looking from 0 m towards 50 m (#18).

Walk towards the 50 m end of the Monitoring Plot again, this time searching the whole 20x50 m plot for non-native plants and large-diameter native stems >50 cm. At the same time, search the smaller 10x50 m sub-plot for medium-diameter stems 20-50 cm.

- Record **information about non-native plants** (#19-22) in the 20x50 m plot.
- Tally the **number of native stems 20-50 cm** diameter (at 1.3m above the ground) (#23) in the 10x50 m sub-plot only. This is most easily done with two people, one walking either side of the central transect.
- Tally the **number of native stems >50 cm** diameter (at 1.3m above the ground) (#24) in the 20x50 m plot.

Walk back towards the 0 m start of the Monitoring Plot recording native tree, shrub and vine recruits within 2.5 m of each side of the transect as described in the detailed instructions below. Use the 2.5m stick/pole to check that the stems of these recruits are within 5 m of the central transect. Gather up any ropes and tapes.

- Record **information about each native recruit species** (#25), including the name or description, whether it occurs in one or both plots, as well as photo numbers (if applicable).

Layout of a Monitoring Plot

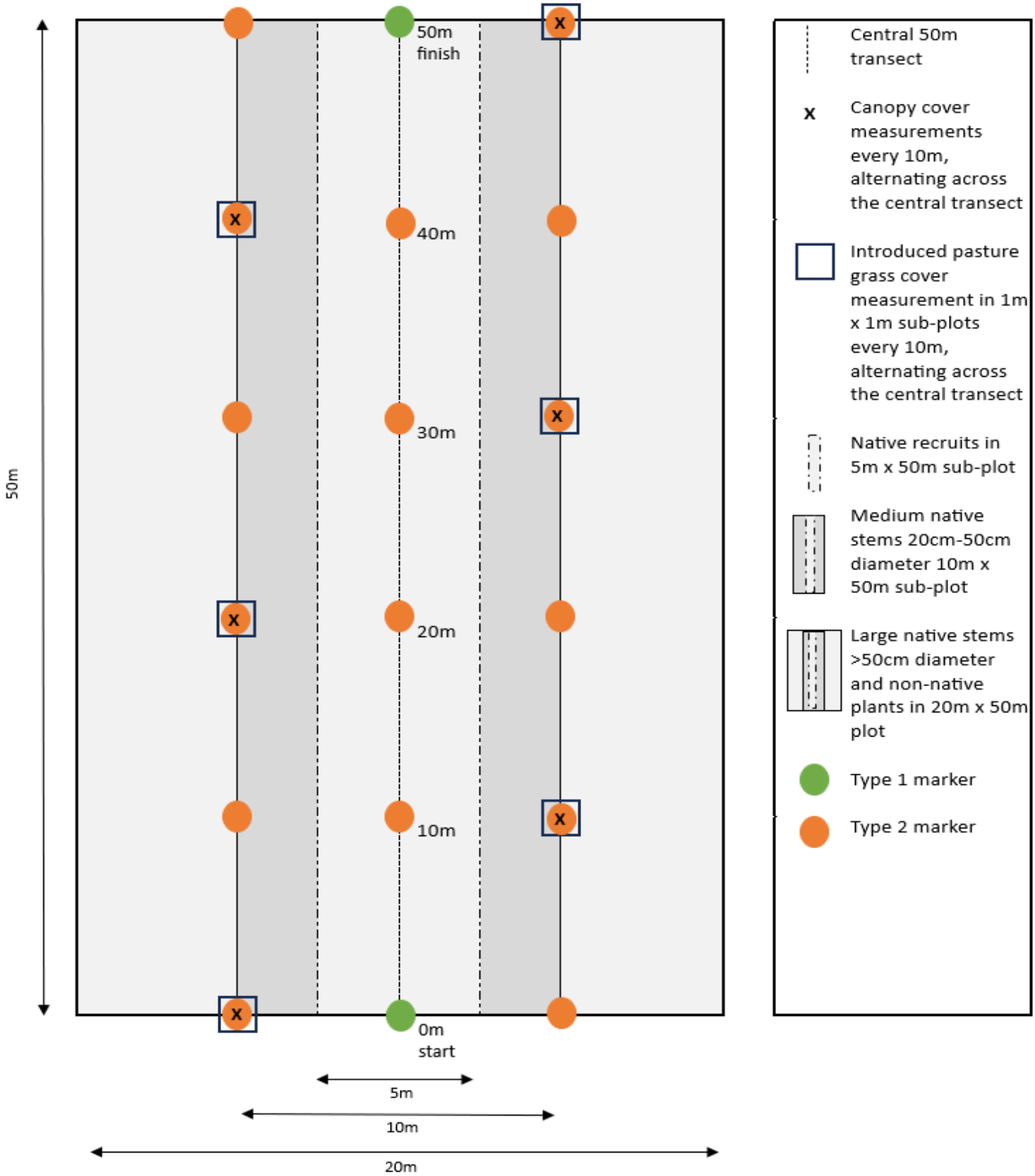


Figure 2 . **Layout of a single Monitoring Plot, including sub-plots and point survey locations.** This graphic is not to scale. Note that a minimum of 2 Monitoring Plots will be set up in each Monitoring Site. More than one Monitoring Site is required for Management Unit areas larger than 4.4 hectares.

Detailed survey instructions

For each Monitoring Plot:

Step 1: Walking from 50 m to 0 m along the transect, record the canopy cover and non-native grass cover at each of 6 points. The points are located every 10 m and alternate from 5 m to the left of the central transect to 5 m to the right of the central transect (Figure 2).

If the canopy is less than 2.0 m in height, do not measure canopy cover; record canopy cover as zero.

Canopy cover. Directly above each point, take the following three actions, also making notes as relevant:

i. Take a canopy photo: hold the camera or phone horizontal to the ground at eye level, so the screen is facing the sky**,** ensuring there is no vegetation less than 2.0 m tall in the field of view. Do not zoom in or out. Record the **photo number** (#12). This photo will be used in the office to measure total canopy cover using a grid overlay (#13a) (see the instructions included at the end of this protocol).
ii. Make a **visual estimate of the total canopy cover** (#13). This is the total cover from all leaves, stems and branches above 2.0 m in height, equivalent to the percent of the ground that would be shaded if the sun was directly overhead. Look upwards rather than relying on actual shade on the ground because shade can also be influenced by lateral foliage if the sun isn't directly above. Use the illustrations of canopy cover estimates at the end of this protocol.
iii. Make an **estimate of the canopy cover of non-native species** (#14).
iv. Subtract the non-native canopy cover % from the total % visual canopy cover estimate to obtain the visually estimated **native canopy cover** (#15).

Note that the visual estimate of non-native canopy cover will also be subtracted from the total canopy cover measured from the photo in the office to obtain a 2nd measure of native canopy cover for each of the 6 points (#15a). The average of the 2 native canopy cover estimates for each point (i.e., the visual estimate and (adjusted) photo measurement) will be used as the native canopy cover measure for the point. The average of the 6 measures from each plot will be the native canopy cover score for the Monitoring Plot. Canopy cover tends to be under-represented in visual estimates and over-represented in photo measurements. The average of both measures gives a more accurate measure of canopy cover.

Non-native grass cover. At each of the same 6 points, record a visual estimate of the **% cover of non-native grasses** (#16) in a 1x1 m square sub-plot, as follows:

Use the 2.5 m poles/sticks centred on the survey point, to define at least 2 sides of a 1x1 m square sub-plot. Stand above this sub-plot and estimate the percent of the ground area that is covered by non-native grasses (including, but not limited to, *Urochloa decumbens* signal grass, *Megathyrsus maximus* guinea grass, *Setaria sphacelate* South African pigeon grass). Include grass that has bent over whether or not it is rooted inside the sub-plot. Include dead grass that may still be present. Do not include cover from sedges or native grass species in this estimate.

Step 2: Walking throughout the plot from the 0 m start point to the 50 m end point, record the presence and abundance of non-native plants, and the number of medium stems (20-50 cm diameter), and large stems (> 50 cm diameter) of native trees.

Non-native plants. Record non-native plants 10 m either side of the transect (i.e., in the whole 20x50 m plot; Figure 2). This assessment involves both categorising species as either high or low impact, as well estimating the abundance of plants in both categories.

Search throughout the 20x50 m plot for non-native vegetation. Make an **annotated sketch of the non-native species** in the plot (#19). You will use this sketch to support your estimate of abundance (#21, below). All occurrences of high impact species (Table 2) should be recorded. Low impact non-native species that occur as less than 10 individuals don't need to be individually identified but should be included in the calculation of abundance of low impact plants. Consider that non-native vines may be abundant in the canopy even though their stems may be sparse in the understorey. For species that are not able to be identified, use a descriptive code and photograph so that the same species can be recognised if it reoccurs in the plot or in future surveys. Even if species names are not able to be identified, they must still be assigned to either the low impact or high impact category. This sketch may also be useful to assess change in future surveys and to target management.

Record the **name or descriptive code of each non-native species** and whether it is likely to have **high or low impact** (Table 2) (#20). In assigning each species to a high or low impact category, use your experience and knowledge of the species in other rainforest areas in the region, observations from other parts of the Methodology Area and any other relevant information. Consider that a given non-native species may have different impacts in different situations, depending on factors such as the stage of development of the planted vegetation, the type of rainforest, site-specific conditions, as well as aspects of the management regime.

Estimate the **abundance class for all low impact non-native plants and for all high impact non-native plants** (#21) recorded in the 20x50 m plot (Table 3). Use the abundance class descriptions and corresponding percent cover estimates as a guide when assigning plants to an abundance class. The annotated sketch (#19) of non-native plants will help estimate the percent cover and abundance of high and low impact non-native plants.

Calculate the **non-native plant abundance class estimate** (#22) (Table 3) for high and low impact plants. The non-native plant abundance class is calculated for high and low impact plants separately, so there is a score for high impact and low impact plants for each Monitoring Site. The Monitoring Site value for each impact category will be whichever of the values from both Monitoring Plots is the *highest*.

Table 2. Characteristics associated with high and low impact non-native plants.

LOW IMPACT	HIGH IMPACT
Usually thrives in full sun and therefore is transient in early stages of rainforest restoration or regeneration	Vigorous and fast growing in shade and can persist in developed rainforest vegetation
Unlikely to thrive, even if not controlled	Likely to thrive unless controlled
Often <2m in height	Reaching heights of over 2m
Typically occurs in low abundance, isolated and scattered individuals	Can form a dense mat, thickets or smother standing vegetation
Usually does not spread rapidly	Likely to spread rapidly
Fairly easy to control	Difficult to control

Table 3. Guide to assigning non-native plants to abundance classes.

ABUNDANCE CLASS	DESCRIPTION OF ABUNDANCE CLASS	APPROX. % COVER
Absent	None detected	0%
Rare	A few individuals, a single small cluster	1-5%
Occasional	Several clusters or individuals sparsely scattered or a few large individuals	6-15%
Common	Numerous small clusters or many individuals or several large individuals	16-30%
Abundant	Frequent or large clusters; large individuals seen throughout the site	31-60%
Dominant	Dense infestation, very large clusters or many individuals found everywhere	61+%

The number of medium native tree stems (20-50 cm diameter). Record the number of medium stems of native trees in the area 5 m either side of the central transect (i.e., in the 10x50 m sub-plot; Figure 2).

Use the 2.5m pole/stick with 20 cm and 50 cm markings to check whether a stem fits the medium or large diameter category. Measure diameter at approximately 1.3 m above the ground. Only count native species, but it's not necessary to record the identity of the species.

For multi-stemmed plants, their equivalent diameter would be 20 – 50 cm if the sum of the diameter squared of all stems (i.e., $a^2+b^2+d^2$.....[where *a*, *b* and *d* are individual stems]) is between 400 cm and 2500 cm i.e., combined diameter =$\sqrt{(\sum \text{diameter}^2)}$.

Progressively tally the occurrences of medium stems as you walk throughout the sub-plot (at the same time as you're assessing the cover of non-native plants, and the number of large native stems). Use the markers of the 10x50 m sub-plot to delineate the area to search. Add up the tally and record the **total number of medium native tree stems** (#23).

The number of large native tree stems (>50cm diameter). Record the number of large stems of native trees in the area 10 m either side of the central transect centre (i.e., in the whole 20x50 m plot). For large-diameter stems located more than 5 m away from the transect (outside the 10x50 m sub-plot), use the 10 m tape to check the distance.

Use the 2.5m pole/stick with 20 cm and 50 cm markings as described above.

Multi-stemmed plants will have an equivalent diameter >50 cm if the sum of the diameter of all stems squared (see above) is >2500cm.

Add up the tally and record the **total number of large native tree stems** (#24).

Step 3: Returning from the 50 m end point to the 0 m start point, record information about the recruitment of native trees, shrubs and vines in the 5x50 m sub-plot.

The number of native plant recruits. Record every native tree, shrub or vine species that is between 10 cm and 1.0 m tall. Do not include herbs, forbs, grasses and other life-forms. Use the 2.5 m pole/stick to check that stems are 0.1 – 1.0 m high. Do not count stems that have been planted; this is only likely to be an issue in very young sites where the assessor will need to use their judgement to decide whether a stem was planted or has recruited. Do not include non-native species.

Use the 2.5 m stick/pole to confirm whether any recruiting native plants are within 2.5 m of either side of the central transect.

Write either the name of each native tree, shrub or vine species or a descriptive code (e.g., *species A, opposite leaves*; *species B, pale underleaf*). Take a photo so that you can check it against other recruits in both Monitoring Plots and for later identification if required. Although it is not necessary to positively identify each species, it is important that a species is not included more than once if there are multiple individuals or if it occurs in both Monitoring Plots, because the total number of species of recruits is calculated across both Monitoring Plots**.** Do not count the number of individuals, only the number of different native species.

Count the **number of different native species recruiting** in the plot (#25).

Data recording sheet

Use this sheet to record information for both of the Monitoring Plots in one Monitoring Site

1. PROPERTY/PROJECT INFORMATION Address: Notes:	
2. PROPERTY/PROJECT OWNER Name: Phone: Email:	
3. MONITORING SITE & PLOT CODES Methodology Area name/code/description: Management Unit name/code/description: Monitoring Site code: **Monitoring Plot 1 code:** **Monitoring Plot 2 code:** Codes of other Monitoring Sites in this same Management Unit:	
4. DATE	5. ASSESSOR(S)
6. PLANTING AGE	7. REASON FOR FIELD SURVEY

8. SKETCH MONITORING SITE & PLOTS Draw and describe how to get to the Management Unit and Monitoring Site. Include notes to help find/access the Monitoring Plots. e.g., distance and direction from closest gate or track, any creek crossings, any locked gates that need key for access. Mark approximate locations of both of the Monitoring Plots in the Monitoring Site. Note anything unusual or distinguishing about the location of the start of the Monitoring Plots such as a pile of rocks, a large or unique tree, a fallen tree, etc. To make it easier during repeat surveys, include as much detail as possible.			
9. NEW OR REPEAT SURVEY (circle one)	New		Repeat
10. GPS 0 m START	E	N	Decimal deg
11. GPS 50 m FINISH	E	N	Decimal deg

MAKE SURE YOU HAVE READ THE DETAILED INSTRUCTIONS ABOUT HOW TO MEASURE CANOPY COVER AND GRASS COVER (STEP 1) BEFORE YOU START TO RECORD INFORMATION BELOW.												
Canopy cover % at 6 points along transect												
	PLOT 1						PLOT 2					
	50m	40m	30m	20m	10m	0m	50m	40m	30m	20m	10m	0m
12. CANOPY PHOTO NUMBER												
13. VISUAL ESTIMATE TOTAL CANOPY COVER (%)												
14. VISUAL ESTIMATE NON-NATIVE CANOPY COVER (%)												
15. VISUAL ESTIMATE NATIVE CANOPY COVER (%) Total (#13) - non-native (#14)												
Fill out in the office 13a. PHOTO MEASUREMENT TOTAL CANOPY COVER (%)												
15a. PHOTO MEASUREMENT NATIVE CANOPY COVER (%) Total (#13a) - non-native (#14)												

NON-NATIVE GRASS COVER - % in 1x1 m sub-plot												
	PLOT 1						PLOT 2					
	50m	40m	30m	20m	10m	0m	50m	40m	30m	20m	10m	0m
16.NON-NATIVE GRASS COVER (%)												
17. COMPASS BEARING	from 0 m START looking towards 50 m FINISH						from 0 m START looking towards 50 m FINISH					
18. MONITORING PLOT PHOTO #	from 0 m towards 50 m						from 0 m towards 50 m					

MAKE SURE YOU HAVE READ THE DETAILED INSTRUCTIONS ABOUT HOW TO MEASURE NON-NATIVE PLANTS AND MEDIUM AND LARGE STEMS (STEP 2) BEFORE YOU START TO RECORD INFORMATION.		
NON-NATIVE PLANTS		
	PLOT 1	PLOT 2
19. SKETCH NON-NATIVE PLANTS Sketch and label occurrences of non-native plants in the 20x50 m Monitoring Plot. Make notes about abundance, lifeform and impact. Write the name of each species in the space provided on the next page and assign it to an impact category (#20). Then use a code (e.g., different colour or shading) to distinguish between plants with high and low impact. This will help allocate plants to abundance classes.		

NON-NATIVE PLANTS						
20. NON-NATIVE PLANT SPECIES NAMES AND IMPACT CATEGORY List non-native plant species in the Monitoring Plots. Use Table 2 to allocate species to high or low impact category. List high impact plants in the first column and tick whether they occur in Plot 1 and/or Plot 2. List low impact plants in the 2nd column and show their occurrence in either/both plots. All occurrences of high impact species should be recorded. Low impact non-native species that occur as less than 10 individuals don't need to be individually identified, but they should be included in the calculation of abundance of low impact plants.	HIGH IMPACT SPECIES	PLOT 1	PLOT 2	LOW IMPACT SPECIES	PLOT 1	PLOT 2

NON-NATIVE PLANTS (continued 1)						
20. (continued) List non-native plant species in the Monitoring Plots. Use Table 2 to allocate species to high or low impact category. List high impact plants in the first column and tick whether they occur in Plot 1 and/or Plot 2. List low impact plants in the 2nd column and show their occurrence in either/both plots. All occurrences of high impact species should be recorded. Low impact non-native species that occur as less than 10 individuals don't need to be individually identified, but they should be included in the calculation of abundance of low impact plants.	HIGH IMPACT SPECIES	PLOT 1	PLOT 2	LOW IMPACT SPECIES	PLOT 1	PLOT 2

NON-NATIVE PLANTS (continued 2)		
21. ABUNDANCE CLASSES Cumulative abundance estimate of non-native plants in high and low impact categories.		
	High impact plants	Low impact plants
PLOT 1 abundance		
PLOT 2 abundance		
22. MONITORING SITE NON-NATIVE PLANT ABUNDANCE CLASSES Non-native plant abundance classes for both Monitoring Plots and the Monitoring Site	**High impact plants** Highest of the 2 abundance classes	**Low impact plants** Highest of the 2 abundance classes

ABUNDANCE CLASS	DESCRIPTION OF ABUNDANCE CLASS	APPROX. % COVER
Absent	None detected	0%
Rare	A few individuals, a single small cluster	1-5%
Occasional	Several clusters or individuals sparsely scattered or a few large individuals	6-15%
Common	Numerous small clusters or many individuals or several large individuals	16-30%
Abundant	Frequent or large clusters; large individuals seen throughout the site	31-60%
Dominant	Dense infestation, very large clusters or many individuals found everywhere	61+%

DENSITY OF NATIVE TREES WITH MEDIUM STEMS				
	PLOT 1		PLOT 2	
23. Tally number of native tree stems 20 – 50 cm diameter in 10x50 m sub-plot	TALLY	TOTAL COUNT	TALLY	TOTAL COUNT

DENSITY OF NATIVE TREES WITH LARGE STEMS				
	PLOT 1		PLOT 2	
24. Tally number of native stems >50 cm diameter in 20x50 m plot	TALLY	TOTAL COUNT	TALLY	TOTAL COUNT

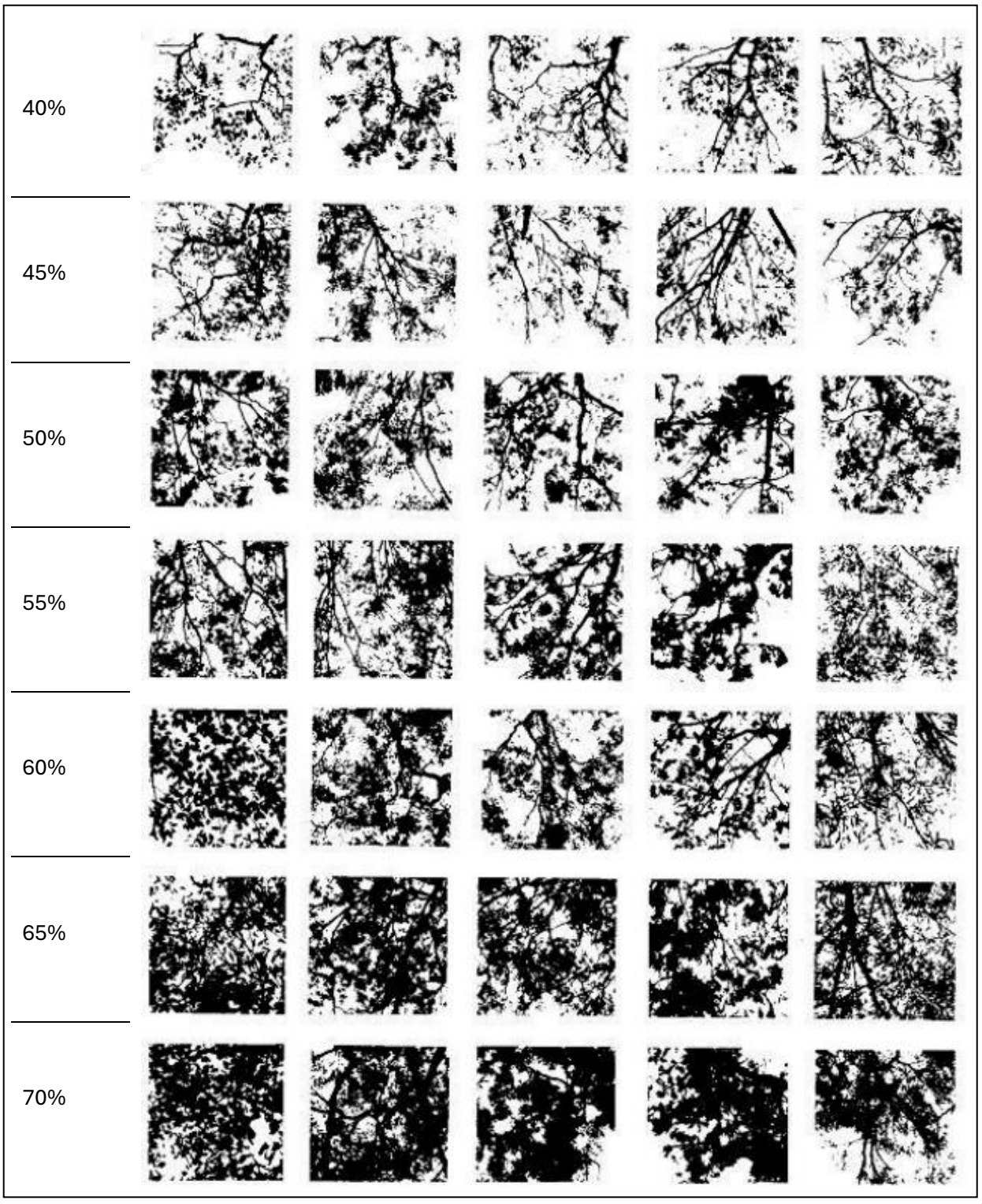
MAKE SURE YOU HAVE READ THE DETAILED INSTRUCTIONS ABOUT HOW TO MEASURE NATIVE PLANT RECRUITMENT (STEP 3) BEFORE YOU START TO RECORD INFORMATION BELOW.

NATIVE TREE, SHRUB AND VINE RECRUITMENT

25. NUMBER OF NATIVE RECRUIT SPECIES List the native species 10 cm-100 cm high in the 5x50 m sub-plot Write species names or descriptions & codes as well as corresponding photo numbers. In Plot 1 you will enter all names, but for Plot 2, only insert new names of species if they were NOT present in Plot 1. Indicate whether each species occurs in plot 1 and/or plot 2.	Species	Photo #	PLOT 1	PLOT 2

NATIVE TREE, SHRUB AND VINE RECRUITMENT (Continued)				
25. Continued List the native species 10 cm-100 cm high in the 5x5 m sub-plot Write species names or descriptions & codes as well as corresponding photo numbers. In Plot 1 you will enter all names, but for Plot 2 only insert new names of species if they were NOT present in Plot 1. Indicate whether each species occurs in plot 1 and/or plot 2.	Species	Photo #	PLOT 1	PLOT 2
			PLOT 1 Count all species present	PLOT 2 Only count species not in Plot 1 (at the end of the list)
	NUMBER OF NATIVE RECRUIT SPECIES IN EACH PLOT			
	TOTAL NUMBER OF NATIVE RECRUIT SPECIES (PLOT 1 + PLOT 2)			

Attachment 1. Guide to estimates of percent canopy cover



Source: Walker and Hopkins (1990)[1]. Canopy cover in rainforest may exceed 70%. In those cases, experienced judgement should be used to estimate canopy cover, within 5%.

[1] Walker J. and M.S. Hopkins (1990). Vegetation. In: McDonald, R.C., R.F., Isbell, J.G., Speight, J. Walker, and M.S. Hopkins. (Eds) Australian Soil and Land Survey. Field Handbook. 2nd edn. Melbourne: Inkata Press.

Attachment 2. Calculating canopy cover from digital photographs

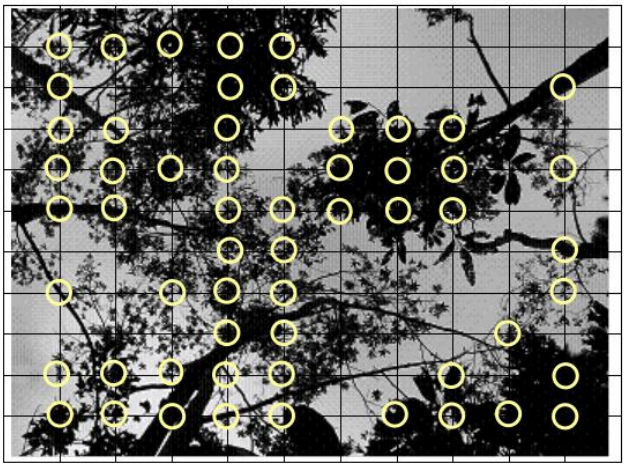
Information extracted from Kanowski *et al*., 2010[3]

Visual estimates of canopy cover can be very subjective. A more objective approach uses photographs. This approach has the advantage that the photos can be stored for later reference or used for showing changes in cover over time.

The approach presented below estimates canopy cover from digital images imported into Microsoft Word. It is based on superimposing a 10x10 grid (the internal gridline intersections of an 11x11 table) over a digital image of the canopy. Canopy cover (percentage) is estimated by counting the number of grid intersections with vegetation (or by counting grid intersections with the sky and subtracting this number from 100).

The approach assumes you have some familiarity with manipulating images and tables in Microsoft Word.

Note: similar procedures could be done using other software, including Microsoft Powerpoint.



Detailed instructions

1. Open a new document in Microsoft Word.

2. Create an 11x11 table with closely spaced (e.g., 0.7 cm) columns and rows.

3. Insert the image of the canopy into the document.

4. Format the layout of the picture so that it sits behind the text.

5. Move the picture so that it is located just inside the top left edges of the table.

6. Resize the table so that its right and lower boundaries extend just outside the edges of the picture.

7. Resize the columns and rows so that they form a regularly spaced grid over the picture (distribute columns and rows evenly within the table).

8. Count the number of grid intersections with vegetation to calculate the percentage of canopy cover (see example, above).

9. Alternatively, count intersections with the sky, and subtract from 100 to determine canopy cover.

10. To more accurately determine whether the grid intersects with vegetation or the sky, view the document at 200% zoom.

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[3] Kanowski J., Catterall C.P., Freebody K., Freeman A.N.D. and Harrison D.A. (2010) Monitoring Revegetation Projects in Rainforest Landscapes. Toolkit Version 3. Reef & Rainforest Research Centre Ltd, Cairns. Download from: http://www.rrrc.org.au/ publications/biodiversity_monitoring3.html