



Guide to monitoring ecological restoration projects

Every effort has been made to ensure that the information in this document is accurate at the time of publication. However, as appropriate, readers should obtain independent advice before making any decision based on this information.

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Office of Environment and Heritage NSW

59 Goulburn Street, Sydney NSW 2000

PO Box A290, Sydney South NSW 1232

Phone: (02) 9995 5000 (switchboard)

Phone: 131 555 (environment information and publications requests)

Phone: 1300 361 967 (national parks, climate change and energy efficiency information, and publications requests)

Fax: (02) 9995 5999

TTY: (02) 9211 4723

Email: info@environment.nsw.gov.au

Website: www.environment.nsw.gov.au

Report pollution and environmental incidents

Environment Line: 131 555 (NSW only) or info@environment.nsw.gov.au

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Guide to monitoring ecological restoration projects

This guide has been developed to assist you to establish and maintain monitoring processes for Environmental Trust (Trust) funded projects. Since the Trust funds projects that include a wide variety of activities aiming to improve the environment, there is no 'one size fits all' approach to monitoring. This means you will need to consider the best approach for your particular project.

The Trust have staff available to help with designing an appropriate monitoring program for your project and can be contacted by telephoning (02) 8837 6093, or by email info@environmentaltrust.nsw.gov.au.

Why monitor?

Monitoring your project is important for a few reasons:

1. It allows you to assess the impact your project has in a measured, visual way, enabling adaptive management decisions to be made and your successes as a group to be celebrated.
2. It provides the Trust with a quantitative and qualitative appraisal of what your project is achieving, because monitoring information is relayed to the Trust in your progress reports.
3. It helps to build a body of data which informs the wider NRM community of the effectiveness of approaches to restoration, whether through innovative or standard practices.

Ultimately monitoring will give you evidence of progressive change that then allows you to evaluate how well you have done, what effect your project has had and the quality of the outcomes you have generated. This then provides you with clear and meaningful information to include in your reporting to the Trust.

What does this guide include?

This Guide provides instructions on:

- Photo monitoring.
- Plot monitoring.

The guide also includes some examples and sample data recording sheets.

1. Photo monitoring

Photo monitoring is a quick and relatively easy way of measuring change in the natural environment. A series of photos are taken from a fixed location at regular intervals with the aim of visually showing improvement in vegetation condition. Photo monitoring will show broad-scale changes within the framed area but is unlikely to enable fine scale, quantitative assessments to be made.

NOTE: Photo monitoring is essential for all ecological restoration projects funded by the Environmental Trust.

How to establish and maintain photo-points

Step 1: Choose your location

Your photo-points will stay the same for the duration of your project, so you should select fixed locations from across your sites which clearly demonstrate the management issues being addressed through your project activities.

There is no minimum or maximum number of points required, however generally speaking, the more complicated your management issues are and the larger your site is, the more you should provide.

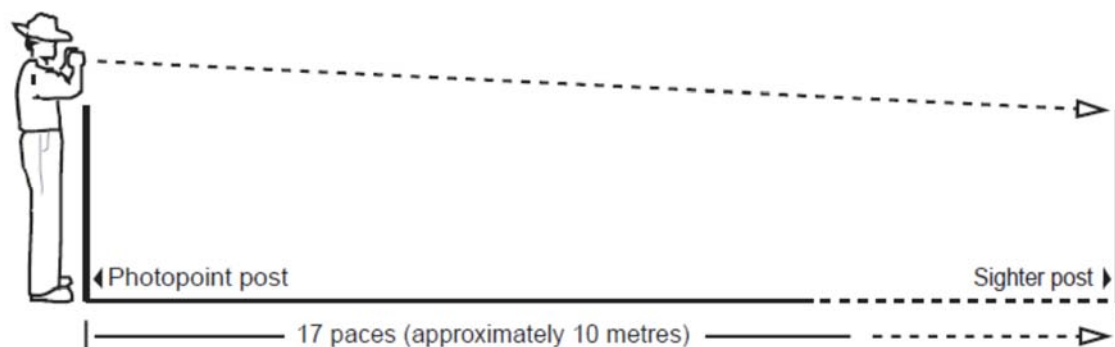
TIPS

- Consider proximity to tracks or roads for future accessibility.
- Consider potential vegetation regrowth that may obscure the clarity of future photos taken from the same location.
- Consider integrating photo-points with some of your monitoring plots (quadrats and/or transects).

Step 2: Mark the location

Install a physical marker (e.g. star-picket, tomato stake, etc.) to mark the point from which a photo will be taken. Then add a sighter post at a set distance (see diagram below).

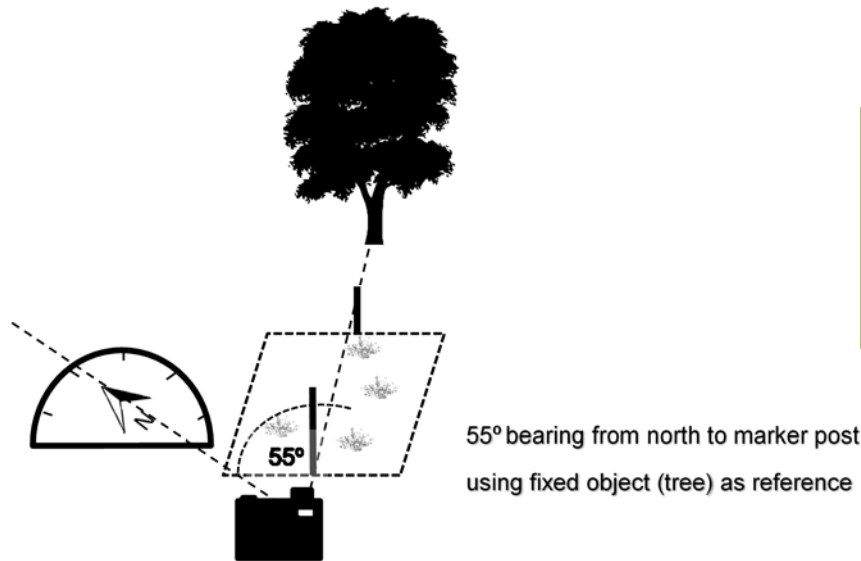
Attach flagging tape with information including a site reference number, date and aspect. Sites can change significantly following remediation work so this will help with finding the same location at a later stage. Capturing a GPS point using a handheld GPS or smart phone is also a handy method of retracing the approximate location of a photo-point and is highly recommended.



Source: Grodecki & Van Willing, 2010

Step 3: Take the photo

While standing at your marker post, use a compass to take bearing from due north to the centre of your photo frame (see diagram below). Take a few shots from the marker post (select the best/clearest shot later). If taking multiple images as part of a panorama, record bearings from north for each image and take sequential photographs (from either left to right or right to left) allowing for each image to overlap so that no gaps exist in the panorama.



REMEMBER

There is no minimum or maximum number of required photo-sites or images you can or need to take. The important thing is to capture images that are representative of your work site.

TIPS

- Try to include a fixed reference object such as a distinctive tree, fence-post etc. in the photo for future reference.
- Consider taking a mix of photos which show your site at a broad scale (landscape) as well as incorporating some of your monitoring plots (transects and/or quadrats). Use the same digital camera and settings (e.g. zoom, light settings, etc.) on the each time you take photos.
- Take along copies of the original photos for reference when returning to the photo-points to help match the field of view contents.
- Light cloudy days are ideal when sunlight is weaker and shadows from vegetation are less pronounced.
- Avoid taking photos during mist, when dark clouds are passing over or when vegetation/landscape are in mountain shadows.

Step 4: Record field data

It is important to record notes when you take each photo which will later help to explain what is being shown in the photo.

Record all information relevant to your photos in a field notebook (refer to Appendix 1) immediately after each photograph is taken. This can be transferred into your master photo monitoring data recording table file prepared for each site (Appendix 2). Accurate field notes are a back-up to e-files in case photo file names are labelled incorrectly or become mixed up.

Information for collection includes the site and station identification numbers, bearing, date, time, season and image number (from camera).

Step 5: Repeat

Photo monitoring is most effective when images are captured using a recurring timeframe. It is essential that monitoring stations are established pre-work (baseline) and soon after you have conducted the first stage of primary work (comparison to baseline). The second photograph should ideally be taken within a few days of the primary work.

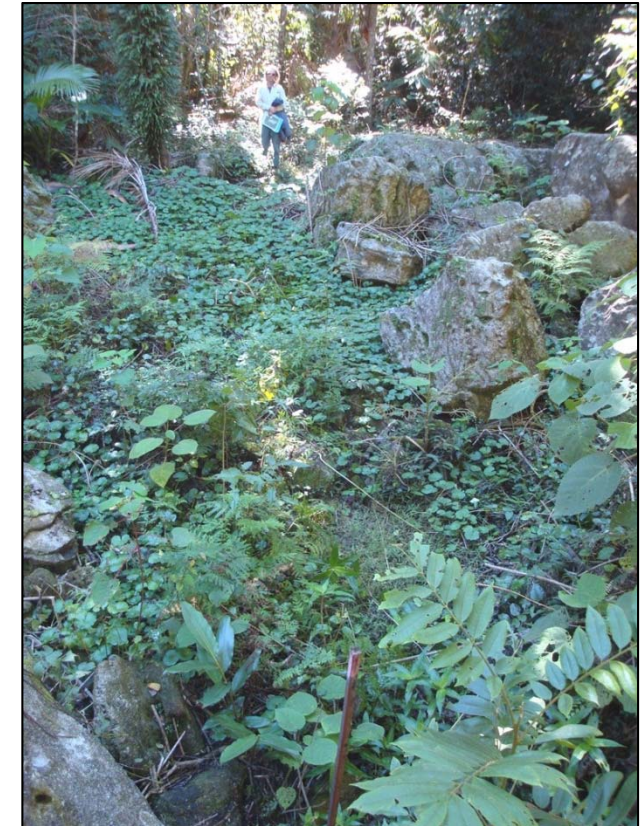
Follow-up photos should then be taken annually within a week of the anniversary of the second photograph (first year) at a minimum to fulfil the Trust's monitoring requirements. You can choose to take additional photographs at the same station on a seasonal basis (i.e. summer; autumn; winter, spring) or on a six monthly basis. Take care to repeat and follow the directions outlined in Steps 3 and 4, being mindful that the same field of view inclusive of the original bearing and reference points are maintained.



Year 1 Baseline (4/03/13) – post primary Lantana treatment



Year 2 (1/03/14) – regenerating Blackbean



Year 3 (5/03/15) – extensive regeneration of ground covers and colonising species such as Bleeding Heart

A good example of a photo series taken at a Wompoo Gorge restoration project. From left to right photos demonstrate natural regeneration occurring post Lantana control, taken at one year intervals.

* A minor tip for improving this photo series is to ensure all photos use the same zoom and are taken from the same location and height while using the background rocks to frame the photo boundary.

Photos supplied and published with permission from EnviTE Environment



Year 1 Baseline (4/04/12) – prior to primary Lantana treatment



Year 2 (1/04/14) – regeneration of colonising species including Native Peach



Year 3 (5/04/15) – extensive regeneration of native species (Bleeding heart, Rubus)

A good example of a photo series showing extensive natural regeneration resulting from Lantana control, taken at regular intervals.

* *Minor tips for improving this photo series include ensuring all photos remain landscape oriented, use the same zoom and the aspect is the same (canopy in background at same level).*

Photos supplied and published with permission from EnviTE Environment

2. Plot monitoring

In addition to establishing photo-points, fixed plots in the form of transects, quadrats, or a combination of both, will enable quantitative measurement of changes to the vegetation on your project site.

Typical measurements collected using transects and quadrats include weed and native plant diversity and density.

How to establish and maintain monitoring plots

Step 1: Plan

The number and type of monitoring plots you decide to establish will depend on the reference vegetation community/communities within your project area. For example, the type of information collected for a one hectare rainforest project site will be somewhat different to that which would be collected for a 50 hectare box gum woodland site.

If your project falls across a large area with more than one plant community type, you will need to establish and maintain monitoring plots in each to measure changes.

TIP

- Standalone quadrats are better suited for use in projects with fairly uniform vegetation types and management issues.
- Transects are better suited for use in projects with varying vegetation types and/or multiple management issues or features

Step 2: Choose the location

As with photo-points, the location of quadrat or transect plots will be fixed for the life of your project, so you should choose locations that provide a representative example of the areas being worked. There are no minimum or maximum number of plots required, however, you should establish enough to represent the different vegetation communities present and management issues being addressed through the project. You may want to divide your project area in to smaller zones and establish one or more monitoring plots in each.

Step 3: Establish your plots

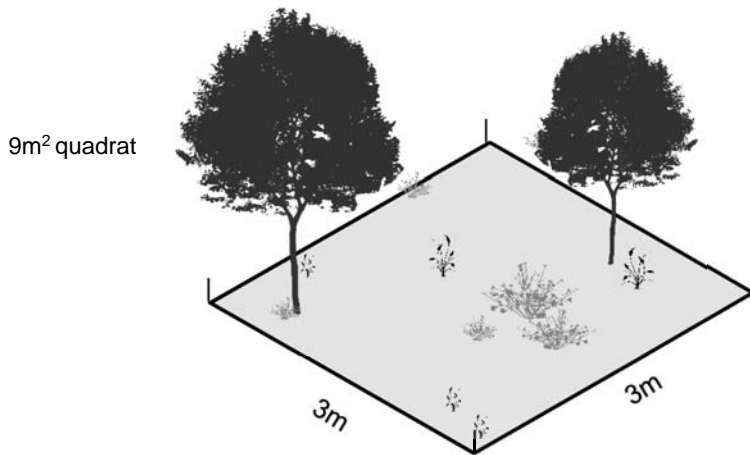
Quadrats A quadrat is a defined area, usually square in shape, where information is collected. The Trust suggests grantees establish quadrats between nine square metres (3 x 3 metres) and 25 square metres (5 x 5 metres).

The following is an example of how to set up a 3 x 3 metre (nine square metres). Setting up a quadrat requires four ground pegs (or half star pickets), a compass, a tape measure, and a rope or stringline equal to the perimeter length of the quadrat. Place a peg in the ground and walk in a straight line three metres due north. Place a peg in the ground here. Walk three metres due west and place another peg in the ground. Place a peg in the ground three metres south of this peg to complete the quadrat.

Lay out the rope around the perimeter of the four ground pegs (12 metres long) to define the edge of your quadrat. If possible leave the pegs in the ground (flagged to reduce their risk as a trip hazard) and use a star picket to mark the south-east corner of your quadrat so you have a 'permanent quadrat' that you can use for future assessments of the site/zone.

Example of quadrat layout within a project area

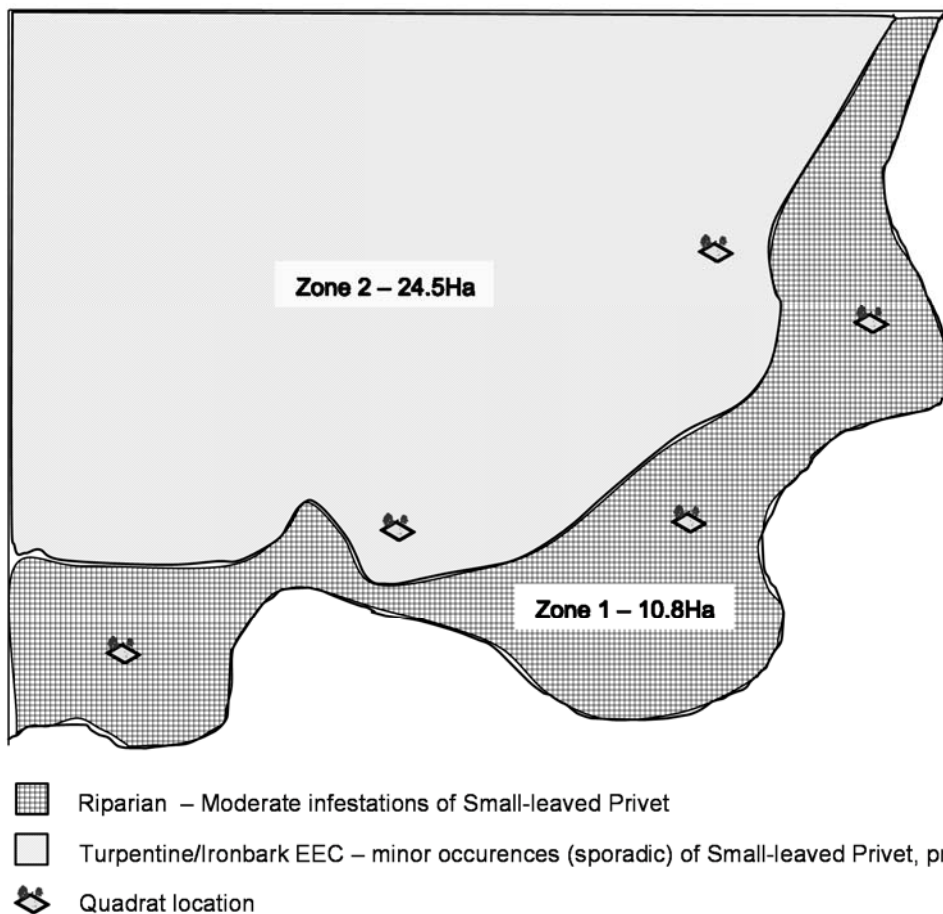
In this scenario the primary objective of the project is to improve the condition of riparian vegetation along a creek line adjacent to an endangered ecological community (EEC) of Turpentine/Ironbark Forest. Two adjacent private properties have previously received treatment. Two primary vegetation communities are present, totalling 35.3 hectares. The riparian zone is the primary focus and the grantee wants to measure the regeneration response to staged removal of small-leaved privet. They have established three, 3 x 3 metre quadrats in locations which are typical of the riparian vegetation condition throughout their primary work area and two 3 x 3 metre quadrats in better condition turpentine ironbark forest EEC.



TIP

Selection of an appropriate method need not be restricted to either quadrats or transects. A combination of both may be employed at any project site depending on the circumstances.

Quadrat locations within project area

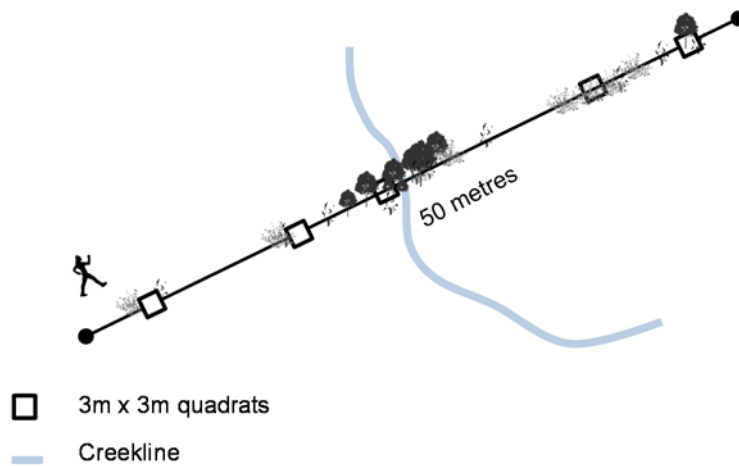


Transects A transect is also an area, usually linear, along which quadrats are established for collection of vegetation data.

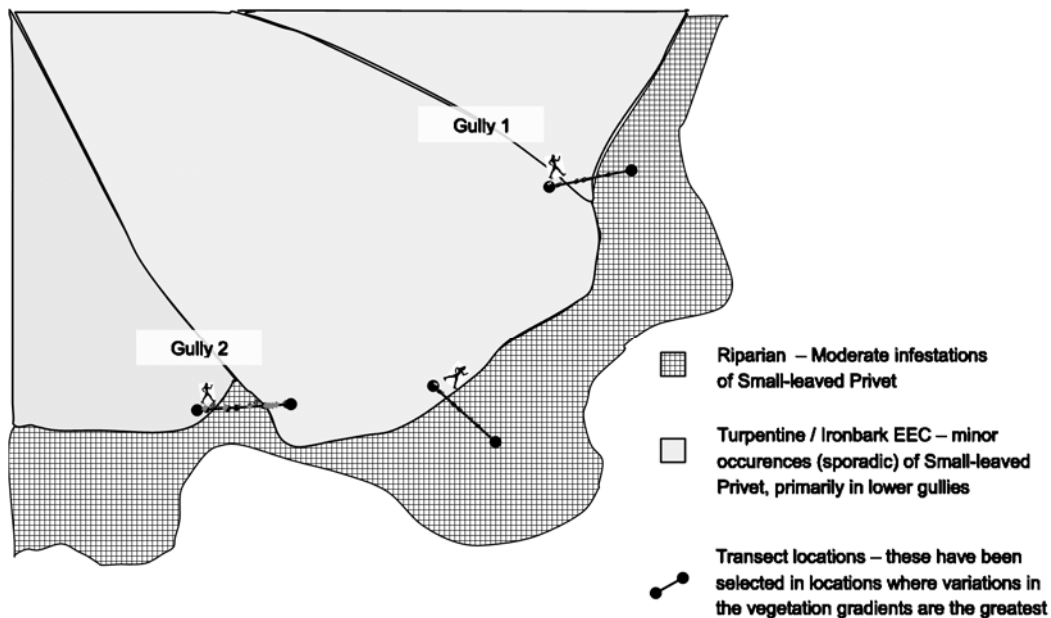
The Trust suggests grantees establish transects that are 50 metres long with five intersecting nine square metre quadrats. The following is an example of how to set up a 50 metre transect. Setting up a transect requires two ground pegs (or half star pickets), a compass, and a measuring tape (or stringline). Place a peg in the ground and walk in a straight line 50m. Place a peg in the ground here. If possible leave the pegs in the ground, clearly flagged to reduce their risk as a trip hazard.

In your initial setup, select a minimum of five random points along your transect (e.g. 3 metres, 12 metres, 29 metres, 36 metres, and 45 metres). At each of these points, you will establish a 3 x 3 metre (nine square metres) quadrat in which to take measurements. It is important that the same points along the transect are used for each subsequent collection of data.

Example of transect layout



Transect locations within project area



Step 4: Collect and record data

Quadrats Walk through your quadrat and record the weed and native species present. The number of species you record will be heavily dependent on the type of site and circumstances relating to your project, however, as a guide you should aim to record **up to five** of both the most significant weeds and native species in each quadrat. Record the proportion (percentage) of the quadrat taken up by each species. Record the density of plant cover at each strata (canopy, mid-storey and ground layer).

Transects Traverse each transect and record the vegetation species at the ground layer, mid-storey and canopy within each of the quadrats you've established along your transect. Record the proportion (percentage) of the area taken up by each species. Record the density of plant cover at each strata (canopy, mid-storey and ground layer).

A data capture template is provided at Appendix 3.

Step 5: Repeat

Annual recapture of this vegetation density data is required to make sense of the improvements occurring at your site. You may notice increases in weed loads at different stratum initially, but as the project progresses, the weed to native plant ratio (number of species and density) should decrease until such time as the site could be considered to be in a maintenance state.

Photo monitoring field data recording sheet

Site ID number	Date	Time	Bearing	Camera image number	Notes/description
1A	12/3/15	1600	55°	1	Baseline pre Small-leaved Privet control

Master photo monitoring data recording sheet

Site ID number			Bearing		Date site established	
Date	Time	Season	Camera image number	Notes		

NOTE: The function of the Master Photo Monitoring Data Recording Sheet is to collate all the photo monitoring data collected from the Field Data Recording Sheets each time after you return from gathering this data in the field. It acts as a repository database that encompasses and keeps track of all your photo monitoring data gathered over the duration of a project.

Quadrat data collection sheet

Record up to 5 of the most significant native and weed species in each quadrat.

Project number	2016/RR/0000	Date	01/07/16
Site/zone number	1A	Map reference	R5
Capture event:	E.g.1 (Baseline)	Collector name	Jane Smith
Quadrat/Transect number	3	Transect interval	25 metres

Native species name	Cover/strata %	Weed species name	Cover/strata %
E.g. <i>Corymbia maculata</i>	50/C	Camphor laurel	50/C
E.g. <i>Acacia floribunda</i>	10/M	Lantana	20/M
E.g. <i>Microlaena stipiodes</i>	10/G	Tradescantia	20/G

Codes
 C = Canopy M = Mid-storey G = Ground layer

Note: The percentage for each strata does not need to add up to 100 per cent but must not exceed 100 per cent

Comments