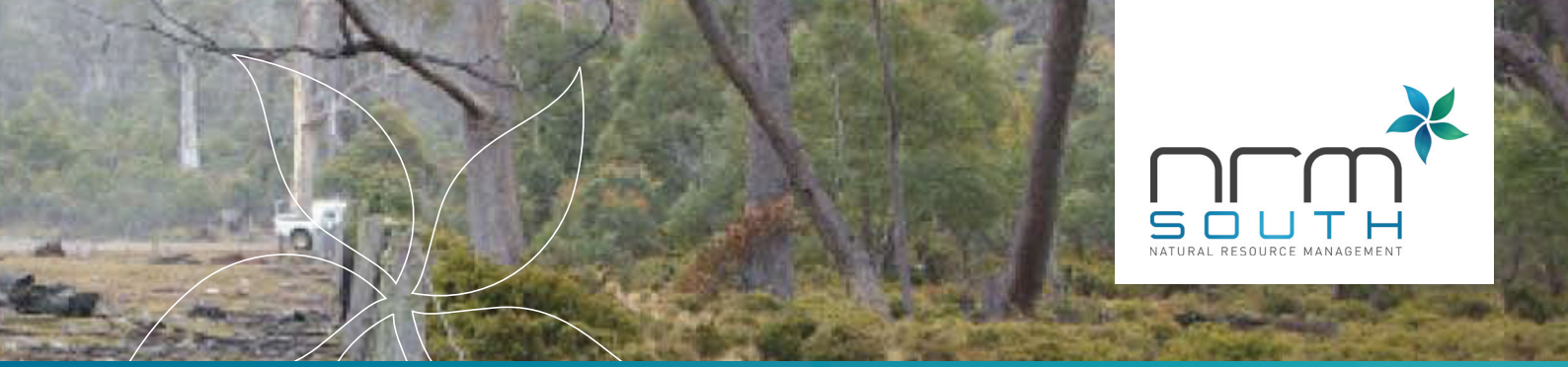


Photopoint Monitoring

FACT SHEET

WHAT IS PHOTOPOINT MONITORING ?

Photopoint monitoring is a simple, fast and inexpensive technique to record and monitor visual changes in the natural environment over time. It involves taking a series of images of a fixed area or subject at regular time intervals, which can then be compared to show physical change at a given location.

Consistency is critical to the success of photopoint monitoring. Photos must be taken at the same location, with the same camera direction angle, focus points and preferably camera settings at each time point, for an effective permanent visual record of environmental change.

Photopoint monitoring is most effective only when its strengths as a method match the objectives of the study, in terms of the nature and magnitude of the change that is expected to occur. When considering using photopoint, you need to be clear about the **appropriateness, capabilities** and **limitations** of the method.

Appropriateness

Photopoint monitoring is a useful technique for recording the effectiveness of on-ground management actions at the site scale (10m-100m) and is most appropriate when used to capture environmental changes which are visible to the eye. Photopoint monitoring may be best used to support other monitoring efforts aimed to quantify environmental change.

The photo series can detect change in condition due to:

- Weed growth/management
- Grazing pressure/management
- Feral animal impacts/management
- Erosion impacts/management
- Recreational or human impacts/management
- Revegetation
- Reintroduction of native animals
- Regeneration
- Dieback

One picture is worth a thousand words

Capabilities

- Low measurement error and variation
- Requires minimal training
- Readily obtainable equipment
- Low impact on monitoring site
- Provides a standardised and precisely replicable result that can be achieved by different people at different points in time
- Generally, it can be conducted by one person; however two people may be preferable due to safety considerations and transporting of equipment
- Complements quantitative monitoring techniques/data i.e. vegetation condition monitoring and species survival counts
- Potential to store data electronically and link to site records and/or GIS maps/data point
- Photos provide a permanent visual record of site conditions that transcends periodic changes in staff and expertise
- Photos may be a more effective communication/extension tool when dealing with the public and decision makers than highly quantitative charts, tables and graphs

Limitations

- Will only detect changes large enough to be seen by the eye from the camera position
- Is a qualitative rather than quantitative monitoring technique. These imitations can be overcome if additional quantitative techniques are applied, such as counts *(see Appendix 1)*.
- May not provide any evidence of cause of change in the variable of interest
- External effects, such as light may make detection of changes more difficult. Extreme wind and rain also present challenges
- Cannot be used in dense woody vegetation as branches and foliage obscure camera field of view.
- Overtime representation of objects may be restricted by the size and number of fields of view or photopoint markers can become obscured by vegetation, or lost due to soil erosion or vandalism
- Results will almost always be relative to the site where they are taken and comparison between sites may be limited
- Interpretation requires collection of 'metadata', e.g. date, time, plant species names
- Changes in operators or technology/equipment may affect results. This can be avoided by following a set method.

THE METHOD

There are five stages to photopoint monitoring:

1. **Project planning**
2. **Equipment acquisition**
3. **Photopoint monitoring**
4. **Photo archiving**
5. **Repeat monitoring**

It is essential that all stages are implemented to ensure that the photopoint standard is maintained and that the project goals and objectives are achieved.

Project Planning

There is no guarantee that photopoint monitoring will produce useful data for every kind of restoration or management project. In the planning phase consideration should be given to:

- the aims of the project,
- the management actions to be conducted,
- relevant indicators and other supporting monitoring techniques, *(see Appendix 1)*,
- the nature, magnitude, and time frames of the expected change, *(see Appendix 1)*,
- the monitoring frequency, *(see Appendix 1)*,
- the level of confidence in monitoring results required to inform further management, and
- the archiving systems and requirements.

Tips for selecting monitoring sites:

- The location of a photopoint monitoring site should be carefully chosen. Choose an easily recognizable location with minimal access issues. Proximity to a road or track will aid efficiency for future monitoring. Remember to obtain permission to restricted areas or private land.
- Avoid steep slopes, where possible, as this can make photo consistency more difficult and complicate interpretation.
- The photo view needs to illustrate a distinct feature that you want to monitor, e.g. a boundary between grazed and un-grazed vegetation, an area subject to weed control, or the growth of revegetation or plants regenerating. Choose a location which will clearly capture the feature you want to monitor. The more specific the photo, the easier it will be to interpret the sequence of photos.
- The view through the camera to the central focus point needs to be uncluttered. Anticipate things like plant growth which may obscure views in future monitoring.
- The photos need to be representative of the site and maximize subject matter in the field of view.

How to select monitoring frequency:

Photos can be taken at different time intervals depending on the changes expected at the site. Baseline photos should be taken to capture the site before management actions are implemented or environmental changes are expected e.g. revegetation or weed control, before an area is opened up for recreation

Following the baseline photos, timeframes for further comparison may be:

- **Short:** before and after. This will help capture short events such as implementation of management actions.
- **Medium:** very 6 – 12 months, when a site is changing quite rapidly or a lot of visible work is being carried out.
- **Long:** every year to few years, when more subtle changes are occurring.

The frequency of monitoring may change over time as management actions or condition improvement/decline on the site. For example, photos may be taken frequently as management works are implemented, and then drop to a medium and then long timeframe as management actions slow or cease and the environment responds over time.

Additionally, photos can be taken at any point in time, of anything of interest occurring on the site, e.g. a new species occurs at the site.

Above: Photopoint monitoring series of regeneration after a fire.

Equipment

For each monitoring point you will need:

- 2 steel or aluminum posts/star dropper (with protectors), approx 1.8m long, per photopoint site.
- Hammer or post driver for driving in star droppers
- Tape measure (up to 50m)
- Coloured flagging tape (optional)
- Camera
- GPS
- Map or aerial photo of the site/location
- Aluminium tags and soft tie-wire or cable ties (or other means of identifying the photopoint position)
- Field Data Sheet
- Data Board
- Marker pen
- Clipboard

Conducting photopoint monitoring

At your chosen site, fix a 'camera post' and 'sighter post' firmly into the ground so they are difficult to remove. If vandalism is likely to be a problem, marker pegs can be placed at the base of each post to mark their location in a less conspicuous manner.

- The 'camera post' is where the photos will be taken from and should have approximately the eye height of the average person (1.5m) remaining above the ground). An identification tag should be permanently tied to the 'camera post'. An identical tag can also be attached to a marker peg on the ground if vandalism is a problem.
- The 'sighter post' is approximately 10m away from the 'camera post' in the direction that you want to take the photo *(Fig. 1a).* Place the Data Board in the field of view, with the site identification and relevant monitoring information visible, e.g. date, time etc. The writing on the Data Board needs to be large enough to be visible.
- Hold the camera on the 'camera post', facing the 'sighter post', and focus the centre of view on the top of the 'sighter post' *(Fig. 1b).*

Fill in the Photopoint Field Data Sheet, making sure it corresponds with the information on the Data Board. When taking the compass bearing of the 'sighter post', be careful to keep the compass away from the metal star dropper as this can influence the reading. Take two steps back and line up both droppers before taking the reading.

Ideally use the same type of camera with the same settings each time. A good choice is a SLR camera with 50mm lens. The 'auto' setting allows for ease of use and consistency, but if you use manual settings remember to record them. Zoom should not be used as it changes the width of the field of view. Turn on date stamping features on the camera if available and unlikely to obscure important elements of the picture (see *Hints and Tips* for more).

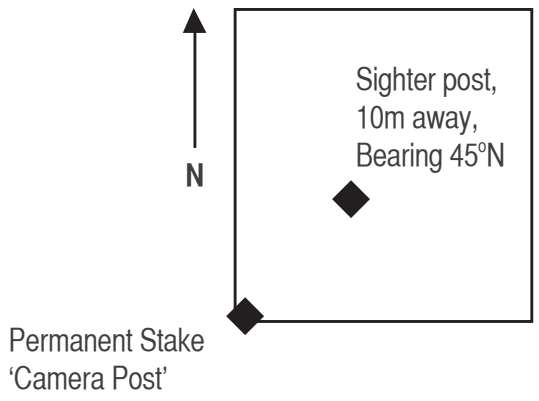


Figure 1: *Example of Photopoint set up - aerial view*

Source: Pedler et al, 2007

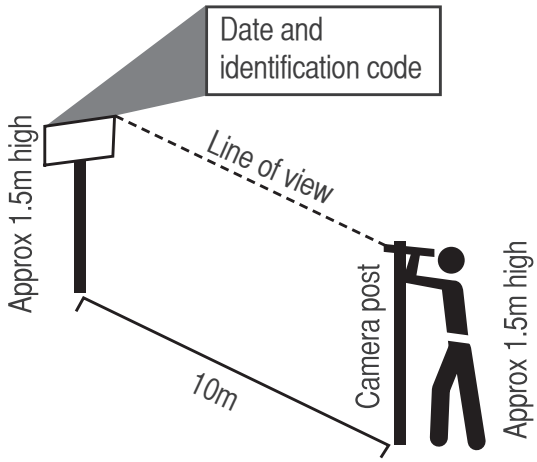


Figure 2: *Example of Photopoint set up - side view*

Source: Friends of Sturt Gorge, 2010

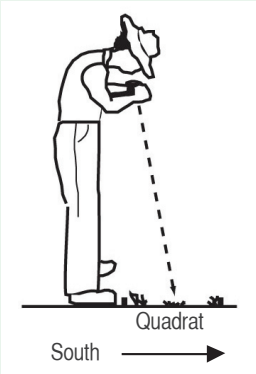
Photo Archiving

At the time of taking the photo it is important to collect supporting data to support the interpretation of the image and enhance the value of the monitoring effort. The more complete the supporting information the more you will be able to assess the environmental change and, if relevant, the impacts of management actions. See the *'Photopoint Field Data Sheet'* template for essential information fields.

When downloading photos, clearly label each photograph with the site ID, site no. and date. Filing photos and corresponding field data sheet either electronically or in hard copy a folder system will help accessibility and efficiency in the future.

There is no substitute for reliable monitoring to help determine the success or failure of management action

ADDITIONAL PHOTO MONITORING TECHNIQUES



Spot photograph

A spot photograph is an image taken looking vertically down on a marked spot or a quadrant from head height *(Fig. 3)*. This is used for recording ground cover, species and organic litter for a standard sized area.

Figure 3: *Spot photograph monitoring*

Source: Grodecki & van Willing, 2010

Photo Quadrat Monitoring

The purpose of photo quadrat monitoring is to derive more detailed quantitative data, which can be compared between the baseline and subsequent data sets taken at the same location over time. This additional data can also be spatially related to the contents of the photopoint photos over time. Like photopoint monitoring, you must be clear about your objectives when considering photo quadrat monitoring. If the additional data is not needed then time will be wasted. Additionally, the 'site observations' section of the Photopoint Field Data Sheet can be used to collect as much or as little supporting data as the user requires and can fill information gaps to support photopoint photos. *Appendix 1* in this booklet suggests when alternative measurements could be taken to support photopoint monitoring. Photo quadrat monitoring could be used as a method to 'count' where this is indicated.

To undertake photo quadrat monitoring, divide the most distant 5m section of the photopoint into 10 (1m x 1m) quadrats *(see Figure 4)*. Within each quadrat, record the information required, for example mark a point for species present, species height and so on. If revegetation or regeneration survival rates is one of the variables you want to monitor, pegs can be used to mark the seedlings planted or new germinants. If seedlings / germinants are no longer present when your return you could conclude that the plants have died, unless the plants experience prolonged dormancy or the site has been tampered with.

This technique should not be used to assess the condition of vegetation community. The Vegetation Condition Assessment method has been developed for this purpose (http://www.dpiw.tas.gov.au/inter.nsf/WebPages/PWOD-7PM7CH?open).

There are several variations on photopoint monitoring using quadrats, please research the best one for your site. All methods require knowledge about plant species.

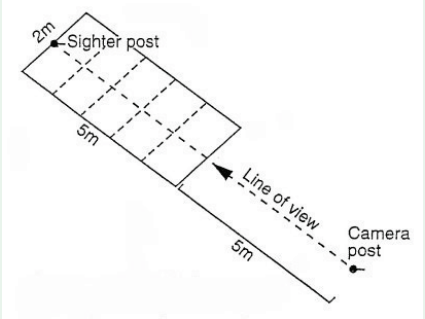


Figure 4: *An example of photo quadrat monitoring for further vegetation monitoring data, aerial view.*

Source: Friends of Sturt Gorge, 2010

HINTS AND TIPS:

- In addition to the fixed photopoint shots, consider taking multiple photos to create a panorama, to help with interpretation of context and subject in the future.
- Do not use a wide angle or telephoto lens as this alters the perspective of the photo and makes it difficult to repeat.
- Minimize sun glare in the photo and try to take photos at the same time of day. Although not always possible, locate photopoint posts north – south, and take the photo facing south with the sun behind you and the sunlight shining on the landscape facing you. This helps prevent glare and avoid direct sun light in the shot.
- Taking photos on a cloudy but bright day can help avoid strong shadows.
- Photos taken between 9am and 3pm will help reduce shadowing and different colour cast which may conceal some features. Auto settings used appropriately for different light levels can help reduce the problems of over exposure. Set the light exposure levels for the monitoring site by excluding the sky. To do this lower the camera and obtain exposure whilst the top of the camera is no higher than the horizon and lock the exposure at that level.
- Photos repeated annually should be taken at the same point in the season.
- Take a copy of the previous or original photo to the site with you and use it to compare with the field of view to ensure consistency.

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Please contact the Biodiversity Coordinator, NRM South

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