

# GUIDELINES FOR MONITORING A BUSHCARE PROJECT



A Component of the Trust's Manual:  
"Aspects of Catchment Health"

## **GUIDELINES FOR MONITORING A BUSHCARE PROJECT**

**Published by the Hawkesbury-Nepean Catchment Management Trust, 2000.**

**Windsor NSW 2756**

**Australia**

We are always seeking comments on the usefulness of this guideline for your project. Please write, phone or email any suggestions for improvement. Please do not extract any parts of this document for your own publications without contacting us first.

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## FOREWORD

The Hawkesbury-Nepean Catchment contains a fascinating variety of bushland. Unfortunately, a large part of it has been damaged through clearing and weed invasion. Our remaining bushland has great value in terms of catchment health. It not only helps regulate water flow and controls erosion, it is an integral part of the catchment's biodiversity. Today, more than ever before, the community is concerned about the health of bushland, and is actively involved in regenerating areas and removing weeds.

These guidelines provide community groups with the means to assess and monitor a bush regeneration site. They also help groups decide what is most useful to measure. The information produced through systematic monitoring will provide opportunities for groups to compare the results across different sites and different approaches to bush regeneration. Monitoring progress can also assist groups in planning their work and demonstrating progress to funding bodies and support organisations.

This is not a manual on how to carry out bush regeneration; it is a resource guide on how to *monitor progress* of the project. It provides a background on how to establish a bush regeneration group, as well as an explanation of a variety of methods for monitoring sites.

This document is ongoing, and the Trust would greatly appreciate any feedback you may wish to provide. Monitoring the progress of bush regeneration in the Hawkesbury-Nepean catchment is of key importance in keeping track of the state of the catchment's vegetation and its health. We hope the guidelines will help standardise the approaches to monitoring. Importantly, we hope the guidelines are widely used.

**Peter Davey**  
**Chief Executive Officer**



# Guideline Summary

## Background

Discusses why assessment and monitoring are important activities for the community to be involved with, and then provides information about the checklists contained in this Guideline.

## The Checklists

This section divides the Checklists into three sub-sections:

“Setting up” activities involve the initial site and project assessment, along with gathering background information from libraries, councils and other sources.

Weed Invasion involves a checklist-directed survey of the site, allocation of scores describing the severity of weed invasion, and mapping weed distribution.

Monitoring Project Progress involve filling in checklists that assess how effective weed control and replanting activities on the project site have been.

## Getting Started in Community Environmental Monitoring

Briefly introduces how to start designing and planning an environmental assessment and monitoring program, and discusses how data can be used both within the project and beyond the project.

## ***The Page Numbers***

Each section of the CRAM Manual can be identified by its page number, eg.:

*ACH means Aspects of Catchment Health; BCP = BushCare Project; SBH = Sclerophyll Bushland Health; RBH = RiverBank Health; WM = Weed Mapping.*

## ***Symbols used in the Manual***

The following symbols identify important sections in the manual. They will help you to navigate through the manual to locate information relevant to you.



Indicates text describing what you will learn in this section. This symbol usually occurs at the beginning of a section/chapter.



Indicates an important passage in the text for special attention



Occurs at the end of a section to summarise the guideline



Suggests questions to ask yourself/your group prior to assessment



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# Monitoring a Bushcare Project



What you will Learn in this Section:

- Definitions of Catchment Health and Community Environmental Monitoring
- The aims and objectives behind the CRAM Project
- Reasons why the community should be involved in environmental monitoring
- How data gained through community environmental monitoring and the CRAM Manual protocols can be used to help project planning and support community participation in environmental management

These guidelines are designed to assist community groups in both **establishing and monitoring** a 'Bushcare' or bushland regeneration project. Guidelines are not "rules", so your group can use only part of the guidelines, or modify them for your own purposes.

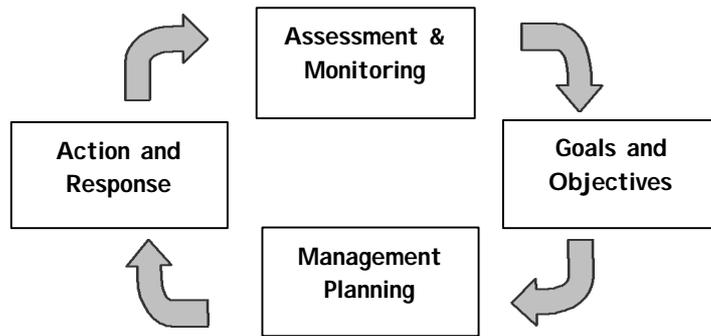
***Our aim is to create a consistent or standard approach to measure environmental change, so data is easier to compare between different times and areas. Groups can use the monitoring checklists to document progress in their project for the purpose of meeting grant requirements, or demonstrating to council, government and the wider community that their project is a success.***



Standardised monitoring creates a database of trustworthy information to transfer to land management agencies, including local government, for environmental decision-making.

## What is Community Environmental Assessment and Monitoring?

Environmental assessment and monitoring are part of an environmental management cycle as shown in Figure 1 below.



**Figure 1.** Flow chart of monitoring as part of the overall environmental management process

✓ In this manual, **assessment** is taken to mean:  
The *initial measurement* of an area, generally of things changing slowly

✓ For **monitoring**, we mean:  
The *regular measurement over time* of an area, generally of things that can change rapidly

## Why get Involved in Community Environmental Monitoring?

There are two main reasons for monitoring the health of our catchment:

1. It lets us know if the natural resources in our environment are declining, stable, or improving
2. It gives us a tool for measuring and improving our environmental management practices

## How Community Groups can Use Monitoring Data

- Collecting baseline environmental information about a site that they are working on - then used to develop site management action plans, eg. for restoration, conservation, weed control, stormwater control, and fire management
- Measuring if environmental objectives are being met by council and other responsible management agencies
- Providing information for reporting to funding bodies (eg. for NHT grants) for legal accountability of taxpayer funds
- Supplying information for councils to modify management practices for better environmental protection, or to address specific issues
- Networking with other groups to share useable data and information
- Raising awareness in the local community and local council about the condition of the local environment

## The Bushcare “Rapid Assessment” Checklists

This rapid assessment method is designed to be an early warning system for bushland health. It is described as “rapid” because it only takes a short amount of your time to complete. A number of checklists are included in this assessment guideline, falling into three main groups.

The Bushcare Project Guidelines are organized into 3 sections:

- 1. Background Information**
- 2. The Assessment & Monitoring Checklists - 3 sub-sections:**
  - a) “Setting up”
  - b) Weed Invasion
  - c) Project Progress
- 3. Getting Started in Community Environmental Monitoring**

The last section describes the process of planning community environmental monitoring programs. If you do not know how to fill out some part of the checklists (eg. full map coordinates), or need help in setting up your group to monitor you should read “**How to plan a CRAM Project**” (ACH p.14) and “**Getting started - Field Methods**” (ACH p.25) sections in the leading **ASPECTS OF CATCHMENT HEALTH** component of the CRAM Manual.

## Why Use Checklists?

***Checklists are standardized data collection forms. If you are carrying out a bush regeneration (bushcare) project, you need to assess the initial condition of the site, and you will need to monitor the changes that take place to see if you are meeting your project objectives.***

### The Bushcare Project “Rapid Assessment” Checklists

The methods are described as “Rapid Assessment” because they only take a few hours to complete. The checklists have not been designed for use by professional biologists – although professional biologists/ecologists have worked to design them. Community groups, interested individuals, students, landholders, and government/management agency staff can all readily use CRAM methods to learn more about their local environment.

Checklists in the Guidelines for Monitoring a Bushcare Project are arranged in three groups:

<b>Group 1 ‘Setting Up’ Checklists</b>	<ul style="list-style-type: none"> <li>• Drawing a Site Map (p.5)</li> <li>• Checklist 1: Bushcare Site Description (p.7)</li> <li>• Checklist 2: Most Common Plant Species (p.9)</li> <li>• Checklist 3: Plant Species List(p.10)</li> <li>• Checklist 4: Photo Points (p.12)</li> <li>• Quadrat maps (p.14)</li> </ul>
<b>Group 2 Weed Invasion Mapping</b>	<ul style="list-style-type: none"> <li>• Weed Invasion Mapping (p 16)</li> <li>• Checklist 5: Causes of Weed Invasion (p. 18)</li> </ul>
<b>Group 3 Monitoring Project Progress</b>	<ul style="list-style-type: none"> <li>• Checklist 6: Seedling Germination (p.19)</li> <li>• Checklist 7: Plant Response to Weed Control (p.21)</li> <li>• Checklist 8: Survival Rates of Planting (p.23)</li> </ul>

Not all the checklists may be appropriate to your particular project and the stage at which you are in the life of your project. **Choose what is relevant for your present and future information needs.**

You may also wish to use checklists in other guidelines of the Hawkesbury-Nepean Catchment Management Trust’s Community Rapid Assessment and Monitoring (CRAM) Manual, especially those in **Guidelines for Assessing and Monitoring the Health of Sclerophyll Bushland** to assess how health changes over time at your site.

Details about all the checklists, and the indicators they measure, are summarized in **Table 2 of ASPECTS OF CATCHMENT HEALTH** (ACH p.10).

# “Setting Up” Activities and Checklists

## Collect Background Site Information

Before you start a bushcare project, you need to collect some General Background Information (see Table 1) and Baseline Information (Table 2) about your site, which all goes into completing **Checklist 1: Bushcare Site Description**.

Consult published and unpublished material in your local library (eg. topographic maps, known heritage features, known hydrological features such as stormwater drains). Key organisations to contact include local councils, fire brigade, local Catchment Management Committee, Historical Society and/or Progress Associations.

**Table 1. General Background Information** you will need for Checklist 1: Site Description.

Subject	Description/Source
• Locality and land tenure	<i>i.e. ownership</i>
• Area of bushland	<i>in hectares</i>
• Map of bushland	<i>enlarged photocopy of 1:25,000 topographic map</i>
• Sub-catchment class	<i>see Appendix – Map of Hawkesbury-Nepean Catchment area</i>
• Altitude	<i>refer to topographic map</i>
• Aspect	<i>refer to topographic map</i>
• Soils	<i>loamy, sandy, clayey/ DLWC soil landscape unit</i>
• Known hydrology	<i>creeks, springs, stormwater drains</i>
• Past land use	<i>site evidence/local knowledge/council</i>
• Known bushfire history	<i>eg. last 3 fires – date/location/intensity</i>
• Heritage aspects	<i>cultural and natural</i>

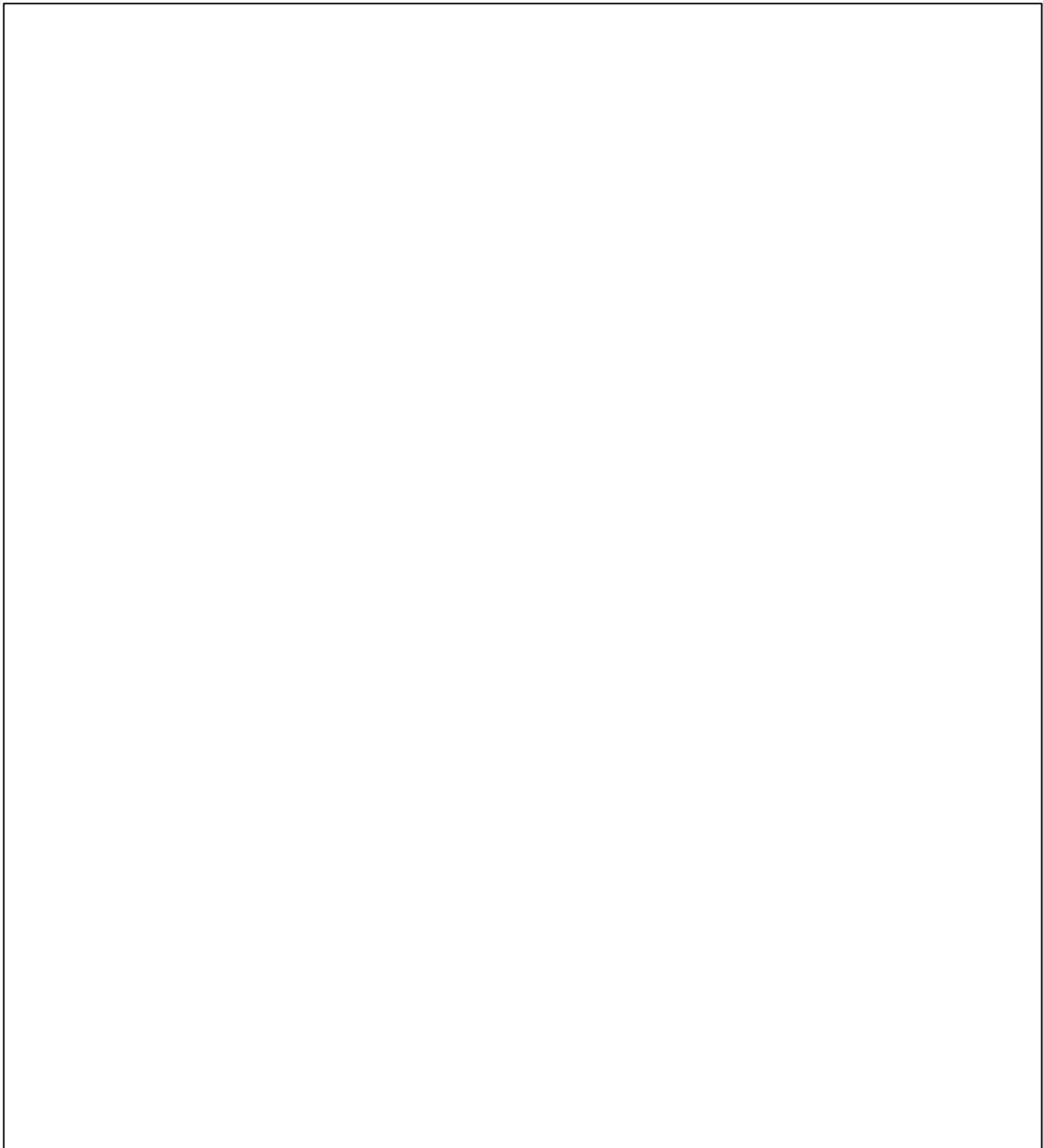
**Table 2. Baseline Information** you will need for Checklist 1: Site Description.

• Date and season	
• Names of assessors	
• Skill level of assessors	
• Location	<i>topographic map reference, street directory grid reference or latitude/longitude</i>
• Map of Site	<i>freehand sketch-map, or enlarged photocopy of topographic map with special features marked in</i>
• Slope	
• Size and shape of bushland	
• Current land use	
• Signs of recent fire	
• Common plants	<i>fire scars and charcoal on tree trunks and bark</i>
• Vegetation structure	<i>3 most common tree and 3 most common shrub species description of vegetation layers present</i>

## Drawing a Map

- Sketch a map of your Bushcare Project site, showing scale, north direction, any major landforms (eg. streams, hills). Use the Grid in **Appendix 5** of the CRAM Manual to measure your site area.
- Draw on your map 'zones' of different vegetation types, eg. sandstone sclerophyll, shale sclerophyll, She-oak communities, wetlands, heathlands, and rainforest.
- Attach your sketch to a photocopy 'blow-up' of the relevant 1:25,000 topographic map, with the Bushcare site marked on it for easy future reference.

### YOUR MAP

A large empty rectangular box with a thin black border, intended for the user to draw a map of their Bushcare Project site. The box is currently blank.

## Checklist 1: Site Description

*The first checklist in this guideline is designed to record the background data and baseline assessment of your site. This checklist is to be used for initial assessment of your site, and is not a monitoring checklist. This assessment checklist should be attached to a site map along with a species list of native plants and exotic weeds on the site.*

### How to Use the “Setting Up” Checklists

- Record the information and circle/tick appropriate answers as prompted by the checklists.
- Using topographic maps, and how to read map coordinates, is explained in **ASPECTS OF CATCHMENT HEALTH: Getting started - Field Methods** (ACH p.25)
- The 3 soil types (sandy, loamy, clayey) are defined in the CRAM Manual **Glossary**. Aspect records the predominant compass bearing in which your site slopes downwards. You may provide an *estimate* of the aspect. The actual slope (degrees) can be measured by an inclinometer or by a protractor and plumb bob.
- Assess your 'knowledge level' to register a degree of data quality assurance. Include experience and any bushcare/training/qualifications you may have.
- Area estimation - a hectare (2.47 acres) is 10,000 square metres or a 100 x 100 metre square. Use the Grid in **Appendix 5** of the CRAM Manual to measure your site area.

## Checklist 1: Bushcare Site Description

(Write in response or circle or tick appropriate answer)

Site name:	Date:	Season:	Site location (eg street directory):		
1:25,000 Map Name:	Year published:	Sheet number: _____	Zone: __	Easting: _____	Northing: _____
Comments:	Geology: Sandstone Shale Basalt Limestone Granite Other:		Aspect: N NE E SE S SW W NW		
	Soils: Sandy Loamy Clayey Alluvial Other:		flat valley bottom ridgetop various		
Predominant slope (degrees):	Assessor's Name:	Knowledge level of assessor: low medium high			
Map attached: Sketch map Photocopy of 1:25,000 topographic map					
Area of remnant (ha):		Sub-catchment of Hawkesbury Nepean:			
Altitude of site (metres)		DLWC soil landscape unit (if known):			
Past land use (if known)		Fire history – last 3 fires and intensity:			
Current land use:		Next planned hazard reduction burn:			
Tick the layers of vegetation you have present: Tree canopy Tree subcanopy Shrub Groundcover		Are there signs of recent fire (eg charcoal on tree trunks):			
Tick what you assess as threats to the area: Major weed source nearby Urban/ rural development upslope Headwaters open to weed introduction (eg roads)					
Known hydrology (creeks, springs, seeps, stormwater drains, pools, hanging swamps, wetlands (also indicate on map):					
<b>Vegetation structure (tick appropriate structural type)</b>					
<b>Growth form of the tallest layer</b>	<b>Foliage cover of the tallest layer (ignore isolated emergents)</b>				
	>70%	30-70%	10-30%	<10%	
<i>Tall trees (&gt;30 metres)</i>	<i>Tall closed forest</i>	<i>Tall open forest</i>	<i>Tall woodland</i>		
<i>Medium trees (10-30 metres)</i>	<i>Closed forest</i>	<i>Open forest</i>	<i>Woodland</i>	<i>Open woodland</i>	
<i>Low trees (&lt;10 metres)</i>	<i>Low closed forest</i>	<i>Low open forest</i>	<i>Low woodland</i>	<i>Low open woodland</i>	
<i>Tall shrubs (&gt;2 metres)</i>	<i>Closed scrub</i>	<i>Open scrub</i>	<i>Tall shrubland</i>	<i>Tall open shrubland</i>	
<i>Low shrubs (&lt;2 metres)</i>	<i>Closed heath</i>	<i>Open heath</i>	<i>Low shrubland</i>	<i>Low open shrubland</i>	
<i>Hummock grasses</i>	-	-	<i>Hummock grassland</i>	-	
<i>Tussocky grasses and grass-like plants</i>	<i>Closed tussock grassland or closed sedgeland</i>	<i>Tussock grassland or sedgeland</i>	<i>Open tussock grassland</i>	<i>Sparse open tussock grassland</i>	
<i>Other herbaceous plants</i>	<i>Dense sown pasture</i>	<i>Sown pasture</i>	<i>Open herbfield</i>	<i>Sparse open herbfield</i>	

## Checklist 2: Most Common Species

- Record **only** the 3 dominant trees and 3 dominant shrubs at your site in Checklist 2: Most Common Plant Species.
- DLWC soil landscape maps are available at university libraries, many public libraries, and the Hawkesbury Nepean Catchment Management Trust library.
- Fire history and planned hazard reduction burns can be gained from your local fire brigade and possibly NPWS.
- Determining how many layers are present in your vegetation and determining the vegetation structural type are explained in Methods for Vegetation Assessment and Monitoring in **ASPECTS OF CATCHMENT HEALTH** (ACH p.36)

**NB.** You will need to survey several sites if your bushcare project area is a large reserve or large area of bush. **Complete a separate checklist for each site.**

## Checklist 3: Species List Checklist

- Complete the full species list in Checklist 3: Plant Species List.
- This will give you an indication of how diverse the plant species are at your site, and allow you to distinguish between numbers of native versus exotic plant species.

**NB.** You will need to survey several sites if your bushcare project area is a large reserve or large area of bush. **Complete a separate plant species list for each site.**

## Checklist 3: Most Common Plant Species

Site name:	Site location: (eg street directory):		
1:25,000 Topographic Map Name:	Year published:	Sheet number: _____	Zone: __ Easting: _____ Northing: _____
<b>Geology:</b> Sandstone Shale Basalt Limestone Granite Other:		<b>Aspect:</b> N NE E SE S SW W NW	
<b>Soils:</b> Sandy Loamy Clayey Alluvial Other:		flat valley bottom ridge-top various	

### Native Species

#### 1. Canopy: 3 Most Common Species

#### Other Canopy Species (Optional)

1.	1.	4.	7.
2.	2.	5.	8.
3.	3.	6.	9.

#### 2. Subcanopy: 3 Most Common Species

#### Other Subcanopy Species (Optional)

1.	1.	4.	7.
2.	2.	5.	8.
3.	3.	6.	9.

#### 2. Shrub Layer: 3 Most Common Species

#### Other Shrub Layer Species (Optional)

1.	1.	4.	7.
2.	2.	5.	8.
3.	3.	6.	9.

#### 1. Groundcover: 3 Most Common Species

#### Other Groundcover Species (Optional)

1.	1.	4.	7.
2.	2.	5.	8.
3.	3.	6.	9.

### Exotic Species

#### 1. Canopy

#### 2. Subcanopy

#### 3. Shrub Layer

#### 3. Groundcover

1.		1.	1.
2.		2.	2.
3.		3.	3.
4.			

Note: **Groundcover** can be grasses, sedges, ferns, vines on ground (eg *Smilax*), prostrate or decumbent small shrubs (< 1 metre) and broad-leaved herbs

## Checklist 3: Plant Species List

Site Name: \_\_\_\_\_

Date: \_\_\_\_\_

Species Number	Species name	Species number	Species name
1		31	
2		32	
3		33	
4		34	
5		35	
6		36	
7		37	
8		38	
9		39	
10		40	
11		41	
12		42	
13		43	
14		44	
15		45	
16		46	
17		47	
18		48	
19		49	
20		50	
21		51	
22		52	
23		53	
24		54	
25		55	
26		56	
27		57	
28		58	
29		59	
30		<b>No. Native Species</b>	

**Exotics**

Species number	Species name
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
<b>No. Exotic Species</b>	

## Checklist 4: Photo Points

*This checklist helps you to record the point from which you take regular photos of your site, transect or quadrat, so that you can keep visual records of your progress over time. The purpose is to ensure you take the photo from the same point in the same direction using the same equipment.*

### How to Use the Photo Points Checklist

- Record the information and circle/tick appropriate answers as prompted by the checklists.
- Using topographic maps, and how to read map coordinates, is explained in Map Methods **ASPECTS OF CATCHMENT HEALTH: Getting started - Field Methods** (ACH p.31)
- The 3 soil types (sandy, loamy, clayey) are defined in the CRAM Manual **Glossary**.
- Aspect records the predominant compass bearing in which your site slopes downwards. The actual slope (degrees) can be measured by an inclinometer or by a protractor and plumb bob.
- The checklist is a way for recording photos of transects, quadrats or general views of your bushcare site. It is important to use the same camera and lens over time to take the photos (and preferably the same film type) to ensure photos cover the same area and are of the same quality.
- Using an identifying feature or a marker, such as a stake, is a good way to ensure the photo is taken from the same spot. A significant permanent feature readily seen in the photo (eg. a rock) may serve the same purpose.
- Preferably use a tripod and take the photo from the same height each time.
- A useful way to make sure you are in the same location is to take a copy of the previous photo along and line up the landscape image with that in the viewfinder. You will need a compass to obtain your bearings in degrees (from 0 to 360).
- Make up a small sign with the photo point number, date and direction of photo on it and include it in the shot. This can pay off later in identifying which photo belongs to what date.

## Checklist 4: Photo Points

<b>Site name:</b>	<b>Site location:</b> (eg street directory):				
<b>1:25,000 Topographic Map Name:</b>	<b>Year published:</b>	<b>Sheet number:</b> _____	<b>Zone:</b> __	<b>Easting:</b> _____	<b>Northing:</b> _____
<b>Geology:</b> Sandstone Shale Basalt Limestone Granite Other:				<b>Aspect:</b> N NE E SE S SW W NW	
<b>Soils:</b> Sandy Loamy Clayey Alluvial Other:				flat valley bottom ridge-top various	
<b>Comments:</b>					

<b>Camera Type:</b>	<b>Focal Length:</b>	<b>Film Type:</b>
---------------------	----------------------	-------------------

Photo point No.	Date and time	Transect/ quadrat/ or general view	Photo No.	Bearing	Description of photo	Identifying features	Assessor

## Quadrat Mapping

### Example of a Completed 1 x 1 metre Quadrat Map (eg. Seedling Germination)

**Site:** Bean Reserve, Gardensuburb

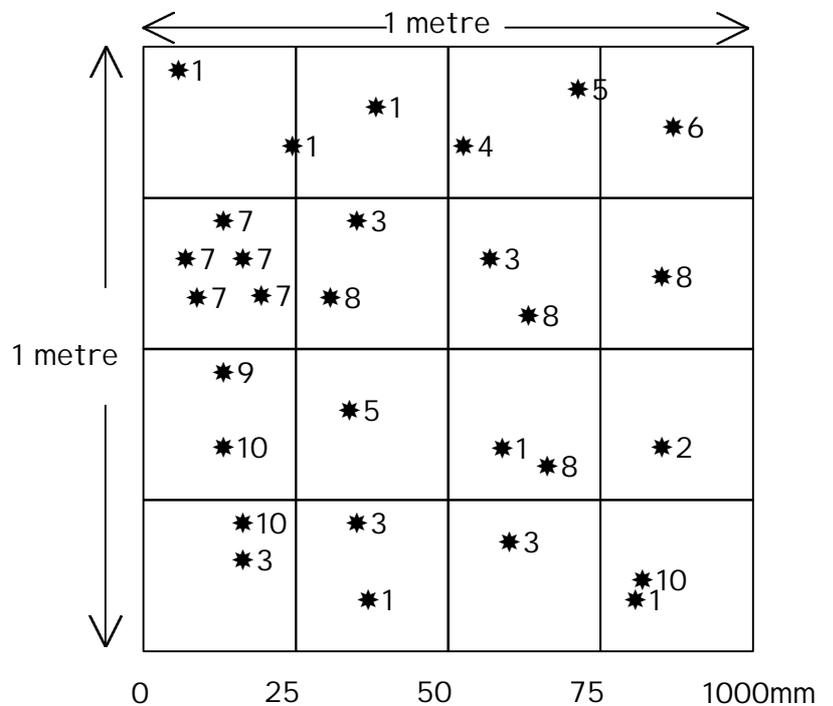
**Quadrat No:** 23

**Quadrat Location:** Enter reserve by main access track off Pea RD. Walk about 150 metres along main track until you reach the really big gum tree on the left, about 20 metres before the small bridge. Turn left into the bush and walk about 15 metres. The quadrat pegs (painted white) should be right in front of you.

**What's being monitored?** Seedling regrowth and growth rate of the *Eucalyptus pilularis*. \_\_\_

#### **LEGEND**

- 1 *Microlaena stipoides*
- 2 *Lomandra longifolia*
- 3 *Eucalyptus pilularis*
- 4 Wandering Jew
- 5 Unknown species 1
- 6 *Dodonaea sp.*
- 7 Unknown species 2
- 8 Unknown species 3  
etc



**Notes:** This example shows a plot of individuals of ten different species within a quadrat

**NB:** This form is included here only as a tool that may prove useful in some circumstances. Groups should not feel that they 'have' to use quadrats for seedling germination assessment. It may be that they gain all the information they seek (for far less work) by walking around an area subject to treatment (eg fire, weed treatment of *Tradescantia*) and recording what native plants are establishing.

✓ How to set up and use quadrats is detailed in **ASPECTS OF CATCHMENT HEALTH Getting started - Field Methods (ACH p.39) using Transects and Quadrats**

# Quadrat Map Form

Site: \_\_\_\_\_

Quadrat No: \_\_\_\_\_

Quadrat Location: \_\_\_\_\_

---

---

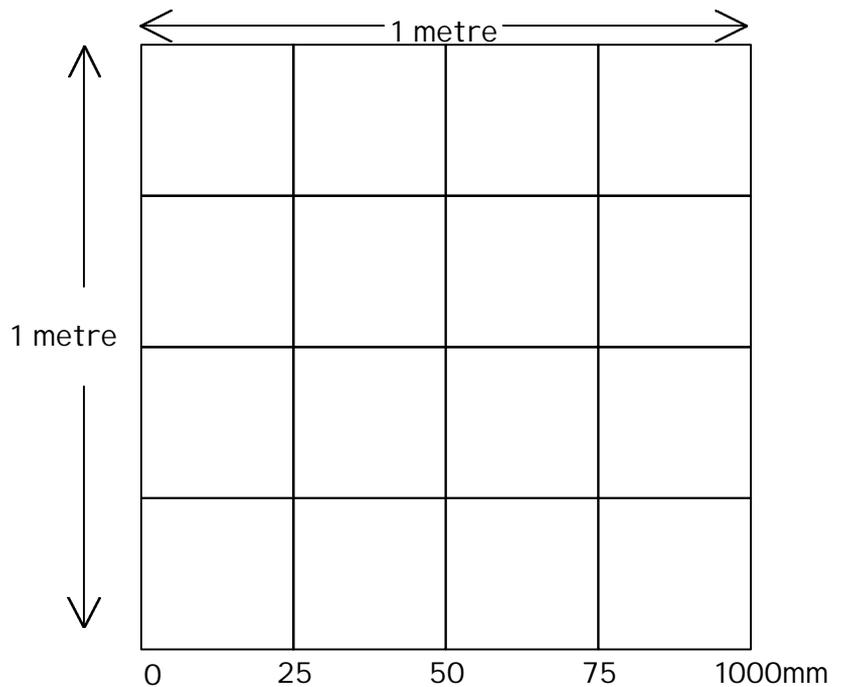
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What is being monitored? \_\_\_\_\_

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## LEGEND



Notes:

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## Weed Invasion Mapping

*This Checklist enables you to report on the type and extent of weed invasion, and highlights the main reasons for weed invasion at that site. Dividing your site up into a number of different "management zones" based on the level of weed invasion allows you to identify priority areas for management activities such as weed control.*

### Weed Invasion Mapping

"Weed Invasion Mapping" has been modified from the National Trust method for assessing the condition of bushland/bushland resilience. This will show the density of weeds in bushland, along with mapping their location so we can see changes over time as we manage the site.

#### How to map weed invasion

Walk the site to gain an overall view of where the weeds are. You will notice that some areas are more weed invaded than others. Areas can be coloured to match overall weed density, which will show problem areas. The site map that you drew can be used to record this information or alternatively you can use a separate map.

#### Condition of bushland/bush resilience mapping-colour coded

This mapping system is a quick method of assessment, which condenses information to produce four zones. These are largely aligned to overall weed density with each level indicative of the level of disturbance and the amount of intervention required to restore the vegetation. This method also takes into account areas degraded by over use but with no weed present.

COLOUR CODE	CONDITION OF BUSHLAND	DESCRIPTION	INTERVENTION REQUIRED
Green	Good	Virtually weed free Healthy native community	<b>MINIMAL</b> (Prevention of further impact; removal of possible scattered weeds)
Blue	Fair	Minor infestation of weed Natives dominate the site	<b>LOW</b> (Requires removal of impact e.g. overuse and of low levels of weed invasion).
Orange	Poor	Severely infested; Regeneration of native species being suppressed	<b>MEDIUM</b> (Removal of impact required; removal of weed; additional "kickstart" to promote natural regeneration eg fire, physical disturbance).
Red	Very Poor	Bushland replaced by exotic species OR Only mature specimens of highest stratum remain-no seedlings or saplings due to infestations of understorey with exotics	<b>MEDIUM OR HIGH</b> (Ability of system to recover is lost or seriously limited; definitely needs a "kickstart" or may need reconstruction to approximate the original system).

Areas on the map are coloured according to this coding.

Where weeds are present, the causes of weed invasion can be determined and marked on the map.

The Weed map is accompanied by another form to record names and descriptions of weed species found in your site. This will help you plan weed management strategies based on the biology/ecology of all the species present.

## Monitoring Checklist 5: Causes of weed invasion

### List the cause of weed invasion

Note the major cause of weed infestation if evident. Causes and symptoms of weed invasion are listed on the checklist. Record the cause of the weed infestations by placing the code (or codes) for the cause of the weeds after the results.

Cause of weed invasion	Symptoms	Tick Box
Physical disturbance of soil (s)	Weeds established on bare soil.	
Imported soil (f)	Weeds established on imported soil containing weeds and nutrients	
Dumped garden refuse (d)	Weeds centred on dumped garden refuse	
Physical disturbance of vegetation (v)	Evident that mowing or trampling has allowed weed growth	
Impacts from storm water (r)	Growing in wet areas below stormwater outlets	
Bird/ animal/ dispersion (o)	Weeds established in otherwise undisturbed area	
Wind (w)	Weeds in otherwise undisturbed area but animals not cause	
Water (a)	Weeds centred on creek where weeds present in headwaters	
Neighbouring property (n)	Weeds spreading from neighbour's boundary	
Total number of exotic and environmental weeds in the zone =	Causes of invasion (codes)	

### Map the cause of weed invasion

The final step is to note the major causes of weed infestation on your weed map. Causes and symptoms of weed invasion are listed on the checklist. Record the location of the cause of the weed infestations by placing the allocated code (or codes) where you think that they occur.



# Monitoring Project Progress

## Checklist 7: Seedling Germination

*This checklist is used to monitor the number of species, their abundance and the number of each species of seedlings germinating in a quadrat after regeneration treatment - eg. after you have piled and burnt weeds, or destroyed groundcover weeds (eg. sprayed Wandering Jew). Information collected can measure the effectiveness of remediation treatments. The indicators in the checklist show which native and exotic species germinate, their level of abundance, and how they vary over time.*

- ✓ This checklist will cease to be useful once plants are established and past the seedling stage.

### How to Use the Seedling Germination Checklist

- Record the information and circle/tick appropriate answers as prompted by the checklists.
- Using topographic maps, and how to read map coordinates, is explained in Map Methods **ASPECTS OF CATCHMENT HEALTH: Getting started - Field Methods** (ACH p.31)
- The 3 soil types (sandy, loamy, clayey) are defined in the CRAM Manual Glossary.
- Aspect records the predominant compass bearing in which your site slopes downwards. Circle the correct aspect description of your site. The actual slope (degrees) can be measured by an inclinometer or by a protractor and plumb bob.
- Record your own assessment of your 'knowledge level' to keep track of experience and personal development.
- Count the number of individual plants of each species in the quadrat (normally a 1 × 1 metre quadrat) over time. See **ASPECTS OF CATCHMENT HEALTH: Getting started - Field Methods** (ACH p.39) for information and directions for quadrat methods.

## Checklist 7: Seedling Germination

Site name:			Site location (eg street directory):				
1:25,000 Map Name:		Year published:	Sheet number: _ _ _ _	Zone: _ _	Easting: _ _ _ _ _ _	Northing: _ _ _ _ _ _	
Quadrat number & size:	Geology: Sandstone Shale Basalt Limestone Granite Other:				Aspect: N NE E SE S SW W NW		
	Soils: Sandy Loamy Clayey Alluvial Other:				flat valley bottom ridge-top various		
Treatment of site to cause germination (eg fire):			Comment on weather conditions at time or initial treatment:			Knowledge level of assessor: low medium high	

Species Number	Species Name	Date:		Date:		Date:	
		No. of plants	Assessor	No. of plants	Assessor	No. of plants	Assessor
1							
2							
3							
4							
5							
6							
7							
8							

## Checklist 8: Plant Response to Weed Control

***The checklist is designed specifically to monitor weed plant response to a particular weed control technique over time at a particular spot (ie. in a quadrat). This is a quite different checklist from that for monitoring the overall weed zones in your site.***

### How to Use the Plant Response to Weed Control Checklist

- Record the information and circle/tick appropriate answers as prompted by the checklists.
- Using topographic maps, and how to read map coordinates, is explained in Map Methods **ASPECTS OF CATCHMENT HEALTH: Getting started - Field Methods** (ACH p.31)
- The 3 soil types (sandy, loamy, clayey) are defined in the CRAM Manual Glossary.
- Aspect records the predominant compass bearing in which your site slopes downwards. Circle the correct aspect description of your site. The actual slope (degrees) can be measured by an inclinometer or by a protractor and plumb bob.
- Record the response for particular weed control treatment types, whether it be physical removal, slashing, fire or herbicide application.
- Under 'response', depending on the treatment, list *quantifiable* data (eg. actual numbers of weeds killed) and any noteworthy *qualitative* observations (eg. leaves yellowing).
- Under 'comments' you may wish to note any special circumstances that may have affected the response (eg. drought, storm, and overcast weather for light sensitive herbicides).

✓ Information about Weed Control Techniques is presented in Table 4 (BCP p.28) of this guideline.

## Checklist8: Plant Response to Weed Control

Site name:		Site location (eg street directory):				
1:25,000 Map Name:		Year published:	Sheet number: _____	Zone: __	Easting: _____ Northing: _____	
Quadrat number & size:		Geology: Sandstone Shale Basalt Limestone Granite Other:			Aspect: N NE E SE S SW W NW	
		Soils: Sandy Loamy Clayey Alluvial Other:			flat valley bottom ridge-top various	
Initial treatment date and time of day:		Treatment type:	Weather conditions:	Degree of shade (low, medium, high):	Herbicide application and rate (if applicable):	

Date Monitored	Species No.	Weed Species Name	Assessor	Response	Comments (eg weather or other factors that may influence response)
	1				
	2				
	3				
	4				
	5				
	6				

Date Monitored	Species No.	Weed Species Name	Assessor	Response	Comments (eg weather or other factors that may influence response)
	1				
	2				
	3				
	4				
	5				
	6				

## Checklist 9: Survival Rates of Plantings

***This checklist is designed to monitor the plantings made on a site.***

### How to Use the Survival Rates of Plantings Checklist

- Record the information and circle/tick appropriate answers as prompted by the checklists.
- Using topographic maps, and how to read map coordinates, is explained in Map Methods **ASPECTS OF CATCHMENT HEALTH: Getting started - Field Methods** (ACH p.31)
- The 3 soil types (sandy, loamy, clayey) are defined in the CRAM Manual Glossary.
- Aspect records the predominant compass bearing in which your site slopes downwards. Circle the correct aspect description of your site. The actual slope (degrees) can be measured by an inclinometer or by a protractor and plumb bob.
- Record your own assessment of your 'knowledge level' to keep track of experience and personal development. See **ASPECTS OF CATCHMENT HEALTH: Getting started - Field Methods** (ACH p.27) section on **Quality Control of your Data**.
- The major cause of death in plantings is generally due to root problems, either from being *root bound*, insufficiently developed roots, or from suffering *root rot*. Pull out dead plants and examine the roots for rot or lack of growth (ie. may still be in a root ball from the pot).
- The spacing of plantings is another factor that can lead to planting failure. Planting too close together can cause death from strong competition. Planting too far apart can allow excessive weed growth.
- Each of the two main boxes asks you to record observations over time in a quadrat, for a **particular species** planted on a **particular date**. If more than 2 species have been planted out in a quadrat then you will need to use more than one copy of the checklist answer sheet.
- The checklist allows you to record the total number of dead plants. The number due to root problems, and the number due to other causes. It is a tool to measure planting strategy success.

## Checklist 9: Survival Rates of Plantings

Site name:	Site location (eg street directory):		
1:25,000 Map Name:	Year published:	Sheet number:_____	Zone: __ Easting:_____ Northing: _____
Quadrat number & size:	Geology: Sandstone Shale Basalt Limestone Granite Other:	Aspect: N NE E SE S SW W NW	
	Soils: Sandy Loamy Clayey Alluvial Other:	flat valley bottom ridge-top various	
Comments (eg weather, special circumstances):		Knowledge level of assessor: Low Medium High	

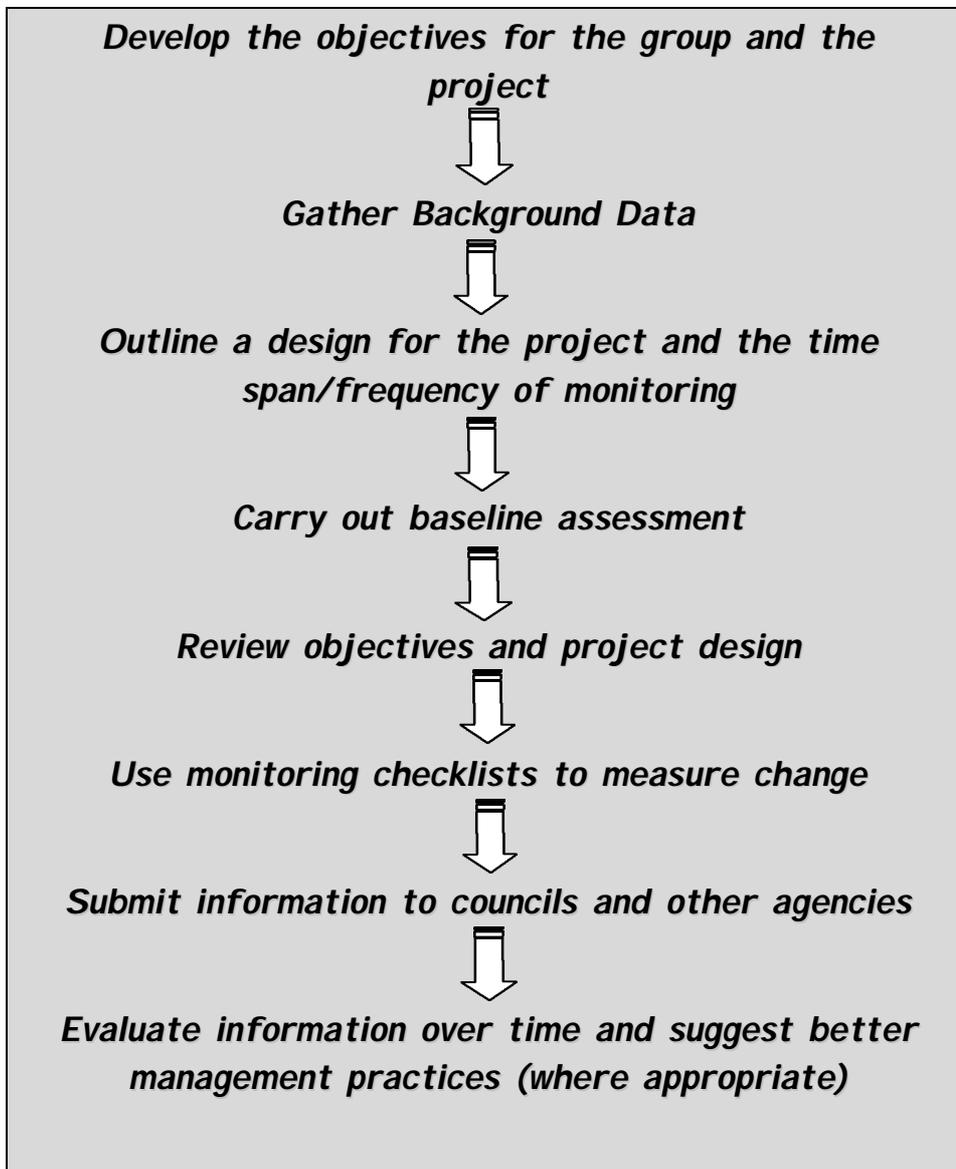
<b>Species 1:</b>							Plant Spacing (cm):				
<i>Date planted:</i>				<i>Initial Number planted:</i>			Planted by:				
Date	Number of dead plants	Number dead due to root problems	Number dead due to other causes (list cause)	Date	Number of dead plants	Number dead due to root problems	Number dead due to other causes (list cause)	Date	Initial	Number dead due to root problems	Number dead due to other causes (list cause)

<b>Species 2:</b>							Plant Spacing (cm):				
<i>Date planted:</i>				<i>Initial Number planted:</i>			Planted by:				
Date	Number of dead plants	Number dead due to root problems	Number dead due to other causes (list cause)	Date	Number of dead plants	Number dead due to root problems	Number dead due to other causes (list cause)	Date	Initial	Number dead due to root problems	Number dead due to other causes (list cause)

# Getting Started on a Bushcare Project

## Planning an Environmental Monitoring Project

There are several steps in the assessment and monitoring of a bushcare project. For more detailed information, please read **"How to Plan a CRAM Project"** (ACH p.14) and **"Getting Started: Field Methods"** (ACH p. 25) in **ASPECTS OF CATCHMENT HEALTH** in the leading section of the **CRAM Manual**. They are extremely important in helping to plan an effective monitoring program for Bushcare projects, and to guide you to follow the necessary steps below:



## Where do you Start?

⑩ The first step to project planning is as simple as writing down a few relevant questions such as:

- What do we want to do and why?
- What permission do we need and from whom?
- What resources are available to the group? How do we access those resources?
- What information already exists? Where do we go for existing information?
- What methods will we use to do our assessment and/or monitoring?
- Where will the data go, and who will collate, manage and interpret the data?
- How will we use the data and do we need help to use it?
- Will the data be useful to others?
- How do we establish contacts with Council/ others to ensure data is used?
- What's going to be the life of this project? Are we going to go on forever or does the group have a short-term objective?

Now you have the basis for determining the objectives of your Bushcare Project!

## Setting Objectives

Based on the questions you have thought of for your site, now re-write the important questions into a format that enables you to measure, or answer, those questions. For example, a Bushcare group may have decided to rid the bush of weeds. The simplest question to ask would be: "Are there any weeds left on the site?".

In reality we know that weeds come back, so they need to set a more **achievable** objective, such as: "Remove 30% of mature weed cover within each six month period". This more specific type of objective provides us with an indicator to measure — in this case the weed cover. The time reference ensures that we have a regular time interval in which to do the monitoring, in this case every six months.

- ✓ To help set objectives, write down all the things you would like to see achieved for your project or for your site, then set a **time frame** that is realistic to achieve the tasks. Accept that objectives will need to be revised and changed over time, as you become more experienced.

## Helpful Resources Available to Community Groups

Community groups must be realistic about what can be achieved with the skills and time available. Some group members may have more time and experience than others. Clearly you need to assign tasks based on an assessment of skills and time. When planning an assessment or monitoring project, it is useful to seek advice and support from a range of organisations that have an interest in the project. Some relevant organisations are listed in **Appendix 1** of Aspects of Catchment Health (ACH p.51).

If you are starting up a **new group** to assess or monitor a certain aspect of the environment, consider discussing your proposal with your local council, existing relevant government bodies, and the Hawkesbury-Nepean Catchment Management Trust. There are many existing community groups, networks and government agencies that can provide an organisational support role. Some of the networks organise valuable workshops providing opportunities to share experience.

## Finding Existing Data and Expertise

Extensive data sets have been collected in the Hawkesbury-Nepean catchment over the years, but there are wide information gaps. Much of the data is reported at different map scales, so detail is often lost at the local scale. The 'references' and 'useful reading' sections of this guideline provide guidance for locating information about the Hawkesbury-Nepean catchment. See **Appendix 3** for discussion on Scale and Scope issues.

**10** Obtaining expert advice and assistance can be a daunting task. Most academics and specialists are quite happy to provide some time and assistance to a community group doing volunteer work, but they will need some key information to know how they can help you.

**Use these questions as a guide when seeking advice from field specialists:**

<p><b>Site description - Environmental condition</b></p> <ul style="list-style-type: none"> <li>• What information is already available? Has a plant list or study been done in your area (eg for a research project, EIS or Development Application)?</li> </ul>
<p><b>List of group's possible objectives</b></p> <ul style="list-style-type: none"> <li>• Outline the kind of expert help your group needs to meet objectives</li> <li>• What do I want from the expert? Most academics have quite specialised fields so it is important to be contacting the <b>right person to get the right answers</b> for your question.</li> <li>• How much can we reasonably expect to ask of an expert in terms of their time and knowledge? Only ask for things that you absolutely need.</li> </ul>
<p><b>Can I get to the expert rather than asking the expert to come to me?</b></p> <ul style="list-style-type: none"> <li>• Remember that experts may be being asked for assistance by many other community groups, so anything you can do to make their task easier will be greatly appreciated. Be well prepared before contacting the experts.</li> </ul>

## Determining Weed Control Techniques

You will need to determine what form of weed control techniques you will use. While this is not a manual on how to carry out bush regeneration techniques, we suggest you consider information in Table 4 (Whyte, 1996; Buchanan, 1989) before you decide on methods.

**Table 4.** Weed Removal Techniques

Weed Removal Technique	Advantages	Disadvantages
Use of hand tools	Minimum disturbance and easy to do anywhere	Time consuming and labour intensive
Mechanical	Quick	Very expensive; non-selective; compacts soil
Mowing	Cheap and relatively quick in the short term	Repetitive and non-selective
Burning	Stimulates native regeneration	Does not kill weeds; produces air pollution
Weed control mats	Suppress weeds and help prevent erosion	Suppresses native vegetation; expensive
Herbicides	Effective	Safety issue
Biological control	Self-sustaining; specific; non-toxic	Research needed
'Bradley' method	Minimum disturbance	Needs skilled operators; not effective for large areas of weed growth

## Using the Checklist Data

Once you have recorded data from assessing and monitoring your site, it will need to be analysed and interpreted to obtain the information you are looking for. Experts who can help in this regard are available in a wide range of organisations including:

- Local natural historians, Bushcare, or other interest groups
- Local council officers
- Royal Botanic Gardens
- National Parks and Wildlife Service
- TAFE bushland management teachers
- Universities

✓ You will need to consider who is collating and managing your data, and Store your data somewhere safe so it doesn't disappear! You also need to avoid the situation where data is collected but never used, because it was never interpreted.

## Why your Data is Valuable

Your data may indicate that a particular change is taking place in your bushland, and you need to publicise your findings. Your data may also lead to the discovery of a rare or threatened plant or animal. If so, you will need to inform the NPWS/ Royal Botanic Gardens. **Information on Threatened and Endangered Species/Communities is presented in Appendix 8 of the CRAM Manual.**

Remember that staff in local government or State government agencies are busy. It is essential that you follow up on your data and provide your interpretation to decision-makers (eg. local councils) in logical and readable formats.

In the light of your assessment, and as you monitor over time, you will need to reassess the objectives of your project, and the methods used, modifying them where appropriate. The changes may be for practical reasons; because your determination of the site's problems have altered; or comments from Council and other parties have highlighted another aspect for consideration.

***The monitoring of a bushcare project is a dynamic process that responds to the data collected, the needs of the group, and the wider community.***

### 🕒 In Summary

- It is important to know the baseline health of a project site so that ongoing monitoring can measure if Bushcare efforts are effective
- Implementing a Monitoring program for a Bushcare project can follow a logical pathway and be relatively quick and easy when using specially designed guidelines and checklists
- Monitoring provides important information for use within the project itself, and for applications outside the project, including exchange with local government and as an educational resource for the greater community

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## Other Useful Reading

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