Monitoring and Evaluating Biodiversity Conservation Projects

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Conserving the nature of WA

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PREFACE

Increasingly, monitoring and evaluation is being recognised by land managers as a valuable tool to directly measure project progress and, more broadly, raise community and landholder awareness and understanding of land management activities. This guide has been developed to assist the planning and implementation of native vegetation management projects. Although primarily for project managers and community groups in south west Western Australia, it may also meet the needs of individual land managers and others within the State and elsewhere in Australia who are involved in vegetation management and other related on-ground works.

Monitoring and evaluation is a necessary part of project management and is the only way that progress towards project objectives can be documented. It is also:

- *the means by which the success of the project is determined (on an activity basis and overall);*
- *the means by which comparisons of effectiveness and efficiency between projects can be made; and*
- *the basis on which to report to funding bodies.*

This guide explains monitoring and evaluation concepts, provides a planning framework and describes monitoring techniques that may be useful within native vegetation management projects.

Chapter 1: *provides an introduction to the key concepts used in monitoring and evaluation.*

Chapter 2: *focuses on the planning process and selecting activities for a monitoring and evaluation program.*

Chapter 3: *provides a selection of monitoring techniques that could be used in a monitoring and evaluation program for native vegetation management projects.*

Chapter 4: *details the process of evaluation to determine the effectiveness of project activities.*

Chapter 5: *draws together some of the important elements and themes from the preceding chapters.*

How to use this Guide

This is not a guide for project development. Rather it is a guide to assist with the design of an appropriate monitoring and evaluation program for your native vegetation management projects.

1. *Starting from scratch. You are just developing a project and need to include monitoring and evaluation into it. Start from* **Chapter 1** *and work in order through to* **Chapter 5**.

2. *You have a funded and implemented project, but need help in choosing monitoring activities.* **Chapter 2** *is necessary reading and* **Chapter 3** *provides a range of monitoring techniques.*

3. *Your project has started and is well planned, but you need more information on the monitoring techniques and recording systems to document progress to your outputs and outcomes. Start at* **Chapter 3**, *check the* **Appendices**, *and review* **Chapters 2** *and* **4** *as necessary.*

A comprehensive list of resources is included in **Appendix I**. *These may be used to support and extend monitoring programs. This guide should be used in conjunction with professional technical advice, as conditions vary in different parts of the State and Australia in general.*

GLOSSARY

Activity: *A task or action that uses specified resources to achieve specific results.*

Data: *Units of information.*

Baseline information: *The first set of information about the indicators collected from a site prior to any works being undertaken. Provides a point from which to measure change.*

Covenant: *An agreement between a covenanting agency and a landholder that protects an area of bushland in perpetuity or for a specified period of time. The covenant is placed on the title of the land, and may be accompanied by management guidelines.*

Edge effects: *Increased or decreased impacts occurring around the edges of vegetation as a result of external factors. This effect is related to the size and shape of the patch of vegetation.*

Fauna: *Animal species, including invertebrates, birds, mammals, reptiles, amphibians, fish.*

Flora: *Plant life (eg. flowering plants, conifers, algae).*

Goal: *What the project is working towards.*

Habitat: *The combination of soil, water and vegetation that makes up the living requirements of a particular individual or group of species.*

Inputs: *The material and human resources used in a project to achieve specific results.*

Issues: *Things that people are concerned about. Derived from people's perceptions or from factual information.*

Objective: *The intended impact or change to be made by a project.*

On-ground: *The observable, physical activities undertaken to rehabilitate, revegetate or restore the environment (e.g. fencing, weeding, planting).*

Outcome: *The physical, biological or social consequences of a project's activities, e.g. as a result of the project, 5 hectares of bushland were protected from grazing enabling regeneration of the site.*

Output: *A measurement of the level of activity being undertaken in a project. For example, the output of a project might be the number of kilometres of fencing erected.*

Output measure: *A measure of the activities completed or products made during a project (the outputs).*

Performance indicator: *A measurement to determine whether the project outcomes meet project objectives. It should measure those achievements that are a direct result of the project's effort.*

Plant density: *Number of plants growing in a defined area. Generally measured as plants per hectare in broad-acre situations.*

Plant survival rate: *Number of plants surviving after a period of time, expressed as a percentage of the original number planted.*

Quadrat: *Square or rectangular (or sometimes circular) areas of a particular size used to assess areas of vegetation.*

Qualitative information: *Intangible measurements of value arising from people's general observations, perceptions, insights and attitudes. Cannot easily be summarised in figures (e.g. the skill level within the community for revegetation activities).*

Quantitative information: *Tangible measurements of area, length or amount. Usually expressed with numbers (e.g. number of covenants established).*

Remnant vegetation: *A patch or area of native vegetation, that is variable in size, but remains relatively intact within a largely cleared or disturbed landscape..*

Regeneration: *Facilitating the rehabilitation and re-establishment of native vegetation by encouraging processes of natural colonisation. Methods include disturbance (either fire or mechanical), weed removal or providing better conditions for seeds to germinate and successfully establish (e.g. restoring the natural fire regime).*

Rehabilitation: *Repairing or re-establishing key elements or aspects of an original ecological community (e.g. wildlife habitat values, an important native plant species, soil structure).*

Revegetation: *Undertaking direct seeding, planting or regeneration to re-establish vegetation at a site. Generally this refers to locally native vegetation.*

Riparian: *The zone or vegetation either side of a creek or river that is directly influenced by the waterway. This includes the bed, banks and adjacent land, as well as the floodplain.*

Theme: *A pattern or common thread that can be seen by looking at all the issues and trends. Themes group sets of issues and trends together and summarises them at a higher level.*

Threatening process: *Any activity, natural or human induced, which threatens or may threaten the survival, abundance or evolutionary development of a native species or ecological community (e.g. inappropriate fire regimes, environmental weed infestation, secondary salinisation).*

Transect: *A straight line of a set length along which plant or animal species, density, vegetation structure and other habitat values can be recorded.*

Trend: *An observed change over time. May be physical, biological, social or economic.*

Vegetation structure: *In natural conditions three layers are generally represented: the canopy or over-storey; under-storey; and ground cover. In some vegetation types (e.g. native grasslands), one or two of these layers may be absent.*

Vision: *The purpose or reason for undertaking a project. This is used to develop objectives for the project.*

Wildlife: *Native plants and animals.*

1. INTRODUCTION

KEY MESSAGES

- **A monitoring and evaluation program is necessary to show progress towards your goals. Funding bodies will ask for this.**
- **Monitoring outputs will help evaluate the project efficiency; monitoring outcomes will help evaluate the effectiveness of the project.**
- **Choosing the right thing to monitor is as important as the quality and quantity of monitoring.**

1.1 What is monitoring and evaluation?

Monitoring is the repeated measurement of a factor or range of factors over time to determine change. Evaluation is the analysis of information gathered by monitoring to determine whether management activities have been effective in achieving the objectives of the project. Evaluation and monitoring must always go together. Monitoring provides the raw information to answer questions about project progress. Evaluation is about analysing that information and drawing conclusions.

Evaluation is where the learning occurs, the questions are answered, the recommendations made and improvements suggested. Yet without monitoring, evaluation would have no foundation, no raw material to work with and be limited to the realm of speculation.

1.2 Benefits of monitoring and evaluation

A monitoring and evaluation program is important for a number of reasons.

1. ***It is an opportunity to build the skills and understanding of the people involved in a project.***

   A monitoring and evaluation program that involves those implementing a project is a way of increasing knowledge and skills about ecosystem process, habitat requirements for particular species, etc. This knowledge may then encourage land holder or community group interest in other aspects of environmental management. Taking the time to evaluate project activities is therefore a valuable investment in both people and the environment.

2. ***It allows project managers to judge the success of a project and whether or not changes are needed.***

   Monitoring and evaluation during the project encourages improvement and is more likely to lead to effective outcomes. However, if monitoring is not started prior to implementation activities (and baseline information gathered), it will not be possible to gauge project progress accurately.

3. ***It provides information for the planning of a new project.***

   The knowledge and skills gained and the lessons learnt by monitoring and evaluating an existing project can guide the planning of a new project. This is particularly true for group activities, where a common understanding of progress, achievements and failings provides an important foundation for future group action.

4. ***It is a means of justifying and promoting a project to the wider community.***

   The information gained through monitoring and evaluating may be used to promote the outcomes of a project to the broader community. More people may then be interested in offering support to and assistance with any future projects.

5. ***It provides documented accountability to funding bodies.***

   Monitoring and evaluation is also important to project participants and investors who are interested in whether or not the project has been implemented properly and its success.

6. ***It may contribute information to broader scale government monitoring and evaluation programs.***

   A well planned and implemented monitoring and evaluation process may generate information that can contribute to a broader understanding of a particular issue, such as the status of a nationally threatened species. In this way, local knowledge can contribute to state, national and international monitoring and evaluation processes, for example, State of the Environment reporting.

The benefits that may be derived from a project will be highest if a monitoring and evaluation program is included from the project's planning phase.

Without monitoring and evaluation, you will never fully know if your project was worthwhile or learn how to improve your techniques. *A monitoring and evaluation program is the best way to improve knowledge about what works, what doesn't and how best to direct your efforts in implementing your project and any future projects.*

In summary, monitoring and evaluation attempts to ask five questions:

1. ***Did we do what we set out to do?***
2. ***Did it work?***
3. ***How did it work?***
4. ***If it didn't work, why not?***
5. ***What will we repeat or do differently next time?***

Monitoring long term changes

1986

The large wandoo in the foreground may have been removed in 1986 on the assumption that it was about to die.

1992

Shrubby* Melaleuca hamulosa *below the wandoo begin to spread.

2000

After 14 years, regeneration has restored the understorey and the wandoo remains alive and has recovered some canopy.

Management decisions can be made with more confidence if all recorded information is available.

Source: Wildelife Notes No. 9 2001 (Photos P. Hussey)

1.3 Key monitoring and evaluation concepts

This section introduces the concepts of monitoring and evaluation and explains how they fit within a project.

1.3.1 What is a project?

A project is a set of tasks or activities designed to address a particular problem or issue. Planning and implementing a project follows a set logic.

1. *Firstly, there is the purpose or reasons for undertaking the project: the* **vision.**
2. *The project's purpose forms the basis for setting* **goals** *and* **objectives**. *The goal is what the project is working towards, while objectives are the specific aims of the project.*
3. *To achieve the project's objectives requires* **inputs**, *such as funding, skills and materials that in turn enable* **actions**.
4. *Actions give rise to* **outputs** *from the project, which should ultimately lead to achieving* outcomes *that meet the stated goals and objectives.*

Table 1 (p. 17) provides two very different project examples and demonstrates how both follow a similar planning logic. Figure 1 (p. 18) illustrates how monitoring and evaluation feeds back into this process.

1.3.2 The participatory process

Projects are about people as much as they are about activities. The role of stakeholders within a project must be considered during the planning phase – who should be informed and consulted about the project; who will be involved in implementing the project and monitoring and evaluating the outputs and outcomes; and who should be told about the outcomes.

A participatory process for monitoring and evaluation is invaluable for several reasons:

- *people like to know what the results of their efforts have been;*
- *people feel more committed to a project when their opinions about it are asked for and valued;*
- *people generally like to learn how to do things better;*
- *people feel more in control and comfortable if they can critically evaluate their own work rather than having it judged by outsiders; and*
- *people have ownership of the process and the activities to be undertaken.*

The last reason is the most important. ***Without ownership, projects will fail to maintain the commitment of stakeholders and the project may collapse.***

1.3.3 Outputs and outcomes

In evaluation terminology, there is an important distinction between outputs and outcomes. Outputs are distinct activities or products done by the project participants. They tend to focus on the level of activity, regardless of its ultimate effect. In contrast, outcomes are the impacts of the project activities or products; they are not actually carried out by the project. Another way of thinking of outcomes is that they can be influenced by the project, but can not be directly 'controlled' during project implementation.

For project objectives to be achieved, outputs should lead to outcomes. For example, if the objective were to address the threat of predation by foxes, the number of baits distributed would be an output. The outcomes might be a decrease in the population size of foxes and an increase in the population size of a small mammal in the region.

Another way to consider this is to think of the outcome as the ultimate impact of a project. For example, an output from the Natural Heritage Trust's Bushcare Program was the funding of 265 Bushcare projects in Western Australia. This is impressive, but it says nothing about the impact these groups are having on native vegetation management; that is, the outcome of these projects.

Outputs are often much easier to measure and track than outcomes. They happen over the short-term, whereas outcomes may not occur for some time (e.g. seedlings have to grow before they can provide habitat for animals). For these reasons, people often inappropriately use outputs instead of outcomes for evaluating their project success. Sometimes this is the only option but it is necessary to be clear about this.

The link between project goals, objectives, actions, outputs and outcomes is shown in Figure 1 (p. 18).

1.3.4 The importance of collecting information from the beginning

To demonstrate change, a starting point is needed. From that point, subsequent monitoring will show the direction and amount of change towards the desired goal. Baseline information is the first set of information about the indicators collected at a particular site. It is generally collected before any activity has commenced. In this way, comparisons can be made later to demonstrate how effective the project has been in making an impact at the site.

The amount of information collected will depend on the agreed monitoring and evaluation program. It could be as simple as a set of photographs, or could include detailed site flora, fauna and social surveys.

Collecting baseline information will also assist in determining what monitoring activities will be appropriate to show the effects of activities. Additionally, baseline information can be used to set benchmarks for how much change is required.

***Record Sheet 1** (p. 8) is an example of a proforma that may be used for recording baseline information for the project or from each project site. **Record Sheet 2** (p. 11) may be used for recording baseline information for waterways projects.*

A successful revegetation site from the perspective of obtaining an output of planting a certain number of seedlings with a high survival rate. However, if the project objective is to improve habitat, then better outcomes could be gained from including understorey and groundcover species in planting.

1.3.5 Including a control and replicates

It is strongly encouraged that a control site be included in the project design. This is a site that is as similar as possible to the site where activities are being undertaken (activity site), but is ***not*** *influenced by the activities. By comparing the activity site with the control site, it is possible to see whether the changes occurring are a result of the activities, or whether they are the result of some other factor (e.g. weather patterns) that may have occurred anyway. Having a control site is particularly important because if the activity site does change after the implementation of the project, but the control does not, then it is fairly clear that this is a result of the project.*

It is also important to include three or more replicates of control sites and activity sites in project design. This may seem excessive, but including replicates means that the results will provide a higher level of confidence about the effect of the project's activities. Having replicate sites means that the difference between natural variations and improvements as a result of the project are more easily identified. If replicates are not included, the evaluation is not necessarily worthless, but the degree of confidence about the results is reduced.

1.3.6 When and how often to monitor?

The frequency of project monitoring will depend on the project's objectives and resources (e.g. time, funds and available people).

Whilst project outputs can be monitored during the life of the project, project outcomes often occur well after the project has finished. It is therefore important to commit to monitoring over the long-term. This means that the same monitoring activities should be conducted at the same place both during and after the completion of the project.

In some cases, monitoring annually and at the same time each year is adequate. Where harmful processes are quite gradual, for example tree and bushland decline, monitoring could be conducted at longer intervals of two to three years. Long-term information (7+ years) is a very powerful way of demonstrating the impact of the project and other environmental trends, so try to include some simple activities that can be monitored beyond the life of the project (e.g. presence / absence of a particular bird species).

Generally, the best strategy is to monitor at regular intervals, which will show up any trends or variations occurring as a result of the activities. Where changes are expected over a long time period, this method will identify those changes with a reasonable degree of accuracy. Monitoring may also be used during or after unexpected events, such as floods, drought or fire. This strategy will help to identify other factors that may be influencing success or failure.

1.3.7 Quality control

Collecting a small amount of reliable information using standard procedures is much better than a large amount of information gathered randomly, which may be much more difficult to interpret. There are a number of ways to maintain the quality of the information that is collected, for instance:

- *use standard checklists and recording sheets (some examples are provided in the* **Appendices***);*
- *carry out monitoring using consistent techniques and at the same time of year;*
- *have a professional assist or check identification of plants or animals;*
- *check the information recorded at the end of each session to ensure that it is complete;*
- *record who has done the monitoring, so that they can be contacted later if needed;*
- *have the assessor rank themselves in terms of their level of confidence (e.g. beginner – intermediate – advanced – skilled professional) in their assessment, as a means of obtaining an indication of the reliability of the information; and*
- *develop and maintain a good system for storing and managing the data collected.*

Helpful tips when developing a monitoring and evaluation process for your project

- ✔ *Avoid collecting information that has no end-purpose.*
- ✔ *Collect information that improves decision-making.*
- ✔ *Balance the need to know with the group's capacity to collect information.*
- ✔ *Try to measure aspects that will change during the life of the project.*
- ✔ *Make sure the information is safely stored, make copies to keep in separate locations.*
- ✔ *Make it easy for others to understand. Record the methods used. This information may be used in future years.*
- ✔ *Find effective ways of summarising and presenting information (e.g. condense onto a map).*
- ✔ *Allow adequate time for interpretation and presentation of information.*
- ✔ *Make the monitoring activities enjoyable.*

Remember! *Gathering and evaluating project information takes time. Choose the information you will gather carefully. This will save time and lead to better decision-making.*

RECORD SHEET 1

Baseline information

This proforma can be used for collecting baseline information at each site within a project. It should be completed only once before starting any activities at the site. If your project site occurs along a waterway, you may prefer to use the foreshore survey proforma in Record Sheet 2.

Project Title:	**Current Date:** ..... **Expected date of completion of activities:** .....
Project Number:	**Site Number:** .....
Property Name:	**Landowner:** .....
Map reference: ...../	**GPS:** S ..... E .....

Land use and disturbance and history

Native habitat or vegetation types historically present at the site (this may be obtained through early maps and aerial photographs, oral histories, and explorers' records...)

.....

Previous activities, land uses or major known disturbances on the project site (if possible include a description of the natural disturbance regimes present if known, eg. fire frequency and timing).

.....

Current activities, land uses or disturbances on the project site (include an estimate (as a percentage) of the proportion of remnant vegetation present and its condition, and current fire regime).

.....

Area of site (ha): .....

Position in landscape: Ridgeline Mid-slope Valley floor

Shape of site:

Circular Square, triangular Rectangular, indentations or extrusions
Long and fragmented Long, thin and fragmented Bordering waterway or wetland

Proximity of site to remnant of native vegetation or reserve

Attached to large area of native vegetation or conservation reserve
Nearest area of significant native vegetation is within 500 m
Nearest area of significant native vegetation is within 500 - 1000m
Nearest area of significant native vegetation is within 1 – 2 km
Nearest area of significant native vegetation is more than 2 km

Corridor formation

Forms corridor wider than 50 m between blocks of native vegetation or conservation reserve
Forms corridor less than 50 m wide between blocks of native vegetation or conservation reserve
Does not form corridor

Priority Class (Refer Appendix III and IV)

Highest
Very High
High
Medium

Soils

Sandy	Clayey	Loamy
Alluvial	Modified/imported soil	Other .....
pH (if known):	Erosion evident	Affected by salinity

Major vegetation type (see Appendix II for definition of terms)

Dominant Vegetation			
	Trees > 30 m	Trees 10 - 30 m	Trees under 10 m
	Tree mallee	Shrub mallee	
	Shrubs > 2 m	Shrubs 1 - 2 m	Shrubs under 1 m
	Grasses	Herbs	Sedges

Canopy cover of dominant vegetation (per cent)

100 – 70 % 70 – 30 % 30 – 10 % 10 – 2 %

Structural formation class (Use information above and Appendix II to identify class)

Presence of weeds

No weeds	Weeds restricted to periphery or small area
Up to 50 % of site is covered by weeds	Whole site is covered by weeds

Litter layer

Standing litter layer present over whole area	Standing litter layer sparse or absent in 30% of site
Standing litter layer sparse or absent in 50% site	Standing Litter layer generally absent

Salinity

No salinity in site or surrounding catchment	No salinity in site, but some in surrounding catchment
No salinity in site but adjacent to saline area	Some evidence of salinity in site

Hydrology

Flowing water/creeks	Waterlogged	Wetland
Stagnant ponds	Mostly dry	Spring/seeps
Stormwater drains	Ephemeral (intermittent)	Rising groundwater

Vegetation condition *(can tick more than one box)*

Tree understorey present	Ground cover present	Up to 50% of canopy has dead branches
Dead branches absent in canopy	All ages of vegetation present	Dead trees present

Habitat Opportunities

Trees with hollows	Logs/trees on ground	Tree falls/dead wood in waterways
Rocks, caves, crevices	Clumps of reeds, grass or shrubs	Vegetation overhanging waterway
Deep waterholes	Shallow ponds	Water flow over rocks

Fire History

No evidence of fire	Signs of an old fire event	Signs of recent fire event

.....

Mapping native vegetation

Depending on the scale of your project, the project manager may find it beneficial to prepare a map of all sites within the project (e.g. catchment scale). A map showing all sites within a property will be more useful to the landholder.

For larger-scale project sites or properties, mapping the location and extent of native vegetation provides a useful starting point (or baseline) for monitoring. Mapping the vegetation on your site and surrounding area also provides a planning tool that you can use to identify potentially important wildlife corridors.

One fairly simple mapping technique involves mapping the extent of native vegetation from an aerial photograph onto tracing paper or clear film. The accuracy is then double-checked with a field inspection, a process also known as 'ground-truthing'. The resulting map can then be referred to in later years to determine the extent of changes that have taken place.

Creating the map

1. *Obtain a recent aerial photograph of your project site or property.*
2. *Place a clear plastic overlay over the photograph.*
3. *Mark the location of the project or property boundaries on the plastic, using a felt pen or overhead transparency pen.*
4. *Mark in the locations of other important features – for example, dams, creek and drainage lines, old road reserves, significant remnants in neighbouring areas.*
5. *Mark the boundaries of each area of remnant native vegetation (you may wish to use a different colour for this). If different types of native vegetation are present on your project site, then you can also map these and code them with different numbers or colours (e.g. native grassland = 1, acacia regrowth = 2, riparian vegetation = 3). Most areas of woody native vegetation can generally be recognised easily from the photograph, particularly if you have some familiarity with the site. Grasslands are more difficult and require a good knowledge of the local area.*
6. *Mark any small islands of native vegetation or regrowth and any major occurrences of weeds.*
7. *Check your map and overlays for accuracy in the field – the boundaries of native vegetation (these may have changed since the aerial photograph was taken) and other features such as waterways.*
8. *Record GPS (Global Positioning System) points if you have access to a GPS unit.*
9. *Record on your map the name of the project site, the date the map was created and who created the map.*

RECORD SHEET 2

Foreshore Condition Assessment Form
Filling out the foreshore assessment form

Paddock scale surveys: quick reference guide to filling out assessment forms	
General Details	Answer as many questions in this section as possible. ESSENTIAL INFORMATION: Your name, date of survey, the farm name, the nearest road intersection to the farm and the location number or lot number* of the property on which the survey was carried out (if known). Please indicate whether the survey was conducted with the assent of the property owner. OPTIONAL INFORMATION: Your contact address and phone number, the farm name and address. ** The location or lot numbers will help to locate the property, if not already known, on 1:50,000 topographical/cadastral maps from the Department of Land Administration,*
Foreshore assessed	Indicate whether one or both sides of the stream are being assessed. Generally, if the stream is at the boundary of the paddock, assess only the adjacent side. If it passes through the paddock assess both sides, using only one form.
Site diagram	Draw a sketch of the farm property, shading in the area where the paddock is located, indicating the general location of the stream. Include any other information which will be useful, such as roads, other streams, prominent features, lot numbers, etc. If you are doing more than one paddock, a single sketch will do. Just number the paddocks on the first sketch and refer to it on subsequent forms.
Foreshore grade (for south-west waterways)	In the basic survey, you grade the foreshore into one of four categories: **A grade:** Pristine to slightly degraded. Where the foreshore has healthy native bush, similar to that which you would see in most nature reserves, state forests or national parks. **B grade:** Degraded. Where the bush along the stream has been invaded by weeds, mainly grasses, and looks like typical roadside bush. **C grade:** Erosion prone to eroded. Where the foreshore supports only trees over weeds or pasture, or just plain pasture, and bank erosion and subsidence may be occurring, but only in a few spots. **D grade:** Eroding ditch to weed infested drain. Here, think of the typical drains you have seen, especially those just having been cleaned out with a backhoe. *Detailed survey* For more detailed surveys grade the foreshore using the sub-categories (A1, A2, ...D2, D3).
Fenced off	Indicate whether the stream is fenced off from livestock. Tick yes only if the fence is in good order and actually functioning as a fence.
Stock access	Tick the yes box if it appears that stock have had access to the river / creek recently, even if the streamline is fenced off.
Crossing point	Indicate whether there is a livestock or vehicle crossing point across the stream.
Comments	Any general comments or specific points regarding fences or livestock or vehicle access should be noted here.

ADDITIONAL INFORMATION	*The following sections provide some useful additional information to help gain an overall picture of the vulnerability and health of the river system. Fill out one or more of the boxes as appropriate.*
Bank steepness	Steep banks are more prone to erosion and collapse than more moderately sloped ones. Combined with soil cohesion information, this will highlight points of high erosion hazards. Tick the box which best represents the foreshore being surveyed.
General soil cohesion	The degree of cohesiveness of the stream embankment determines how vulnerable it is to erosion and subsidence once the supporting vegetation has been lost. Rocky embankments are extremely cohesive and the erosion of sediment is limited. Clayey soils are reasonably cohesive and only erode slowly, although loose surface sediment is quickly lost. Non-cohesive embankments of sand, loam or dispersive clays are the most prone to erosion and collapse. Tick the box which best represents the foreshore being surveyed.
Major erosion / siltation	Any point of erosion that produces more than a trailer load worth of sediment can be considered 'major'. Erosion types include simple cutting into the stream bank, undercutting of stream banks, firebreak or track washouts, and subsidence. Also indicate if there are large heaps of excess sediment, usually seen as white sand. Use the comments to give additional information such as the extent of the erosion or whether sediment is filling a river pool. This information will be used to identify "black spot" areas. Tick the appropriate boxes (you may tick several boxes).
Vegetation health	Use this section to give a general description of the health and vigour of the vegetation. This information is needed to identify section so the foreshore that may become unsupported by trees in the near future. Be sure to note the presence or absence of regenerating trees. The mature trees may be dead or sick looking, but if young ones are present, they may replace the old ones. Alternatively, adult trees may be healthy but no regeneration is occurring. Tick the appropriate boxes (you may tick several boxes).
Comments	Any general comments, special notes or specific points should be included here. For example, reference to cultural features or Aboriginal sites of significance.
Overall stream environmental rating	Assess each of the given parameters using Table C. Add all the scores together to obtain the *total score*. Use this score to calculate the *stream environmental rating*. An explanation of the parameters is given below. **Floodway and bank vegetation:** This vegetation grows in the floodway or on the banks and is the major natural source of nutrients and carbon for the stream ecosystem. The canopy is the tree cover that overhangs the stream. Plant roots stabilise the floodway and banks against erosion and subsidence. Stems and foliage dissipate the energy of floodwaters, reducing erosion and promoting sedimentation. **Verge vegetation:** The stream verge extends from the top of the embankment to a paddock fence, backyard fence or road, and is usually about 10-50m wide. Verge vegetation provides habitat next to water, increases the value of the riparian zone as an ecological corridor and stabilises the stream banks by anchoring them with tree roots to adjacent land. **Stream cover:** Fish and other aquatic organisms require snags, leaf litter and rocks to shelter from predators and fast flowing water, to reproduce, establish territories and for navigation. Aquatic plants are also very important for fish and other creatures in the stream. They have a direct effect on the available oxygen in the water, which in turn can effect the type of fish and other animals found. Protruding snags and rocks provide roosting and preening sites for birds and help to oxygenate water in fast flowing sections. Overhanging and emergent vegetation provides shade to which many aquatic animals retreat during the hot days of summer and autumn. Insects blown from flowers and leaves are a very important source of food for fish and other animals. **Bank stability and erosion:** Banks erode naturally, especially on bends (meanders). However when vegetation is cleared for agricultural activities and urban development, the stream banks can become unstable, resulting in extensive erosion along the floodway and the build-up of sediment that is then slowly washed downstream. Erosion and bank collapse can also be caused by increased runoff from impervious surfaces (e.g. car parks), from pipes and drains and by straightening or channelling the stream. **Habitat diversity:** Different habitat types in steams include cascades, rapids, riffles, waterfalls (which are quite rare), runs, meanders, pools and floodplains. Stream sections that have a range of habitat types can support a greater variety of species. Rapids occur where rocks and snags protrude through rapidly flowing water. Areas where water flows quickly over stones and rocks, or between tree stems, are known as riffles. Areas where the water surface is essentially flat are known as runs. Rapids and riffles provide habitat for invertebrates. It is common for the stream floodway, including rapids and riffles, to be

	heavily vegetated. The vegetated floodways are usually broken by deep pools which provide habitat for fish, turtles, marron and other animals. Pools are often the only parts of streams to retain water over summer, providing an essential drought refuge. Long broad sections of vegetated or clear floodway are typical of the lower reaches of our larger south-west rivers. They provide different types of habitat because the cutting action of water at bends creates deeper areas and variable water speed. Seasonal floodwaters adjacent to the stream may provide important breeding and feeding habitat for aquatic life. **Surrounding land uses:** The surrounding land use activities will contribute greatly to the ecological value of the stream. An area of national park or remnant bush contribute to, and benefit from, a wider biological diversity than can be found in either the stream or the bushland alone. A stream in an agricultural setting will have elevated sediment and nutrient levels, while a stream in an urban or industrial area will be more vulnerable to weed invasion and pollution. Native animals living in urban and semi-rural areas benefit from a stream environment and from the remnant bush along its flanks.

FORESHORE CONDITION ASSESSMENT FORM

FOR PADDOCK SCALE SURVEYS

General details

Date:.....

Recorder's Name: .....

.....

Recorder's Contact Details: .....

.....

Farm Name:.....

Farm Address:.....

.....

Nearest road intersection:.....

.....

Catchment:.....

Stream name:.....

Location or Lot No:.....

Aerial Photo Ref:.....

Owner/manager consent obtained:
Yes / No

Owner/manager present during survey:
Yes / No

Site diagram

Foreshore assessed:
left ☐ right ☐ (facing upstream) both ☐

FORESHORE GRADE

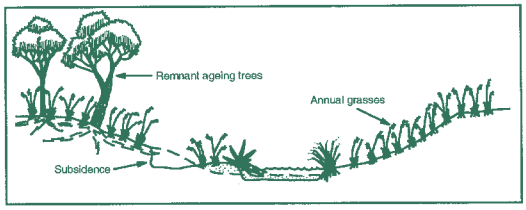
A PRISTINE - FEW WEEDS ☐

A1 Pristine: no weeds ☐

A2 Near pristine: some weeds ☐

A3 Slightly disturbed: local weed infestations ☐

B DEGRADED - WEED INFESTED ☐

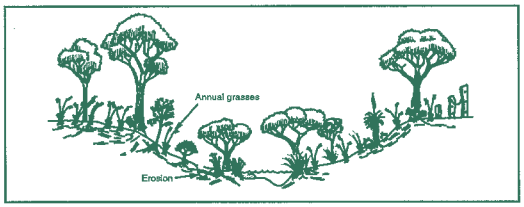


B1 Weed infested: understorey mainly natives ☐

B2 Heavily weed infested: natives = weeds ☐

B3 Degraded: understorey weed dominated ☐

C ERODING OR EROSION PRONE ☐

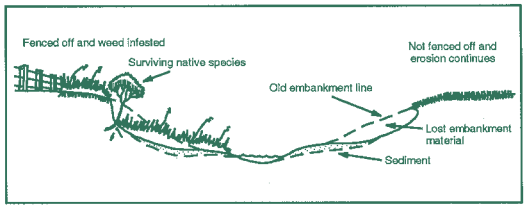


C1 Erosion prone: understorey weeds only ☐

C2 Surface erosion: soil exposed ☐

C3 Erosion and subsistence present ☐

D DITCH OR DRAIN ☐



D1 Eroding: extensive erosion and siltation ☐

D2 Freely eroding (ditch): erosion / siltation out of control ☐

D3 Weed infested (drain): highly eroded ☐

Source: Water and Rivers Commission (1999a)

FENCING STATUS

Fenced off: Yes ☐ No ☐

Stock access to foreshore: Yes ☐ No ☐

Crossing point present: Yes ☐ No ☐

Comments:.....

.....

.....

ADDITIONAL INFORMATION

General bank steepness

- ☐ >60° — Very steep
- ☐ 45-60° — Steep
- ☐ 10-45° — Moderate slope
- ☐ 0-10° — Slight slope

General soil cohesion

- ☐ Excellent - rock, stone
- ☐ Good - clay, clayey loam
- ☐ Poor - sand, loose loam

Major erosion/siltation

- ☐ None
- ☐ Points of cutting/undercutting
- ☐ Major undercutting
- ☐ Firebreak/track washouts
- ☐ Bank subsidence
- ☐ Large sediment deposits

Vegetation health

- ☐ Looks healthy
- ☐ Some sick trees
- ☐ Many sick and/or dying trees
- ☐ Many dead trees
- ☐ Mainly long dead trees

Tree seedlings and saplings present:
Yes ☐ No ☐

Comments

Stream environmental health rating (refer to Table C)

Rating	Floodway & bank vegetation	Verge vegetation	Stream cover	Bank stability & sediment	Habitat diversity
Excellent	(15)	(8)	(8)	(8)	(6)
Good	(12)	(6)	(6)	(6)	(4)
Moderate	(6)	(4)	(4)	(4)	(2)
Poor	(3)	(2)	(2)	(2)	(1)
Very poor	(0)	(0)	(0)	(0)	(0)

Surrounding landuse:

- ☐ Conservation reserve (8)
- ☐ Remnant bush (6)
- ☐ Rural residential (4)
- ☐ Urban (2)
- ☐ Agricultural (2)
- ☐ Commercial/industrial (1)

Score	*40-55*	*30-39*	*20-29*	*10-19*	*0-9*
Rating	*Excellent*	*Good*	*Moderate*	*Poor*	*Very poor*

Total score = ...

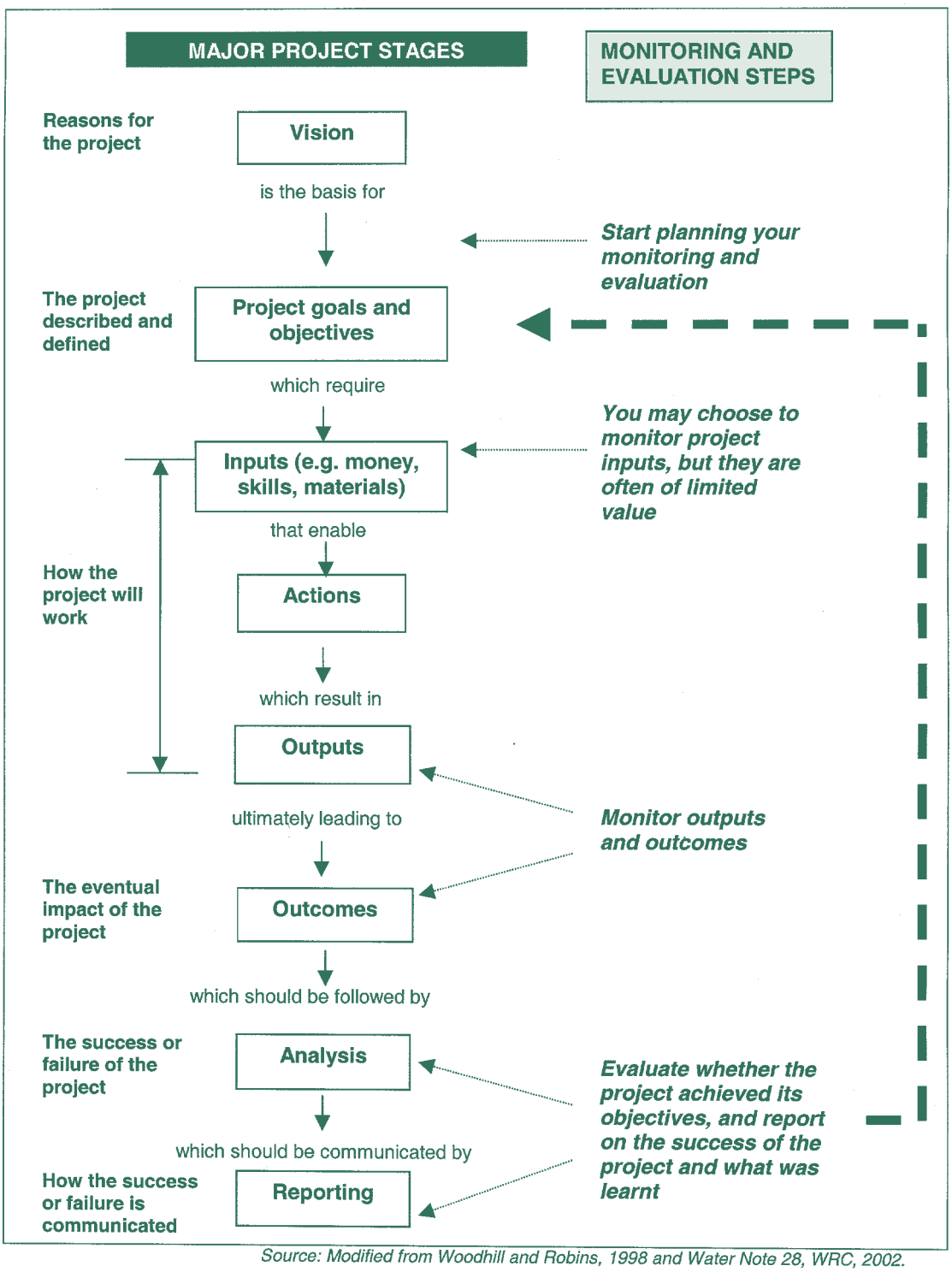
Environmental rating = ...

LIVING STREAMS SURVEY: INFORMATION TO DETERMINE OVERALL STREAM ENVIRONMENTAL RATING

	Floodway and Bank Vegetation	Verge Vegetation	Stream Cover	Bank Stability and Erosion	Habitat Diversity
Excellent	• Healthy undisturbed native vegetation. • No weeds. (15 points)	• Healthy undisturbed native vegetation. • Verges more than 20m wide. (8 points)	• Abundant cover: shade, overhanging vegetation. • Snags, leaf litter, rocks and/or aquatic vegetation in stream. (8 points)	• No erosion, subsidence or sediment deposits. • Dense vegetation cover on banks and verge. • No disturbance. (8 points)	• Three or more habitat types. • Some permanent water. (6 points)
Good	• Mainly healthy undisturbed native vegetation. • Some weeds. • No recent disturbances. (12 points)	• Mainly healthy undisturbed native vegetation. • Verges less than 20m wide. (6 points)	• Abundant shade and overhanging vegetation. • Some cover in the stream. (6 points)	• No significant erosion, subsidence or sediment deposits in floodway or on lower banks. • May be some soil exposure and vegetation thinning on upper bank and verge. (6 points)	• Two habitat types. • Some permanent water. (4 points)
Moderate	• Good vegetation cover, but a mixture of native and exotic species. • Localised clearing. • Little recent disturbance. (6 points)	• Good vegetation cover, but mixture of exotic and native species. • Verges 20m wide or more. (4 points)	• Some permanent shade and overhanging vegetation. • Some instream cover. (4 points)	• Good vegetation cover. • Only localised erosion, bank collapse and sediment heaps. • Verges may have sparse vegetation cover. (4 points)	• Mainly one habitat type with permanent water, or a range of habitats with no permanent water. (2 points)
Poor	• Mainly exotic ground cover. • Obvious site disturbance. (3 points)	• Narrow verges only (< 20m wide). • Mainly exotic vegetation. (2 points)	• Channel mainly clear. • Little permanent shade or instream cover. (2 points)	• Extensive active erosion and sediment heaps. • Bare banks and verges common. • Banks may be collapsing. (2 points)	• Mainly one habitat type with no permanent water. (1 point)
Very Poor	• Mostly bare ground or exotic ground cover (i.e. pasture, gardens or weeds but no trees). (0 points)	• Mostly bare ground or exotic ground cover (i.e. pasture, gardens or weeds but no trees). (0 points)	• Virtually no shade or instream cover. (0 points)	• Almost continuous erosion. • Over 50% of banks collapsing. • Sediment heaps line or fill much of the floodway. • Little or no vegetation cover. (0 points)	• Stream channelised. • No pools, riffles or meanders. • The stream forms a continuous channel. (0 points)

TABLE 1 Comparison of a native vegetation management project with a construction project (modified from Water Note 28, WRC 2002).

	Native vegetation management example: Robinup Catchment Group	Bridge-building example
Vision	• To protect and enhance remnant vegetation in the Robinup Catchment for wildlife habitat.	• To reduce traffic problems in the southern metropolitan region.
Goal (for current project)	• To protect by excluding domestic stock and link by revegetation all remnants larger than 10 hectares in the Robinup Catchment within 5 years.	• By building a bridge, re-route traffic flow away from the southern metropolitan area and across the river within the next 5 years.
Objectives	1. Within 5 years, improve remnant quality by at least one level of classification (see *Monitoring Technique G*) in all of the remnants larger than 10 hectares. 2. Within 5 years, address the decline in numbers of quenda due to predation, by implementing a fox control program across the catchment. 3. Within 3 seasons, control the weed problems in the three largest remnants. 4. Within 2 years, exclude stock from all areas of remnant vegetation larger than 10 hectares. 5. Within 3 years, create linkages of local vegetation at least 30 m wide between the three largest remnants	1. Within 5 years, re-route at least 50% of vehicle and bicycle traffic across the river via the bridge. 2. During construction of the bridge, keep to within $10,000 of the project budget and ensure that the bridge is built in accordance with appropriate safety and building protocols.
Project Inputs	• Herbicide, human labour and time, fencing, seed collection.	• Construction workers, building materials, safety equipment, heavy machinery.
Actions	• Undertake fencing, weed control, distribution of fox baits and direct seeding.	• Build the bridge.
Project Outputs	• Fences installed (kms), herbicide sprayed (litres), seed collected (kgs), area direct seeded (ha), fox baits distributed (#).	• Concrete poured (m^3), steel used (tonnes).
Project Outcomes	• Linkages created between three areas of remnant vegetation in the catchment and protection from weeds and grazing by domestic stock has increased the habitat value of the vegetation for quendas and other native fauna.	• Traffic flow in southern metropolitan area improved. • Traffic flow over river via bridge increased.
Monitoring (for project outcomes only)		
Indicators	• Increase in remnant vegetation quality. • Use of revegetated links by target species (i.e. quenda, bird species). • Natural regeneration of local species.	• Decrease in the number of cars using the southern metropolitan area following construction of the bridge. • Improvement in the traffic flow in the southern metropolitan area (e.g. the time taken to travel through the interchange/cross the river).
Monitoring methods	• Remnant vegetation quality assessment. • Photopoints. • Sand plot identification of quenda movement. • Early morning bird sightings. • Surveys of plant survival rates using transects.	• Traffic counts, prior to, during and after construction. • Recording number of accidents on site. • Air quality sampling. • Consumer surveys.
Evaluation (for project outcomes only)		
Evaluation process	• Assess the results from the surveys and compare with photographs. • Determine whether remnant quality has increased/decreased over the life of the project. • Determine whether the remnant protection activities undertaken have affected the target species. • Make recommendations on future activities.	• Assess the traffic counts. • Determine whether traffic flows in the area have been affected by the bridge, and if not, why not. • Make appropriate recommendations for future activities based on the evaluation.



Source: Modified from Woodhill and Robins, 1998 and Water Note 28, WRC, 2002.

FIGURE 1: The stages of a well-managed project.

2. PLANNING AND DESIGNING A MONITORING AND EVALUATION PROGRAM

KEY MESSAGES

- **Monitoring and evaluation is based on SMART objectives.**
- **Output measures are easier to select, but performance indicators are a better estimate of the project outcomes.**
- **Monitoring activities are based on information needs and limited by project resources.**

Monitoring and evaluation is considered a cyclical process. The information it provides can improve the project as it proceeds as well as feed back into the development of new projects.

Figure 1 in **Chapter 1** *outlines the complete monitoring and evaluation cycle.*

In this cycle, planning is the first step. It is important to plan before starting a monitoring program, so that resources can be identified and useful techniques selected. The purpose of the evaluation must also be identified and understood by everyone involved in the project. There are five steps in the planning and design of a monitoring and evaluation program. These are set out in Figure 2 (p.20) and **Sections 2.1** *to* **2.5** *go through this process step by step.*

See Hussey and Wallace (1993) and Rutherfurd et al *(2000) for further advice on project planning and design.*

2.1 Identifying project objectives

To begin the process, everyone involved in the project must have a clear understanding of the project's goals, objectives and expected outcomes. Clear objectives will make project management, monitoring and evaluation much easier. The project objectives should therefore be SMART - ***S****pecific,* ***M****easurable,* ***A****chievable,* ***R****elevant and* ***T****ime-bound.*

When building project objectives, it is also important to state the underlying assumptions about the linkage of the objective with the intended outcomes. In some cases, those assumptions may be found to be wrong, and the actual outcomes may be very different. For example, the assumption that 'controlling weeds in revegetation areas will lead to better survival and growth of native plants' may be wrong if the weeds were protecting the native plants from insect attack or grazing by native animals.

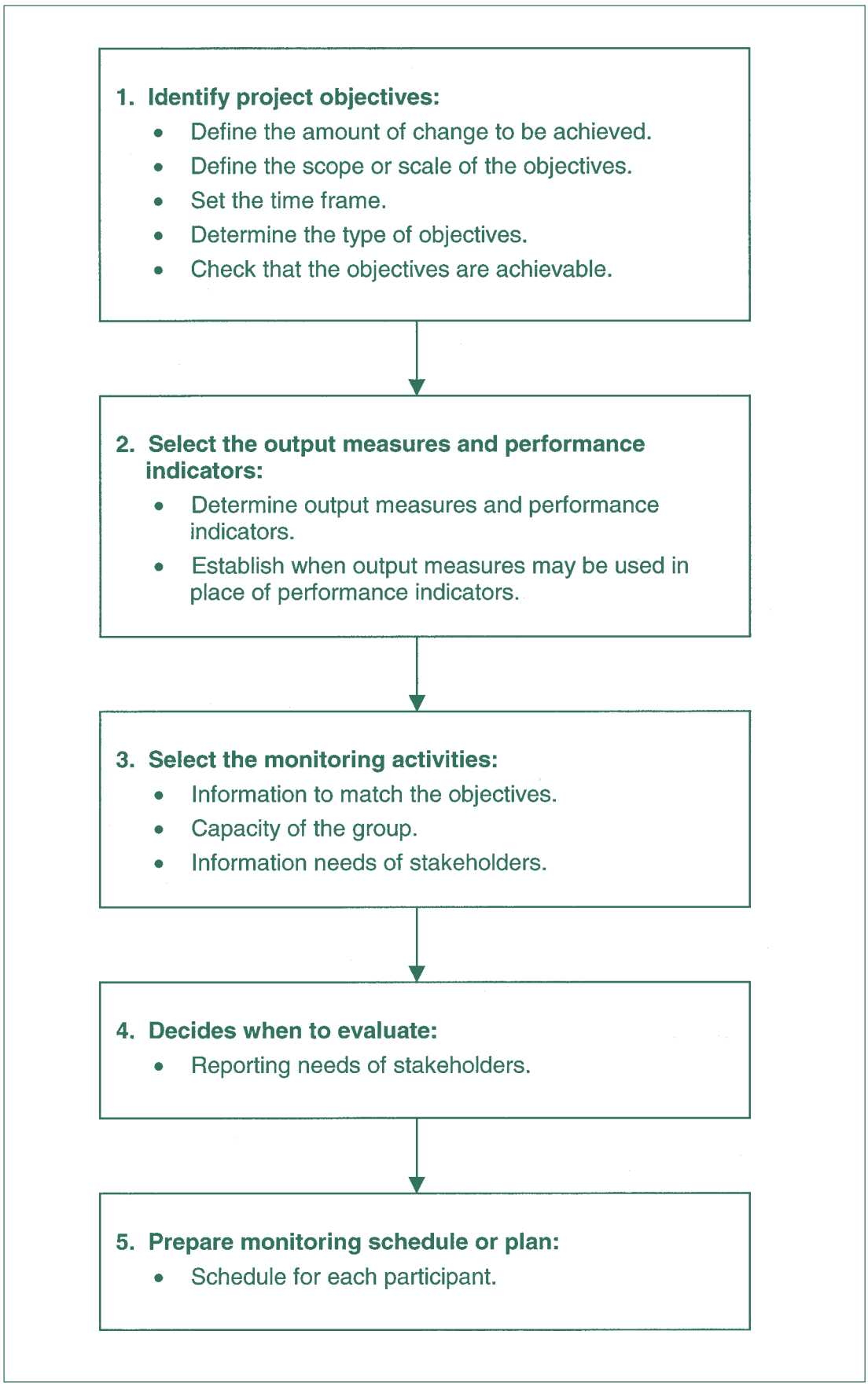


FIGURE 2: The five steps of planning and designing a monitoring and evaluation program.

2.1.1 Specific – what will be achieved is clearly defined

When setting objectives, it is important to work out what would be considered a disappointing result and what would be a great success. Objectives can also aim to maintain rather than improve a site so that its condition does not deteriorate.

The objectives that are selected during the project planning process should also be at a scale appropriate to that of the project. Consideration should now be given to such questions as 'Will the project affect a large area of the landscape?' 'Are areas lower in the catchment likely to be affected?' and objectives defined accordingly.

The information should be clear enough that everyone agrees that the objective is related to a specific action and place that is within the sphere of the project.

2.1.2 Measurable – there is some way of measuring what will be achieved

Objectives should reflect whether outputs or outcomes are expected as a result of the activity. This is an important distinction because while outputs (such as length of fencing erected) can indicate how active the project group has been in completing on-ground activities, they do not indicate how effective those on-ground activities have been in contributing to environmental changes or outcomes (e.g. the level of regeneration of native vegetation following the removal of grazing pressure from domestic stock).

Another term that is used to describe objectives that relate to a project's outputs is efficiency indicators. Efficiency indicators can provide information about how efficient, in terms of the inputs, a group has been in completing on-ground activities (e.g. X km of fencing was erected for the input cost of X dollars).

Similarly, objectives that relate to the project's outcomes are also known as effectiveness indicators. They can provide a measure of how effective the on-ground activities of a group have been in bringing about environmental change (e.g. X hectares of remnant vegetation increased in quality by one level of classification).

Both efficiency indicators and effectiveness indicators are a way of measuring the project's achievements.

2.1.3 Achievable – the objective is realistic given the resources available

It is important to choose objectives that are achievable in terms of both group capacity and resources. This is necessary for both monitoring and evaluation purposes and for group morale. People are likely to rapidly lose enthusiasm if project objectives can never be met. By following the steps outlined above, it should be possible to set objectives that are achievable.

2.1.4 Relevant – the objective is essential to the project vision and goals

It is important that the objectives address the cause of the problem rather than the symptom. For example, if the problem is a rising water table, draining the landscape will remove the water but will not solve the problem. However, revegetating a significant proportion of the landscape may address both the problem and the symptoms.

The term 'threatening processes' is often used to describe activities or situations contributing to degradation of remnant vegetation. These include processes such as inappropriate fire regimes, grazing by stock, encroachment of weeds and secondary salinisation as a result of a rising water table. When defining objectives, the threatening processes should be identified and rehabilitation activities selected accordingly.

2.1.5 Time-bound – there is a time by which the objective will be met

To be able to evaluate the project, the time frame for expected outcomes must be identified. Given that rehabilitation activities can take a number of years to show results, it may be necessary

to set both short-term and long-term objectives. Short-term objectives measure the outputs of the project (and possibly some immediate outcomes) and long-term objectives measure the effects of the activities (outcomes).

Exercise 1 Clarifying the goals and objectives of the project

In the first Chapter of this Guide, Table 1 presented two examples of a monitoring and evaluation program – one for the Robinup Catchment Group's native vegetation management project and one for the building of a bridge.

*Using **Worksheet 1** (page 87) list your project's objectives. One of the objectives identified by the Robinup Catchment Group is provided as an example. The process described in the remainder of this section (i.e. selecting measures for objectives) will need to be completed for **every** objective. The group may wish to split up and each sub-group work with one objective. Alternatively, the group could work together to address each objective.*

To help understand the objectives and match them to indicators, you may find that completing a site evaluation form is useful. This should be done for each project site and it is the project manager's role to make sure that they are completed by everyone involved in the project and that the results are collected. Each sheet should indicate the site location and be placed on a map of the catchment.

2.2 Selecting measures for outputs and outcomes

One of the reasons for undertaking monitoring and evaluation is to find out whether the project is meeting its objectives. This information will also be used in evaluation.

2.2.1 Output measures and performance indicators

To measure outputs and outcomes, two different types of indicators are used: output measures and performance indicators.

Consider the output measure 'number of workshops'.

1. *The number of workshops held in one year does not say anything about the success of the workshops.*
2. *It would be better to include 'the number of landholders who attended' and 'whether the attendance at workshops had increased or decreased.'*
3. *It would be better still to have surveyed the participants to discover how well the workshops met their needs.*
4. *Even better than this would be to find out whether landholders had put into practice what they learnt at the workshops.*
5. *The ultimate information would be whether the changes in land management practices had been beneficial to both the environment and agriculture.*

Only the last three measures are performance indicators.

Developing indicators, that provide information to assess progress, determines whether or not the project is meeting its objectives. However, discussions, interviews and workshops with people who have been involved with or affected by the project will often provide a rich understanding about the project that will not be provided by indicators alone. It is often this type of qualitative information that helps explain why an indicator is giving a particular result. In contrast, indicators provide quantitative information.

In summary, to demonstrate that a project has achieved its objectives it is important to pay special attention to the nature of the performance indicators. Ideally, performance indicators:

- *relate directly to project objectives;*
- *focus on outcomes, not inputs or outputs;*
- *provide a measurable assessment of the project outcomes;*
- *relate directly to the impact of the project and are not greatly affected by outside factors; and*
- *show trends over time.*

2.2.2 When output measures can be used as performance indicators

In project planning, assumptions are made about how actions will lead to outputs and how outputs will lead to outcomes. If it has been reliably shown that a particular action or output always leads to a particular outcome, then the output measure may be a valid substitute for a performance indicator. In other words, if the assumptions of cause and effect are correct, then output measures can be used as proxy performance indicators.

For example, the output indicator 'area of bushland fenced' can be used to show how effectively remnant vegetation is being protected ***only*** *if the main threat to the bushland is grazing by animals that can be effectively controlled by fencing. However, if weeds or rising water tables are also present, this output measure isn't useful and must be replaced with a performance indicator.*

Exercise 2 Selecting indicators

Worksheet 2 *(p. 89) should be completed using an objective chosen by your group during Exercise 1. An objective from the Robinup Catchment Group's project plan has been provided to demonstrate output measures and performance indicators.*

Attached to ***Worksheet 2****, is a table that provides some examples of activities and the output measures and performance indicators that might be used to evaluate them.* The examples are not exhaustive and should be used as a guide only.

2.3 Selecting the monitoring activities

Factors to consider when selecting monitoring activities are:

- *the information needed to meet both output measures and performance indicators;*
- *the amount of time and resources available to commit to monitoring; and*
- *the information needs of the stakeholders and funding bodies.*

Together, these factors will influence both the activities selected and the commitment to monitoring. Therefore, it is important that effort is made to balance any competing elements so that the level of monitoring will match the information needs and the capacity of the project participants.

Exercise 3 Recording monitoring activities and frequency

Using the same objective of the Robinup Catchment Group used in earlier exercises, ***Worksheet 3*** *(p. 92) includes monitoring activities chosen by the Group and the frequency for recording information as an example.*

In completing the exercise at ***Worksheet 3*** *for your project, you should consider what level of monitoring is feasible for your activities and record your actual commitment. The date for monitoring should also be included, specifying either a particular date or the month and year in which the activity is to occur.*

2.4 Knowing when to evaluate and report

A critical part of the monitoring process is knowing when to evaluate and report. The triggers for evaluation and reports can be group meetings, external evaluations, publicity for the project through the media or times at which direction of the project could be changed if monitoring and evaluation suggests it is necessary.

At this point in the planning process, it is necessary to identify the project stakeholders and anticipate their information needs. Having identified when evaluation will occur will make it easier for the project manager to plan ahead, and ensure that the information is available in the right format and at the right time.

When to evaluate:

- *When adequate data has been collected.*
- *At critical times during the project (especially at points where improved management can occur and at the end of natural cycles).*
- *When the funding bodies require it.*
- *When the participants need feedback.*
- *When it can be used to influence external communication.*

When to report:

- *At critical points during the project, allowing management improvements to be made.*
- *At the end of each year.*
- *At the end of the project.*
- *When stakeholders (internal and external) require the information.*

Exercise 4 Making a record of reporting and evaluation

Worksheet 4 *(p. 93) is an example proforma designed for recording the group's decisions about reporting and evaluation. When recording this information, try to be as specific as possible about the stakeholders and the type of information they will require. This will help to focus the report writing and the information to be collected.*

Examples of possible stakeholders and information and reporting requirements are also provided within ***Worksheet 4****.*

2.5 Preparing a monitoring schedule

Now that these decisions about why, when and how monitoring will occur have been made, it is important that they are not lost. This is best achieved by preparing a monitoring schedule. The schedule should consist of the project objectives, the indicators selected, the techniques and frequency for monitoring, the analysis to be used and the dates for monitoring. It should also identify who is responsible for completing each action and by when.

The schedule should also include the type of analysis or evaluation that will be conducted. This is partly covered by the information needs of the stakeholders covered in ***Worksheet 4****. However,* **Chapter 4** *of this Guide covers the steps involved in evaluation in more detail.*

Once the schedule for monitoring has been set, it should be transferred to the project manager's calendar or diary each year so that activities are not missed. A copy should also be provided to everyone participating in the project so that they can also record their commitments in diaries or calendars. This schedule is completed before any of the monitoring activities begin and should be constantly referred to during the project.

It is important to make these schedules available to all participants and other stakeholders associated with the project. This will ensure that monitoring and evaluation of the project can continue even in the case where the project manager or coordinator may be replaced and/or the records from project activities lost. ***The participation of project participants*** **and stakeholders** ***in all stages of monitoring and evaluation should be encouraged.***

Exercise 5 Preparing the monitoring schedule

Worksheet 5 *(p. 94) is an example of a monitoring schedule. The Robinup Catchment project has again been used as an example.*

As a group, the project participants should complete the Worksheet with their own decisions.

Matching monitoring with information needs – A checklist

- ❒ *What do stakeholders want to know?*
- ❒ *What activities will best monitor outputs?*
- ❒ *Will more than one monitoring activity be needed per output?*
- ❒ *Is there more than one site contributing to an output, and do all sites need monitoring?*
- ❒ *What activities will best monitor outcomes?*
- ❒ *How often do the monitoring activities need to be carried out, and over what period?*
- ❒ *Do project resources limit monitoring and evaluation activities?*
- ❒ *Have all evaluation and reporting requirements been allowed for in the selection of monitoring activities?*

Monitoring change in plant regeneration in a protected remnant, may lead to altered management of weeds and public access.

Monitoring germination rates may alter methods of preparation and particularly weed control for direct seeding sites.

3. CHOOSING YOUR MONITORING ACTIVITIES

KEY MESSAGES

- **A monitoring program for environmental projects can include the monitoring of environmental change, social change and project administration.**
- **There are many different monitoring activities that may be used to evaluate environmental and social change.**

Monitoring can focus on several areas:
- *environmental change (on-ground outcomes);*
- *social change (changes in community and individual thinking as a result of the project); and*
- *project administration (how the project has been implemented or outputs).*

This section contains examples of techniques that may be included in a monitoring program. Not all of these techniques may be useful for or applicable to your project and it may be necessary to seek alternatives.

3.1 Monitoring environmental change

Environmental factors that we might wish to monitor include:
- *changes in the physical environment (e.g. soil structure, creek bank stability);*
- *changes in the abundance, activities and movement of fauna observed before and after treatment;*
- *levels of natural vegetation regeneration and planting success;*
- *changes in plant diversity and composition;*
- *weed increase or reduction; and*
- *notes on feral animal activity, tracks, scats (animal faeces) and nests.*

Monitoring changes to the biological and physical aspects of the project can range from simple but effective photopoint monitoring, to more comprehensive surveys of flora and fauna. Choose methods that provide relevant and useful information that can be successfully incorporated with the available time, money and other project resources. Some commonly used techniques are described over the following pages.

To evaluate the habitat value of any revegetation or remnant vegetation protection works, fauna and flora monitoring activities should occur prior to works being carried out. This will ensure you have baseline information against which comparisons may be made during the project evaluation process.

Native vegetation is utilised by fauna (and flora) for a variety of purposes including breeding and nesting sites, food and shelter. Species, particularly fauna species, may occupy the same area of vegetation for similar or different purposes, at the

same or different times of the day or year, or on a permanent or ad hoc basis. Therefore, monitoring to determine the presence or absence of species, both prior to and following vegetation works, should occur at different times of the year.

Some species are particularly sensitive to any decline in the extent and condition of vegetation. An understanding of the requirements of fauna species found at the site will provide an indication of the vegetation's value as habitat. For example:

1. *Some birds require hollow nesting spaces in which to lay eggs and rear chicks. Such spaces are only found within trees over a particular age (referred to as 'old-growth'). The presence of these birds, and an associated stability or increase in their population, reflects a high habitat value for the site and the implementation of a management regime appropriate to the birds. On the other hand, a decline in the population may reflect poor habitat value and/or an inappropriate management regime.*

2. *The seeds of some native flora require fire to assist with germination. The exclusion of fire or the inappropriate use of fire at a site will see a decline in these species and reflect a decline in habitat value.*

Trends in fauna activity or the presence/absence of flora species may reflect changes in vegetation habitat value. As with other monitoring activities, any results or trends should be used to guide the further implementation of the project and land management activities more generally at the project site or catchment level.

3.1.1 Monitoring revegetation activities

This section outlines a number of techniques that you may consider using in your monitoring program. They include:

A. Establishing a permanent photopoint.
B. Establishing vegetation transects and quadrats.
C. Combining quadrats and photopoints.
D. Monitoring plant regeneration.
E. Monitoring planting success.
F. Monitoring weeds.
G. Making a vegetation quality assessment.
H. Monitoring and assessing foreshore condition.

A. Establishing a permanent photopoint

Photographs can rapidly document vegetation changes at a site and give an overall impression of the success or otherwise of the project's activities. They are a simple and effective means of recording the project's progress. Photopoint monitoring requires that photographs be taken from the same location at set intervals over time using a standardised method.

To follow are guiding principles for establish a permanent photopoint for vegetation monitoring.

1. *Photopoints should be located where they can easily be found in future years.*

2. *Photopoint sites should be marked, for example, with painted star pickets or fence posts and a compass bearing used to give the direction of the shot. Ideally, the location of the photopoint should be noted with a GPS reading and recorded along with an identifying number on a metal tag on the picket. Alternatively this information could be painted on the side of the picket. Consider putting two star pickets in the ground as a reference guide for the angle of the photograph so that successive photographs will be along the same line each time (see Figure 3, p.29).*

3. *Ideally, photos should be taken during the same season, at the same time of day, from exactly the same place with the same view and camera settings. Take care with placing photopoints that face east to west. You may have difficulty photographing these in the morning or afternoon.*

4. *Try to take photos that contain distinguishable features such as background hills, an old and easily recognisable tree or buildings.*

5. *Several photopoints are recommended for large or very diverse sites.*

6. *Select representative sites that can be easily marked.*

7. *Select a site that shows a large area within the project site.*

8. *Take additional photographs to document major events such as a fire.*

9. *If possible, have the same person take the photographs or set the camera on top of the star picket to ensure a consistent height.*

10. *Use the same camera and film type for greater consistency, for instance 24 exposure ISO100 or 200 film. Consider using slides, as they are less likely to fade and can be projected on to a whiteboard, assisting with the tracking of changes and the comparison of images.*

11. *Place a clear label and date on the back of each photograph. Record the information in a notebook and include this in the album where the photographs are kept.*

Photopoints can also be used in conjunction with vegetation transects. See the activities on the following pages for more information.

A suggested format for recording photographic information is at ***Record Sheet 3*** *(page 30).*

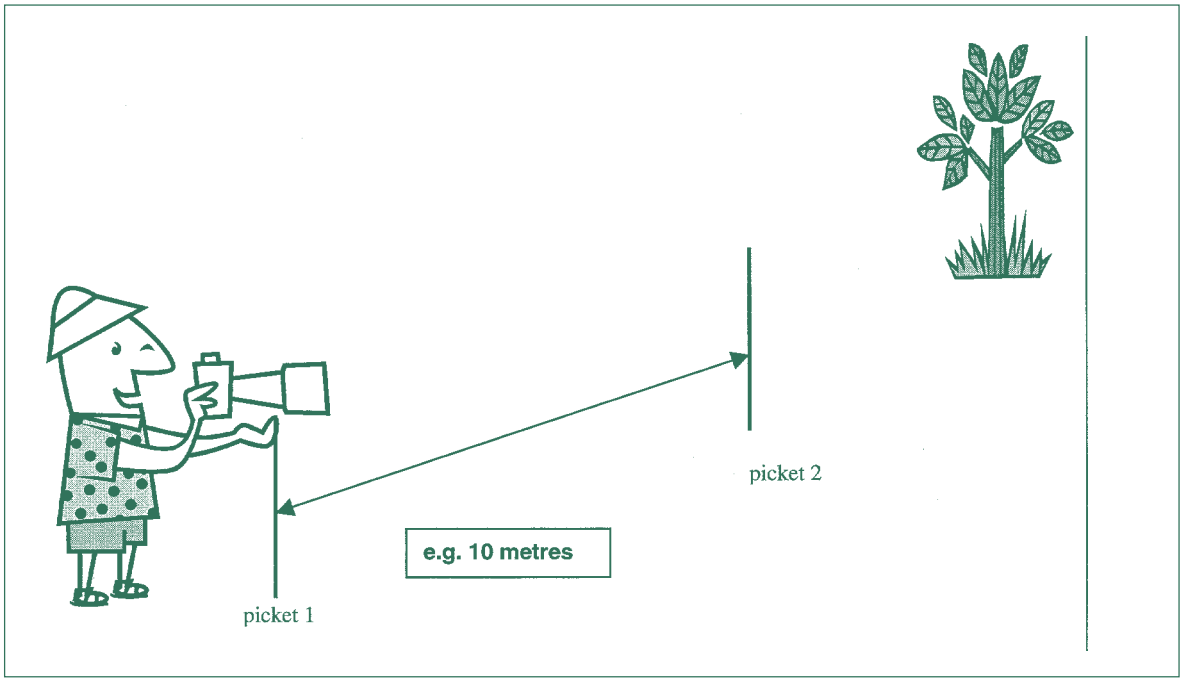


Figure 3: Technique for setting up a monitoring photopoint
Permanent pickets spaced 10 m apart.

RECORD SHEET 3

Photopoints

Photopoint location:	Date:	Time:
Location details:	Compass bearing:	GPS: S E
Direction of photo:	Negative number:	
Lens type/other camera settings:	Photographers name:	
Purpose of photo/site observations:		
Attach photograph here		

Photopoint location:	Date:	Time:
Location details:	Compass bearing:	GPS: S E
Direction of photo:	Negative number:	
Lens type/other camera settings:	Photographers name:	
Purpose of photo/site observations:		
Attach photograph here		

B. Establishing vegetation transects and quadrats

Transects are generally straight lines of a set length along which plant or animal species, vegetation density, vegetation structure and other habitat values can be recorded. They can be used to monitor sites with remnant vegetation or sites that are being revegetated/regenerated.

The level of detail recorded along each transect varies depending upon the goals of the monitoring program. For example, transect monitoring may involve a leisurely walk along a set route of 100 m - 500 m length, recording very general attributes of the site such as number of trees with dead branches. Alternatively it might involve much more detailed counts of seedlings emerging from a direct seeding operation along randomly selected 1 m lengths of a 50 m transect. Transects can also be combined with photopoint monitoring or permanent monitoring locations at set intervals along the transect where seeding regeneration or planting success may be recorded in more detail. See Monitoring Technique D – Monitoring plant regeneration *for more details.*

Transects are generally used where it is impractical to monitor an entire site, the aim being to sample a representative portion of the site. If there is limited time or resources available for monitoring, this technique can be useful to obtain basic information. In this case, make sure that the method for setting up the transect is standardised and tailored to the amount of time available and that the major species of interest at the site have been included. It is better to use several (often 3 are used) smaller transects than one large one, because it will allow the user to be more confident that the results are truly representative of the whole site (see ***Section 1.3.5****).*

Quadrats are square, rectangular or sometimes circular areas of a particular size used to sample an area of vegetation. Like transects, they are used as a representative sample of the site, particularly when it is impractical to measure characteristics over a whole site. They can vary in size from 0.25 m^2 for monitoring germination in a direct seeding site, to more than 100 m^2 (10 m x 10 m) for measuring vegetation structure or density of plants 3 years after planting and up to 2,500 m^2 (50 x 50m) for monitoring for recovery of vegetation following a fire event. They can be combined with transect sampling. This is most often done by placing a set of quadrats at set intervals along the transect line (see Figure 4 below). Take a look at the examples of transect and quadrat sizes used in the table below. These give a rough indication of appropriate transect dimensions.

Survey focus	Dimensions (examples)
Canopy tree coverage	Three transects of 50 m x 10 m
Understorey shrub density planted in rows	Three transects of 25 m
Grasses and herbs	Three 1 m x 1 m quadrats along a 20 m transect
(take several quadrat samples from fixed points along a transect)	

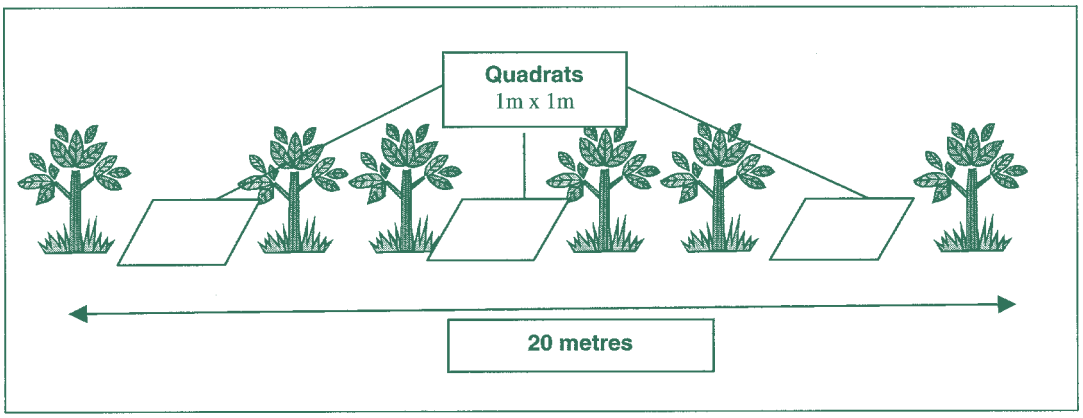


Figure 4: Quadrat placement along a transect

Three 1m x 1m quadrats can be used for more intensive and standardised recording of seedling regeneration when placed along a 20 m transect.

C. Combining quadrats and photopoints

Figure 5 shows the suggested layout for a permanent transect and photopoint. The technique is set out below.

Selecting and marking the transect

Step 1. Select an area within the project site that is generally representative of the vegetation to be monitored.

Step 2. Measure out a transect line (for example 100 m) and stake with star pickets or 3" x 3" hardwood or treated pine posts at either end as indicated by the 'permanent transect' line in Figure 6, p. 35.

Step 3. Establish a permanent photopoint by recording the GPS position if possible at the reference photopoint picket. The GPS location is useful for recording monitoring positions on a map.

Step 4. Place three more star pickets 10 m apart at right angles to the transect in a T formation. This gives a 2 dimensional record of the photopoint area when all pickets are held within the camera field of view.

Other information may also be collected at points along each transect, such as:

- *general transect notes;*
- *a plant species survey;*
- *plant regeneration;*
- *planting success; and*
- *a weed coverage assessment.*

The information recorded here should be compared with future survey sheets to help determine any changes that may occur over time. To save time, use the same transect for doing multiple assessments (e.g. bird observation or weed coverage assessment).

***Record Sheet 4** (p. 34) is provided to assist with recording information from vegetation transects.*

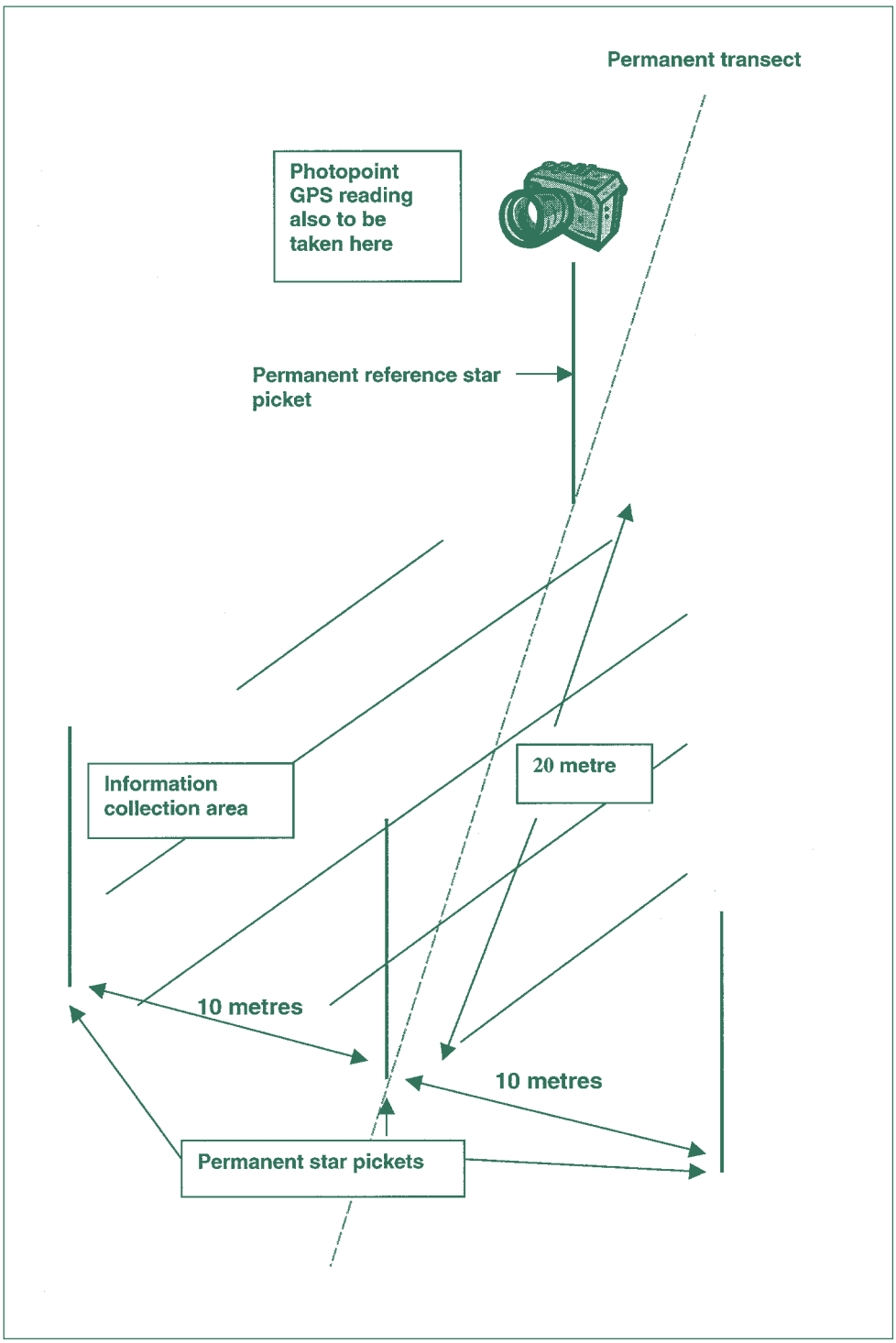


Figure 5: Layout of a photopoint constructed on a permanent transect.
Construction uses 4 permanent pickets in a T formation, giving a 2 dimensional record

RECORD SHEET 4

Vegetation transect notes

Project Name: ..... **Project location:** .....

Recorders Name: ..... **Date recorded:** .....

Tick if applicable

In the transect identify which of the following apply:

Soil / Habitat	Fauna	Vegetation
Heavy leaf litter, twigs	evidence of rabbits	a range of tree ages
Evidence of active erosion	evidence of foxes	signs of insect attack
(gullies or rills, exposed roots)	bird calls	degraded vegetation
Large patches of bare earth		fungal disease
large loose rocks		signs of dieback
Signs of salinity present		exposed roots
Fallen hollow logs		signs of dieback
site degraded by stock		aquatic plants
Other _____		regrowth
_____		domination by weeds
_____		branch tips with no leaves
_____		an understorey of shrubs
_____		regeneration evident

Measurable attributes

% weed cover = ...	No. weed species = ...	No. regenerating species = ...
% canopy cover = ...	Canopy height (m) = ...	% Ground cover = ...
Soil pH = ...	Soil litter depth (mm) = ...	

Management actions/project activities conducted within transect

.....
.....
.....
.....
.....
.....

Additional notes: (i.e. time of year, climate, rainfall patterns, average temperature or unusual events)

.....
.....
.....

Notes (whether the site is patchy or consistent in terms of soil, vegetation or hydrology may also be noted)

.....
.....
.....

D. Monitoring plant regeneration

This technique is useful for sites where direct seeding or natural regeneration has occurred, or where seedlings have been planted randomly. For sites where seedlings have been planted in rows, see Monitoring Technique E – Monitoring planting success.

Monitoring the success of planting efforts should usually only be necessary on a yearly basis, although records of what has been planted, where and when should be kept on an on-going basis.

For small sites, it may be possible to assess the performance of the entire area. For larger plantings, this may be overly time consuming. This method, and the one in Monitoring Technique E, *will reduce the amount of time needed to spend monitoring, yet provide good estimates of the results.* ***Record Sheet 5*** *(p. 39) may assist with recording plant regeneration.*

If monitoring plant regeneration following a fire, information about the fire conditions and types of regeneration patterns that follow could also be recorded. This may assist in understanding the kinds of fire regimes that lead to desired regeneration patterns.

Assessing species survival

Although the following method will provide information about the overall survival rate of plants at the site, the results will not provide any information about the number of species present. To overcome this, the total number of species present at each observation can be recorded and compared with the number planted, or these methods could be used to count individual species.

This method can provide the following information:

- *plant density (of tubestock planted randomly) expressed as plants per hectare;*
- *an estimate of the total number of surviving plants (where the total area of the revegetation site is known or can be estimated); and*
- *the survival rate expressed as a percentage (where the total number of seedlings planted is known).*

The following steps demonstrate the assessment process with specific examples that show how the calculations are made. Remember, the length of the transect may be varied depending on the circumstances.

Step 1. *Randomly select 2 transects of 150 metres within the revegetation site and mark them with pegs. The distance can be paced.*

Step 2. *Randomly select 3 points along each transect that are at least 20 m apart and mark them with pegs (see Figure 6 below).*

Step 3. *At each point selected on the transect, set up a 10 m x 10 m square quadrat and count the number of living plants within each square (see Figure 6). The species of the plant should also be recorded.*

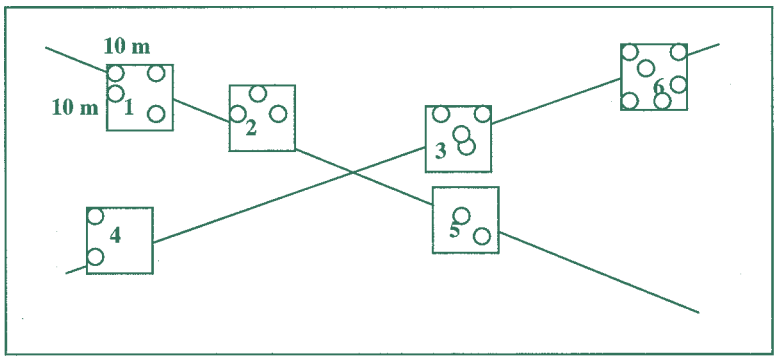


Figure 6: Setting up transects for monitoring in a randomly planted revegetation site

Two transects are shown marked in a revegetation site with 3 quadrats of 10 m by 10 m along their lengths.

Step 4. To calculate the number of plants/stems per hectare (density) in each quadrat, multiply the number of plants in each of the 10 m x 10 m squares by 100.

Step 5. To obtain the density of plants over the whole site as plants per hectare, add the number of plants calculated above and divide by 6.

Quadrat	Number of plants counted	Density (per hectare)
1	4	400 plants
2	3	300 plants
3	4	400 plants
4	2	200 plants
5	2	200 plants
6	6	600 plants
Total	**2100**	

Density of plants per hectare = 2100 ÷ 6 = ***350 plants per hectare***

Assume for this example that a) the total area of the revegetation site is 2 hectares; and b) a total of 3,500 seedlings were originally planted. Using these assumptions, it is possible to estimate the total number of surviving plants and the survival rate (as a percentage).

Step 6. To estimate the total number of surviving plants, multiply the density of plants per hectare by the number of hectares:
350 plants per hectare x 2 hectares = ***700 plants in the revegetation site****.*

Step 7. To estimate the survival rate in the two hectare revegetation site, divide the number of plants by the total number of seedlings planted and multiple by 100:
(700 ÷ 3500) x 100 = ***20% survival****.*

E. Monitoring planting success

The following method is useful for sites where tubestock or direct seeding has been planted in rows. Please note: *Projects seeking to achieve increased biodiversity within revegetation sites may wish to consider alternative planting patterns that better reflect natural plant growth. Alternative patterns may provide greater environmental and biodiversity outcomes than planting tubestock or seed in rows.*

Generally, it should only be necessary to monitor sites using this method on a yearly basis. However, records of what was planted, where and when should be kept on an on-going basis.

This method can provide the following information:

- *the survival rates of seedlings expressed as a percentage;*
- *the plant density expressed as plants per hectare; and*
- *an estimate of the total number of surviving plants (if the length of the rows and the area of revegetation is known).*

Step 1. Before visiting the site, choose the row numbers to be reviewed randomly (for example, the 4th and 7th rows). Where possible, avoid selecting the outer rows to reduce the edge effects.

Step 2. Within the two rows, randomly mark 3 lengths of 20 metres with pegs (see Figure 7, p. 37). To ensure that the selections are random, the lengths may be selected before arriving at the site (e.g. nominate lengths at 30 m, 70 m and 100 m along the row). The last 10 metres of the rows should be avoided to limit edge effects.

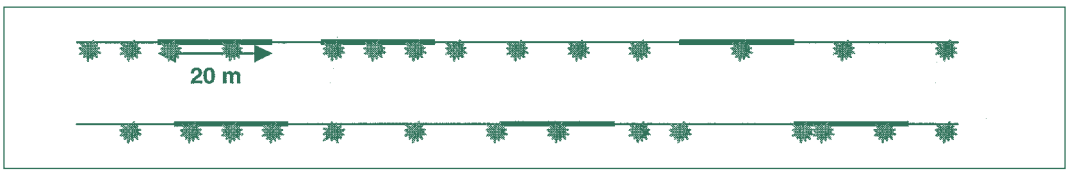


Figure 7: Transects for planting in rows
Twenty metre lengths should be marked at 3 intervals along pre-selected rows.

Step 3. If it is difficult to estimate the original distance between each plant (as a result of plant deaths), the average distance will need to be estimated. Selecting an area within the rows where it is clear that consecutive plants are surviving can do this. Measure this distance to the nearest metre at 3 points and calculate the average distance between consecutive plants (see Figure 8 below).

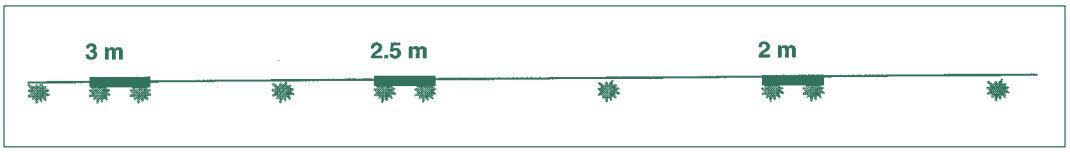


Figure 8: Measuring distance between plants

In Figure 8 above, the distance between consecutive plants is 3 m, 2.5 m, and 2 m which averages out to 2.5 m.

Step 4. To calculate the number of plants originally planted in each of the twenty metre lengths above, divide the length by the average distance between plants:
20 m ÷ 2.5 = ***8 plants originally planted in each twenty metre length****.*

Step 5. To calculate the percentage of surviving plants within each 20 m length, divide the number of plants surviving by the number originally planted and multiply by 100.
2 ÷ 8 = 0.25 x 100 = ***25%***

Length	Number of plants surviving	Number originally planted	Percentage of plants surviving
1	2	8	25%
2	3	8	38%
3	1	8	13%
4	3	8	38%
5	2	8	25%
6	3	8	38%
Total	**14**	**48**	**29%**

Step 6. To calculate the average survival rate, add together the 6 estimates and divide by 6. In the example above, the ***percentage of plants surviving is 29%****.*
Assume for this example that a) 10 rows were planted in this revegetation site, each 300 metres long, giving a total length of 3000 metres of plants; and b) the total area of the revegetation site is 2 hectares. Estimating the plant density at the site (in plants per hectare) can be done in two ways.

Step 7. *Firstly, the total number of plants originally planted (if not recorded at the time of planting) can be calculated by multiplying the total number of metres planted by the number of plants originally planted in each 20 metres and dividing the result by 20:*

$$\frac{\text{3,000 (total metres planted)} \quad x \quad \text{8 (plants per 20 m)}}{\text{20 (metres)}} = \textbf{1,200 plants at the site}$$

This is then multiplied by the survival rate (i.e. 29%) to give an estimate of the total number of plants surviving, which in this case would be:
1,200 plants per hectare x 0.29 = ***348 plants at the site.***

This result is then divided by the number of hectares:
348 plants ÷ 2 hectares = ***174 plants per hectare originally planted.***

Step 8. *Alternatively, the plant density can be calculated using the average number of plants surviving in each row: 14 ÷ 6 = 2.33 plants per 20 m. This is then used in the same calculation as step 7:*

$$\frac{\text{3,000 (total metres planted)} \quad x \quad \text{2.33 (plants surviving per 20m)}}{\text{20 (metres)}} = \textbf{349.5 plants at the site}$$

This is then divided by the number of hectares: 349.5 plants ÷ 2 hectares = ***174.75 plants per hectare surviving****.*

Record Sheet 5 *(p. 39) may assist with monitoring regeneration and planting success.*

RECORD SHEET 5

Monitoring Regeneration and Planting Success

This record sheet has been designed to record the results of *Monitoring Techniques D and E*. This sheet can be used to record data for all species or for individual species at the site. The species list for the site should be recorded as an attachment to this sheet.

Project Name: .....

Location of site: .....

Date of initial planting: .....

Planting method used: .....

Recorder's Name: .....

Size of activity area: .....

No. of species planted: .....

Observation date	Number of species present	Plant density	Survival rate	Notes
1/2/1992	*15*	*340 plants per hectare*	*89%*	*Seedlings appear to be growing well but some weed control is indicated*

F. Monitoring weeds

Recording the weed species present and the size of the population (either as number of individuals or the percent coverage of each species) helps to determine the most appropriate management technique. Monitoring such parameters indicates the effectiveness of the weed control methods, the maintenance required and the success of the native plant establishment, or whether other techniques may be required (e.g. closer tree plantings to shade out weeds).

To effectively estimate the area covered by weeds at the site, the most useful method is to set up 3 quadrats of 1m x 1m along two transects (see Figure 9 below). Within these quadrats, the area covered by weeds can be estimated.

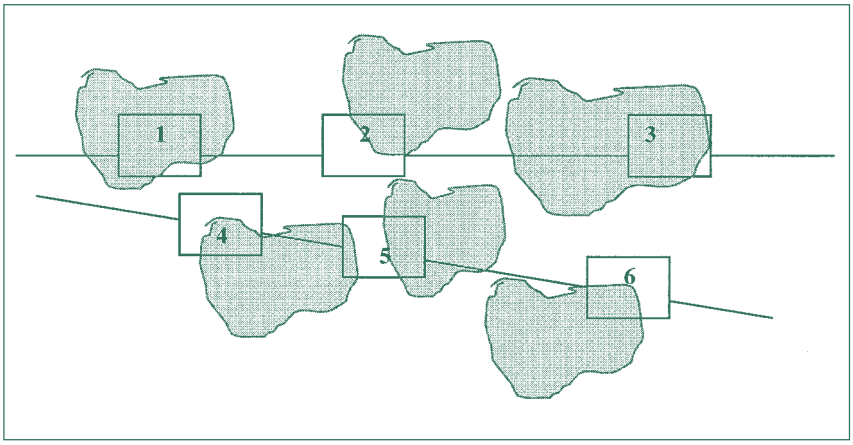


Figure 9: Setting up transects for weed density
Quadrats 1 m x 1 m.

In the example above, the following estimates of weed coverage are made:

Plot number	Percentage estimate of coverage
1	90%
2	40%
3	40%
4	35%
5	50%
6	30%
Total	**285**

To calculate the average percentage of the site affected, add each of the estimates above and divide by 6:
285 ÷ 6 = 47.5. ***The average area of the site affected is estimated at 47.5%.***

Record Sheet 6 *(p. 41) should be used to monitor the weeds within a site.*

RECORD SHEET 6

Monitoring Weeds

Project Name: ..... **Site location:** .....

First year of observation: ..... **Site description:** .....

Recorder's Name: ..... **Transect length and quadrat size:** .....

Weed species: ..... **Scientific Name:** .....

Control methods: .....

Observation date	Monitoring Location	Density	Notes (growth stage, status)	Next management action
22/3/2000	*Transect 1*	*<5%*	*Mature plants with fruit, environmental weed*	*Hand removal of remaining mature plants prior to seeding*

G. Making a vegetation quality assessment

To gauge improvements in the quality of remnant vegetation as a result of management actions, it may be feasible to make an annual (or at longer intervals) assessment of vegetation quality.

***Appendix III** and **IV** provide an assessment proforma for undertaking assessments of vegetation quality for most areas in Western Australia.*

This technique is appropriate for larger areas of vegetation within which management activities have been undertaken. It is useful for gauging the overall success of these activities in contributing to improvements in remnant quality, as well as for making assessments of the value of the bushland for participation in covenanting programs or other schemes for encouraging conservation.

*Use **Record Sheet 7** (p. 43) to record the results of your vegetation quality assessments. **Record Sheet 2** (Foreshore Condition Assessment) (p. 11) can also be used to record the condition of your riparian vegetation and to gauge improvements as a result of the projects activities.*

Wandoo woodland with attributes such as intact litter layer, no weed invasions, appropriate structure and variable age of vegetation led to the remnant being classed as having excellent value (see appendix II).

H. Monitoring and assessing foreshore condition

Completing a foreshore condition survey (see Record Sheet 2, p. 11):

Surveying the condition of a waterways foreshore:

- *provides a broad picture of the condition of your river or creek system, including vegetation health, bank stability and habitat diversity;*
- *ensures that future surveys will collect and record data in a consistent manner so that any number of people can conduct surveys over a period of time;*
- *enables you to identify areas of degradation and to target landcare works and assistance where they will do the most good; and*
- *allows baseline information to be recorded so the impact of the project activities can be monitored and evaluated.*

By conducting the survey you will identify two indicators of foreshore condition for your river section.

1. *A foreshore grade of A, B, C and D, ranging from pristine (A) through to completely degraded (D). This grading reflects the typical process of foreshore degradation. Surveys can be done at this basic level or refined to incorporate three subcategories for each grade, as detailed in **Record Sheet 2** (p. 11).*

2. *An overall stream environmental rating, providing information on the quality and diversity of habitats. Floodway bank and vegetation, verge vegetation, stream cover, bank stability and erosion, habitat diversity and surrounding landuse are used as assessment parameters to help identify the health of the habitat around the stream you are monitoring.*

Note that any of the monitoring activities outlined in the following section may be used to enhance a foreshore condition survey by monitoring specific aspects of foreshore health in more detail.

RECORD SHEET 7

Vegetation quality assessment results

Project Name: .....

Site location: .....

First year of observation: .....

Site description: .....

Recorder's Name: .....

Management activities undertaken at site:

.....

.....

Observation date	Monitoring Location	Assessment rating	Assessment of remnant quality	Next management action indicated by assessment
22/3/2000	*Transect 1*	*42*	*Very high*	*Some weed control indicated, fence at north end needs to be repaired.*

Conducting a foreshore condition assessment

The following method outlines a few simple steps for conducting a foreshore condition assessment:

Step 1. Traversing the foreshore areas prior to the survey to gain familiarity with the area and to assess the range of condition and general accessibility.

Step 2. Dividing the foreshore area into relatively homogenous sections, delineated on the basis of vegetation structure or landuse. A 'paddock scale' form is used to assess the condition of the stream foreshore on a block of land used for farming. If you have a number of paddocks with stream foreshore, a corresponding number of forms will be used. In areas with dense foreshore vegetation on both banks of the river, each side should be surveyed separately with survey forms completed for each side. On highly degraded rivers where the foreshore along both banks is easily observed from one side, and the vegetation and disturbance factors are similar, a single survey form may be used.

Step 3. Working through the Foreshore Condition Assessment Form and Guide (see ***Record Sheet 2,*** *p.11) to determine overall foreshore condition. The assessment form allows you to collect the following information:*

- *general condition of the foreshore area – A, B, C or D grading;*
- *fencing status and stock access;*
- *bank steepness and general soil cohesion;*
- *major erosion of siltation features; and*
- *overall stream environmental rating.*

A synopsis of the method has been provided here. For a full description, please refer to Water and Rivers Commission (1999a). A similar methodology has been developed for foreshore condition assessment in urban and semi-rural areas and can be found in Water and Rivers Commission (1999b).

3.1.2 Monitoring fauna activities

Managing or rehabilitating the native vegetation at the project site will encourage fauna. Why should we do this?

- *Native fauna of temperate woodlands may become locally extinct if nothing is done to improve the management of their natural habitat.*
- *Increasing or stable diversity indicates that human management is contributing to a viable ecosystem.*
- *Many animals and birds eat insect pests, keeping a balance between species.*
- *Some bird and frog species are useful indicators of the health of bushland, watercourses and native grasslands.*

Each native animal species at the site is there either permanently or temporarily because suitable habitat is present. Some species are generalists and able to live in many different places, while others are specialists, confined to habitat such as bushland, native grasslands, wetlands or watercourses. Undertaking an assessment of the sites within the project will identify potential habitat areas. See Box 1 (opposite) for further facts about fauna.

Before undertaking any trapping or handling of animals, In Western Australia advice should be sought from the local Department of Conservation and Land Management office about any licences required and techniques for handling the animals that may be encountered.

Survey techniques are wide ranging. Some common methods include:

- *sampling using nets: insect nets for butterflies; dip nets and small seines for fish;*
- *catch and release fishing competitions with fish numbers and identity recorded (these give an indication of fish populations and waterway health);*
- *pitfall traps for insects and reptiles (these are small pits dug into the ground that animals fall into);*
- *assessment of any road kills (identify animal species and size);*
- *identifying tracks using a sand plot (see Box 2, p. 47);*
- *diving in clean dams and waterways with snorkel and goggles to identify turtles (submerged aquatic plants may also be recorded at this time); and*
- *identifying bird and frog calls and using binoculars for bird sampling.*

Specialised skills in handling fauna are needed to minimise injury and stress to the animal. In addition, animals (including insects) should always be returned to the same place they were collected, as soon as possible and unharmed.

The simplest method is to carry a notebook when visiting the project site. Notes about any fauna seen may be recorded for later entry on to the appropriate form. Over several years it should be possible to make some comparisons that give some insights into the wildlife and patterns of change in wildlife activity that may be occurring at the site.

Box 1 Some facts about fauna habitat

Do any of the following facts about fauna habitat apply to your project site, or can some of your sites be improved?

- *If the region where you will be undertaking your project contains no suitable habitat for a particular species that was known to occur in the region, then it is unlikely that the species will be found at the project site. For example, a small native marsupial that requires dense grass cover or grassy clumps within Eucalypt woodland for nest sites will not be found in the area if these requirements are not met.*
- *The area of available habitat will limit the range and abundance of species present in each habitat type.*
- *The greater the number of different habitats present, the greater the number of species likely to be present.*
- *Small patches of specialised habitat have value, particularly if they are interconnected.*
- *Given time, habitat areas can be created or rehabilitated in appropriate places that can in turn promote greater land productivity.*
- *Good habitat for particular species provides places for them to live, breed and feed and provides protection from predators.*
- *Some species will rest or nest in one type of habitat but feed in another habitat. These can be kilometres apart.*
- *Degraded habitats can often be dominated by one or two common species (e.g. galahs).*
- *Habitats that provide resources all year round are likely to remain attractive to a range of species.*
- *Important factors contributing to habitat include landform, elevation, aspect, moisture/water, plant species, distribution and abundance, plant species present (diversity) and the structure and arrangement of plant species in the landscape (trees, shrubs, grasses, herbs, logs, litter, etc.).*
- *As a general rule, to attract wildlife it is important to provide a range of habitats (e.g. trees, shrubs, limb hollows).*
- *Habitats are always changing due to factors such as plant growth and decay and the effect of browsing by wildlife, insects, fire, and seasonal influences, such as flood, drought and frost.*
- *Consider enhancing fauna habitat by adding logs, rocks, bird boxes, hollow logs or bat boxes to the project site to encourage utilisation of the site in the early stages.*

The following sections I to M (mammals, birds, reptiles, frogs and macroinvertebrates) will provide more detailed methods of surveying wildlife or recording observations. It may be appropriate to enlist the help of local wildlife enthusiasts to assist with the survey and to impart some skills to the group (e.g. local bird or frog enthusiasts, university students or researchers, field naturalists, bird observers clubs and Nature Search volunteers). Help may be sought from a Museum for specimen identification.

The Department of Conservation and Land Management is particularly interested in observations of threatened fauna (a list of threatened fauna as well as flora is available at http://www.calm.wa.gov.au/plants_animals/watscu_lists.html). If threatened fauna are observed at the site, complete the threatened fauna report form attached to ***Record Sheet 8*** *(p. 48) and send it to the nearest Department of Conservation and Land Management office or to the address on the form.*

It is also recommended that adjacent areas of remnant vegetation be surveyed to find out what species occur in the area. The requirements for these species can then be replicated in the project area. A better understanding of species requirements will also enable a better interpretation of the monitoring results.

I. Mammal survey techniques

This section deals with native mammals (not introduced species such as pigs, rabbits, hares, foxes, dogs, cats etc). The techniques used to identify mammals are relatively simple, but perseverance is required.

Survey techniques

1. *Search for scats (droppings), animal remains such as skin, hair, bones, markings on trees, foot prints, diggings, sounds etc.*
2. *Look under logs, leaf litter and observing streams at dawn/dusk.*
3. *Spotlight (with binoculars handy) from a slow moving vehicle or walking along tracks.*
4. *Spotlight in woodland, forest, road verges, watercourses and dams to observe larger mammals such as kangaroos, possums, woylies and bats.*
5. *Set up sand plots for tracks.*
6. *Spotlight in flowering or fruiting trees for possums.*
7. *Trap using Elliot traps for small mammals or cages for possums. Some training by an expert will be required in order to do this effectively and without causing undue stress to the animals. Licences for trapping and handling native fauna are also required. Check with the Department of Conservation and Land Management (in Western Australia) or similar agency in other States/Territories.*

Record the presence of any mammal along with any other general observations. ***Record Sheet 8*** *(p. 48) provides a suggested format for a fauna observation record sheet.*

Hint: *Gather scats or droppings and test for seed germination in the nursery by placing on sterile potting mix in pots or trays. This may provide some clues about what plants the animals are eating and the species they are dispersing. This may assist in selecting plants for the project site.*

Box 2 Sand plotting technique

Although the best way to identify the animals in bushland is by seeing them up close, the survey techniques to do this require skilled people and may involve a risk of injury or stress to the animal, especially if they have to be caught in a trap. One way to identify animals that are small, nocturnal, secretive or not often seen is to use a sand plot. This involves clearing a series of square plots of sand in bushland and burying a bait or lure in the centre. As the animal walks onto the plot to investigate the bait, it leaves tracks in the sand that can be used to identify it.

Identification of animals
Although it may not be possible to use the tracks to identify the species of animal, it should be possible to identify the type of animal eg. kangaroo, wallaby, possum. Using a guidebook for identifying scats (droppings) and tracks will help to better identify the animals. A guidebook should provide information about which animals are likely to be found in the area, and the types of habitat they prefer.

When to use the technique
Tracks are most easily identified in clean, firm and slightly damp sand. Tracks are best viewed in the early morning before the sand has dried and the wind has blurred them, and are more easily seen when the sun is still low in the sky.

How to set up a sand pad
Where sand occurs naturally at a survey site, plots can be made by clearing and raking smooth a square. Where sand occurs along vehicle tracks and firebreaks, the technique can be expanded to 1.5-2 metre wide strip by attaching a heavy drag to a vehicle. In some cases, sand will have to be brought in to create the sand plots. The best sand to use is the yellow 'brick-layers sand' often used on building sites. ***It is very important that this sand is clean and declared free of*** **Phytophthora spp** ***and other known plant pathogens and is weed free****.*

Sand plots are generally about one half (0.5 m x 0.5 m) to one square metre in size (1 m x 1 m), large enough to ensure that any animal coming to investigate the bait or lure cannot reach it without setting foot on the sand. The bait or lure can be a small cube of meat or a ball of bait made from peanut butter, oats and sardines and placed in the centre of the pad, either on top of the sand or buried just below the surface. Burying the bait prevents birds such as ravens and currawongs from removing it and also provides some protection from ants.

The distance between the sand plots will depend on which species are being targeted and the size of the area being surveyed. For small carnivorous mammals (e.g. phascogales and dunnarts) and rodents, sand plots can be as close as 50 m. For medium-sized mammals (e.g. chuditch, quenda, woylies and possums) and as a general-purpose survey, 100-200 m is a better distance between sand plots. The sand plots can be split up into separate transects of 10-20 plots each to cover a wider area and range of habitats. If an existing firebreak is being used as the sand plot, then the entire length of the firebreak can be used, but obviously this will take longer to check in the morning. It is not necessary to place baits or lures any closer together than 100-200 m on continuous plots on firebreaks.

RECORD SHEET 8

Fauna Observations

Project Name: .... **Recorder's Name:** .... **Year:** ....

Site Location: ....

....

Common Name	Date Observed	Weather conditions on day	Location (map reference or GPS reading if available)	Time	Notes (i.e. seen or heard mammal, male, female, vegetation types observed in, dawn/dusk, general conditions etc)
Kangaroo	*12/7/2000*	*Cold/cloudy*	*E 115 34 06.3* *S 34 12 16.5*	*6.40pm*	*In a mob of thirty, some with joeys, by the dam*

Threatened fauna report form

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

FILE#_____ PRECISION: _____ DATABASE RECORD#_____
SPECIES _____ NO. SEEN:_____
DISTINGUISHING FEATURES OBSERVED: _____ _____
_____

CERTAINTY OF IDENTIFICATION: ☐ Very certain ☐ Moderately certain ☐ Not sure

AGE AND SEX:
No. of Adults: _____Male _____Female _____ Sex unknown
No. of Juveniles: _____Male _____Female _____ Sex unknown

COLLECTOR/OBSERVER: _____ PHONE NO:_____
SURVEY DATE: _____ TIME:_____
SHIRE:_____CALM REGION:_____
LOCALITY:_____
_____
MAP REF:_____CALM MAP NAME: _____Grid Reference_____

(Complete one line ONLY)

Latitude ☐☐° ☐☐ ☐☐ S Longitude ☐☐☐° ☐☐ ☐☐ E

AMG Zone ☐ 49 ☐ 50 ☐ 51

Northing ☐☐☐☐☐☐☐ Easting ☐☐☐☐☐☐

LAND STATUS:
☐ Nature Reserve ☐ State forest ☐ Private Property ☐ Road Verge Shire
☐ National Park ☐ Vacant Crown Land ☐ Road Verge MRD
☐ Pastoral Lease ☐ Other reserve ☐ Unknown

VEGETATION TYPE:
☐ Forest Significant species _____ ☐ Grassland
☐ Woodland Significant species _____ ☐ Sedgeland
☐ Mallee Significant species _____ ☐ Rock communities
☐ Tall Shrubland Significant species _____ ☐ Wetland
☐ Heathland Significant species _____ ☐ Other_____

OBSERVATION/COLLECTION METHOD:
☐ Daylight sighting ☐ Night sighting ☐ Heard ☐ Caught or trapped ☐ Diggings
☐ Droppings ☐ Feathers ☐ Bones ☐ Dead ☐ Other

BEHAVIOUR:
What was the animal doing?_____

BREEDING:
☐ Pregnant ☐ Lactating ☐ Mating ☐ Male in breeding colours ☐ Eggs/young in nest ☐ Other

FIRE HISTORY:
☐ Not known Year burnt_____ Month (approx)_____
☐ Next prescribed burn: Year _____ Month_____

CURRENT LAND USE:
☐ Nature Conservation ☐ Agriculture ☐ Pastoralism ☐ Mining
☐ Forestry/Multiple purpose ☐ Recreation ☐ Other

FERAL ANIMALS:
Habitat damaged by feral animals ☐ Yes ☐ No ☐ Unknown
Feral species and damage type_____

SPECIMEN:
☐ Retained by collector ☐ WA Museum ☐ Other_____ ☐ Not retained

ATTACHED: ☐ Map ☐ Mud map ☐ Photo ☐ Notes
ACTION, TAKEN/REQUIRED:_____

OTHER COMMENTS: _____

COPY SENT TO: ☐ Regional Office ☐ District Office ☐ Head Office

Signed:_____ Date:_____

PLEASE SEND COMPLETED FORM TO SENIOR ZOOLOGIST, WILDLIFE BRANCH, DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT, LOCKED BAG 104 BENTLEY DELIVERY CENTRE W.A. 6983

[RECORD NO.]

J. Bird survey techniques

As most birds eat insects or nectar, they play a large part in reducing insect numbers around the farm and aid in the pollination of many native plants.As a general rule, the greater the diversity in vegetation, the higher the diversity (the number and variety) of birds and animals.

Bird watching can be an enjoyable experience for all age groups. With a little practice, a bird identification book and some patience, most people will soon be able to identify birds by both their appearance and their calls. There are three main ways to observe birds. The first two involve the use of binoculars, while the other involves nothing more than careful observations while carrying out general project activities. Reliable, repeated (and repeatable) surveys will be of most value.

Survey techniques

1. *Walk slowly through the project site for a particular time and distance and observe carefully the various birds encountered. New birdwatchers may find it helpful to refer to pictures and descriptions in a field guide.*
2. *Sit down in a piece of bushland or near a watercourse and wait for birds to approach. A small bird call device available from some nature stores is quite useful for calling the small species of birds (e.g. wrens, finches, honeyeaters etc.)*
3. *Select several sites and go to the same site each season, record or count the birds seen or heard for a set amount of time (e.g. 20 minutes) and a given area (say 2 hectares) and record the bird species present at each site.*

It may be more convenient to carry a small notebook and bird field guide during everyday activities. As birds are observed, jot notes down about them, along with a concise description and enter them into a more formal record when convenient.

The best time to observe most species of birds is the early morning or late afternoon. Many of the smaller birds prefer the shrubby understorey or grass area because this is where food is found (e.g. insects, fruit and seeds), there is protection from predators and there are nesting sites. During the hot middle of the day, birds are usually resting. However, if there is an area within the project site with permanent water and thick surrounding shrubs, a number of species may be observed at this time.

Remember! *Record the date, time observed, and presence of all birds found!*

*The bird observation record sheet (**Record Sheet 9**, p. 52) provides a list of the birds likely to be found in most bushland areas. The greater the number of different species found, the greater the diversity present in the bushland. Use this sheet to record the different types of birds present in your bushland.*

RECORD SHEET 9

Bird Observations

Project Name:	Recorder's Name:	Date:
Site location:		

Species	Yes	Species	Yes	Species	Yes
Cockatoos and Parrots		**Honeyeaters and Chats**		**Swallows and Martins**	
Red-tailed Black Cockatoo		White-eared Honeyeater		Welcome Swallow	
White-tailed Black Cockatoo		Brown-headed Honeyeater		White-backed Swallow	
Carnabys Black Cockatoo		Spiny-cheeked Honeyeater		Tree Martin	
Pink and Grey Galah		New Holland Honeyeater		Fairy Martin	
Corella		Singing Honeyeater			
28 - ringneck		Yellow-plumed Honeyeater		**Owls, nightjars and frogmouths**	
		Brown Honeyeater		Southern Boobook	
Hawks, Eagles and falcons		Tawny-crowned Honeyeater		Barking Owl	
Black Shouldered Kite		Crimson Chat		Masked Owl	
Brown Goshawk		White-fronted Chat		Barn Owl	
Australian Hobby (Little Falcon)		Red Wattlebird		Owlet Nightjar	
Australian Kestrel		Yellow-throated Miner		Tawny Frogmouth	
Spotted Harrier					
Peregrine Falcon		**Robins, Whistlers and Shrike-thrushes**		**Waterbirds**	
Wedge-tailed Eagle		Red-capped Robin		Black Swan	
Little Eagle		Jacky-Winter		Australian Shelduck	
Brown Falcon		Golden Whistler		Australian Wood Duck	
		Rufous Whistler		Grey Teal	
Pigeons		Grey Shrike-thrush		Musk Duck	
Common Bronzewing		Western Yellow Robin		White-faced Heron	
Crested Pigeon		Southern Scrub-robin		Straw-necked Ibis	
				Australian White Ibis	
Crows and Ravens		**Fairy wrens and scrub wrens**			
Australian Raven		Splendid Fairy-wren		**Other**	
Little Crow		White-winged Fairy-wren		Magpie-lark	
		Shy Hylacola		Richard's Pipit	
Fantails and Flycatcher		Rufous Fieldwren		Bush Stone-curlew	
Grey Fantail				Striated Pardalote	
		Thornbills		Mallee fowl	
Restless Flycatcher		Yellow-rumped Thornbill		Magpie	
Willie Wagtail		Chestnut-rumped Thornbill		Emu	
		Western Thornbill		Mistletoe bird	
Sitellas and Treecreepers		Inland Thornbill		Black-faced Cuckoo Shrike	
Rufous Treecreeper				Western Gerygone	
Varied Sitella		**Kingfishers & Bee-eaters**		Weebill	
		Rainbow Bee-eater		White-browed Babbler	
		Sacred Kingfisher			

K. Reptile survey techniques

There are a number of different techniques you can try to locate reptiles in your project sites.

Survey techniques

1. *Systematically search bushland, rocky outcrops, under bark, rocks and logs, and along creeks and rivers;*
2. *Look out for them while undertaking project activities;*
3. *Make use of local knowledge;*
4. *Spotlight along tracks at night (most geckos are nocturnal). Note the "eye-shine";*
5. *Set up pit-fall traps for small reptiles using plastic containers (e.g. ice cream or large yoghurt containers) buried flush with the soil surface. Check regularly to minimise casualties and place lids over traps with not in use. Avoid building larger ones so that snakes are not trapped. Again, check licensing requirements with the WA Department of Conservation and Land Management or relevant agency in your State or Territory; and*
6. *Take photos and send them to an expert for identification.*

Box 6 General Points to Remember

- *Reptiles are more difficult to observe and locate due to their shy nature.*
- *Tortoises/turtles prefer aquatic habitats and are often only observed in farm dams or crossing roadways.*
- *Snakes may be dangerous.* ***Do not pick up, try to kill or attempt to catch them.*** *They can be observed from a distance and particular markings on their skin noted for identification.*
- *Lizards can be tricky to identify and some may require gentle handling to correctly identify. Avoid handling wherever possible.* ***Do not attempt to handle a goanna more than 50 cm long as they can be dangerous.***
- *Use a combination of reptile identification books and local knowledge to help identify different species (see* ***Appendix I****).*

Remember! *Record the date and presence of all reptiles found and don't forget to indicate which habitat type they were found in, what they were doing, time of day, weather and the climate. The information should be recorded every* ***6-12*** *months using the fauna observations record sheet (****Record Sheet 8****, p. 48).*

L. Frog survey techniques

Frogs are sensitive to many chemicals, particularly those that end up in waterways. Therefore it is a good idea to consider the extent of chemical use in the area (e.g. neighbouring industrial sites or agricultural enterprises). The number and/or presence of frogs can provide a guide to the health of streams in the project area. If few frogs were found when water was present during the Spring breeding period, then this suggests that the stream was in poor health (e.g. from salinity). For this reason, frogs are often referred to as environmental indicators. As well as being indicators of stream health, frogs make a very positive contribution to ecology through their ability to consume many insects that attack pastures and crops.

For the above reasons, it may be quite useful to be aware of how many frogs are present, or if they are present, to determine the health of bushland or habitat areas in the project.

All 39 species of frogs in Western Australia are harmless. It is also useful to know that there are no native toads in Australia.

Survey techniques

Frogs, particularly at night, are often hard to locate. The following methods and observations may be useful and remember, a quality frog identification book is quite useful.

1. *Listen to the range of frog calls, particularly at night in spring and early summer after rain, to try and determine the presence and/or number of frogs. The Frogwatch tape may be useful here.*
2. *At night, track down a calling frog using a torch or portable spotlight (look for 'eye-shine'). Use a dip net and spotlight to catch frogs. Place the frog in a jar with some damp paper towel for later identification. Always return frogs to the place where they were captured.*
3. *Search around creeks, rivers and dams during the day, looking under logs, stones. bark and leaf litter. Some frogs can be found in old equipment after rain.*
4. *Walk through bushland, on farm tracks and open paddocks to see frogs at night, particularly after rain. Use a spotlight. Two people walking from different directions can make frog location easier, as the cross-over point of their torch beams can assist in identifying where the frog is hiding.*
5. *Playing a tape/CD of frog calls can encourage frogs to call at night while also helping to identify frogs by their call. This may enable the detection of species that are otherwise difficult to find.*
6. *Recording the frog calls and then sending the tape to the museum with an identification request may assist with those hard-to-identify species.*
7. *Don't rely heavily on subtle colourings for identification, as some frogs can change colour.*

Remember! *Record the date and presence of all frogs found and don't forget to indicate which habitat type they were found in, what they were doing, time of day, weather and the climate. The fauna observations record sheet (**Record Sheet 8**, p. 48) can be used for these records.*

M. Macroinvertebrate survey techniques

Like frogs, macroinvertebrates are useful biological indicators in aquatic systems. If there is a change in the water quality, or a change in flow then the macroinvertebrate community will also change. Therefore, the richness of the macroinvertebrate community composition in a waterbody can be used to measure the impact of pollution, identify water quality trends, collect baseline data, evaluate the outcomes of restoration activities and provide an estimate of waterbody health.

Survey techniques

Step 1. Select your site, with safety in mind.

Avoid sites that have steep, slippery or unstable banks, or are adjacent to deep, fast flowing water. Do not sample alone, or at a site that has a potential algal bloom.

Step 2. Determine frequency of sampling.

Limit sampling to four times a year to keep the impact of sampling to a minimum. It is important that sampling reflects seasonal changes while ensuring that over-sampling does not occur. Generally, macroinvertebrates are found at their highest diversity when water levels are beginning to recede and temperatures begin to rise. For example, in Western Australia, for rivers this would be in late winter and spring, and for wetlands in spring and early summer.

Step 3. Ensure you have the appropriate equipment.

*Waders/boots, sampling net (mesh size of 250 µm/0.25 mm), buckets, sorting trays, plastic spoons/pipettes, ice-cube trays, magnifying glass, identification key, Macroinvertebrate Data Sheet (**Record Sheet 10**, p. 57).*

Step 4. Collect specimens.

Sampling needs to be conducted for at least 5 minutes to ensure the greatest diversity of macroinvertebrates is collected. Only one or two people should enter the water at a time. Using the net, there are two different methods of sampling:

a. A kick sample is used for flowing water with mainly rocky bottoms (riffles). The sediment and stones are disturbed immediately upstream of the net by stirring it up by shuffling and kicking with waders or boots. The animals are dislodged and are swept downstream into the net.

b. A sweep sample is used in deeper water or muddy bottoms and for sampling along banks and amongst vegetation. Bounce the net against vegetation, logs and over the bottom to dislodge any animals that might be attached and stir up the sediment. Use the net in a scooping motion to collect the macroinvertebrates that are dislodged.

Step 5. Sort the sample immediately.

Keep all samples out of the sunlight (heat) and well oxygenated. Gently mix the sample in a bucket to ensure that the contents are evenly distributed. Empty some of the sample into a white tray, which has about 2 cm of clean water from the site. Too much of the sample might make visibility difficult. Collect macroinvertebrates using only a plastic spoon, brush or pipette, carefully avoiding damaging the animals, and transfer into a white ice-cube tray for closer observation. Make sure the ice-cube tray also has clean water from the site in the compartments. The sorting process should take a minimum of 20 minutes, as some macroinvertebrates are quite hard to find.

Step 6. Identify and record your sample.

*Use a magnifying glass or microscope and identification key. Classification is generally a combination of order and family level. Mark down on **Record Sheet 10** what you have found. Count each type of organism only once. Also make notes about abundance and any other observations in the comments column.*

Step 7. Return macroinvertebrates to the place where they were collected within 1 hour.

Check to make sure that no animals have been left on equipment such as nets, trays, buckets, etc. Remember that all native fish and amphibians are protected.

Step 8. Evaluation

Data relating to riparian vegetation, fish, algae, frogs, birds, lifecycle, season, water flow and habitats should be collected to support the waterbody assessment and to explain why each animal is living at a site and how it is interacting with its environment and other organisms. Essential water quality parameters (temperature, turbidity, conductivity, pH, nutrients and dissolved oxygen) should also be taken to support the macroinvertebrate data.

For example, if nutrient testing indicates high levels of nutrients, those taxa able to cope and in some cases flourish in eutrophic conditions (such as water fleas and water boatmen), can be predicted to be present in high abundance. Alternatively, if macroinvertebrate sampling indicates a high abundance of water fleas and water boatmen, nutrient testing is appropriate to gauge the extent of the eutrophic conditions and change over time.

With further monitoring and more data it may be possible to calculate sensitivity ratings for each animal. Comparisons can be made for data collected at a site at different times of the year, or with different sites in the same catchment or stream, or with different waterbodies.

RECORD SHEET 10

Recording Macroinvertebrates

Group:_____		Site:_____	
Contact:_____		Sampling Net:_____	
Date:_____	Time:_____	Sampling time:__(*mins*)	Sorting time:____(*mins*)

Macroinvertebrate	Classification	Present (✓)	Comments
PHYLUM ARTHROPODA – CLASS INSECTA			
Stonefly larvae	Plecoptera (order)		
Mayfly larvae	Ephemeroptera (order)		
Caddisfly larvae	Trichoptera (order)		
Dragonfly larvae	Odonata (order)		
Damselfly larvae	Odonata (order)		
Water boatmen	Corixidae (family)		
Backswimmers	Notonectidae (family)		
Water scorpion	Nepidae (family)		
Water measurer	Hydrometridae (family)		
Water strider	Gerridae (family)		
Riffle beetle adult/larvae	Elmidae (family)		
Predacious diving beetle adult/larvae	Dytiscidae (family)		
Water scavenger beetle adult/larvae	Hydrophilidae (family)		
Whirligig beetle adult/larvae	Gyrinidae (family)		
Mosquito larvae and pupae	Culicidae (family)		
Blackfly larvae	Simuliidae (family)		
Soldierfly larvae	Stratiomyidae (family)		
Biting midge larvae	Ceratopogonidae (family)		
Springtails	Collembola (order)		
PHYLUM ARTHROPODA – CLASS CRUSTACEA			
Freshwater crayfish	Parastacidae (family)		
Freshwater prawn	Decapoda (order)		
Water flea	Cladocera (suborder)		
Clam shrimp	Conchostraca (suborder)		
Amphipod	Amphipoda (order)		
Ostracod	Ostracoda (subclass)		
Copepod	Copepoda (subclass)		
Shield shrimp	Notostraca (order)		
Fairy shrimp	Anostraca (order)		
Isopod	Isopoda (order)		
PHYLUM ARTHROPODA – CLASS ARACHNIDA			
Water mite	Acarina (order)		
Water spider	Araneae (order)		
PHYLUM MOLLUSCA			
Freshwater mussel	Bivalvia (class)		
Freshwater snail	Gastropoda (class)		
PHYLUM ANNELIDA			
Segmented worm	Oligochaeta (class)		
Leeches	Hirudinea (class)		
PHYLUM NEMATODA			
Roundworms	Nematoda (phylum)		
PHYLUM PLATYHELMINTHES			
Flatworms	Turbellaria (class)		
MACROINVERTEBRATE DIVERSITY (TOTAL)*			

* Add up the number of ✓'s to determine the total number of different macroinvertebrates found. The presence of various freshwater macroinvertebrates may vary according to season, lifecycle, water flow, habitat and water quality.

3.1.3 Monitoring herbivorous grazing pressure

The effectiveness of native vegetation regeneration and works to protect remnant vegetation may be inhibited to some extent by the grazing pressure at a site. Grazing by domestic stock (e.g. cattle, sheep, horses), introduced herbivores (e.g. rabbits, goats) or native fauna (e.g. kangaroos, wallabies, native grasshoppers) will all impact on native vegetation. The grazing pressure at a site by all herbivores is the known as the total grazing pressure.

A simple technique for monitoring the impact of grazing pressure involves the creation of a grazing-exclusion zone at the site. The creation of such a zone may simply involve establishing a fenced plot, using netting appropriate to exclude the herbivores known to graze the area. For example, a standard ringlock fence may be sufficient to exclude sheep, however chicken wire partially buried will be needed to exclude rabbits and netting erected to a height of approximately 2 metres will be required to exclude kangaroos. The exclusion zone is then compared with the rest of the site, using the techniques described in previous sections.

The impact of grazing at a site may be quite significant, to the extent that vegetation may fail to regenerate and plantings can be destroyed. Therefore, a vegetation monitoring system that includes the monitoring of grazing pressure is essential and management actions to mitigate the effects of grazing should be implemented as required.

Watercourses should be fenced off from stock where possible to protect the riparian vegetation and prevent erosion and damage to the bed and banks of the stream.

3.2 Monitoring social change

3.2.1 Monitoring community attitudes and understanding

Working together to improve the environment is a community bonding exercise. Whether it be urban Bushcare groups planting trees, shrubs and other native species to improve catchment health, Rivercare groups implementing a River Action Plan or Landcare members fencing valuable areas of remnant vegetation on their properties, the human interactions required to restore land can be important contributors to the development of both community and project success.

Awareness of actions, interactions and the attitudes associated with projects can also be monitored and evaluated. Collecting information about the 'social process' that groups go through to fulfil the goals of vegetation management projects can provide information on:

- *changed **attitudes** towards conservation during the life of the project;*
- *increased **awareness** of ecological values, plants and animals, and restoration techniques within the community group over the life of the project;*
- *development of **social networks** within the group and beyond, to other groups, agencies, and the wider community;*
- *improved levels of **understanding and skill** within the group; and*
- *changed patterns of **participation** in project activities.*

Information can be collected on any of the highlighted goals above at the start, during, and after the completion of the project. Monitoring 'social process' before and during a project will provide baseline information to evaluate the change in attitudes and social interactions brought about by the project. This may be important, particularly if these relate to project goals focussing on building community capacity.

Remember! *Only collect information that is relevant to the project goals or is of use to the group (e.g. to build further community support for the project).*

N. Questionnaires and interviews

Questionnaires and interviews are two techniques that may be used to gather information about the project participants and their behaviour. They usually involve a structured question-and-answer session, using a standard set of questions – either closed questions (questions that require a 'yes' or 'no' answer), open-ended questions or a mixture of both. Questions are designed to gather information about a specific aspect of the project. Interviews are also likely to include an un-structured discussion.

Both questionnaires and interviews require that standard sets of questions be repeated with a certain number of members within a target audience (e.g. all members of a Bushcare Group or all landholders within a sub-catchment).

Questionnaires and interviews are particularly useful in determining:

- *if skills, understanding and perceptions have changed during the course of the project;*
- *if there have been any unforeseen effects of the project activities;*
- *the effectiveness of activities such as working bees, newsletters, training workshops; and*
- *why people may be joining or leaving the group (entry/exit questionnaires).*

Open or closed questions

Perhaps the most important consideration when designing questions for a questionnaire or interview is the type of questions used.

Closed questions seek a 'yes' or 'no' response. For example:

Did you attend the workshop on remnant vegetation rehabilitation techniques?

The responses to closed questions provides quantitative information about the activities of the project participants / group members / landholders within the sub-catchment.

Open-ended questions encourage people to answer with a variety of answers other than a simple 'yes' or 'no'. For example:

How much do you feel you know about the plants and animals in your bushland remnant?

These types of questions encourage the respondent to provide qualitative information. However, the information received may be difficult to evaluate or quantify and people may be less inclined to prepare a response that is time consuming as may be the case with an open-ended question.

Alternatively, to quantify people's responses to make evaluation easier, answers could be encouraged along a sliding scale. For example:

How would you rate your knowledge of the plants and animals of your bushland remnant?
Please circle.

1	2	3	4	5
Very basic		Adequate		Extensive

When used at the start and completion of a project, this type of question should indicate some change in the respondent's awareness or understanding of a particular issue or component of the project. The question would be slightly different at the end of the project, for example:

How would you rate your knowledge of the plants and animals in your bushland remnant
as a result of being involved in this project? Please circle

Below is an example questionnaire that could be used to make such an evaluation. Similar questions could also be used in an interview format.

Landholder Questionnaire

Why do you wish to protect the remnant bushland on your property?

……
……
……
……

What is your vision for the future of the bushland on your property?

……
……
……
……

How many people do you know locally who are interested (OR 'actively involved' for your final questionnaire) in protecting bushland on their property?

……
……
……
……

How would you rate your knowledge of the:

Native plants in your bushland remnant	*1*	*2*	*3*	*4*	*5*
Weed plants in your bushland remnant	*1*	*2*	*3*	*4*	*5*
Animals in your bushland remnant	*1*	*2*	*3*	*4*	*5*

How would you rate your knowledge of bushland management techniques such as:

Fire	*1*	*2*	*3*	*4*	*5*
Stimulating natural regeneration	*1*	*2*	*3*	*4*	*5*
Weed control	*1*	*2*	*3*	*4*	*5*

O. Changes in people's participation

Most groups keep a record of the attendance of their members at working bees, meetings, field trips, etc. This in itself provides useful information about the involvement of people in the project.

An attendance record keeps track of who has been involved in the project in a given year and provides a record of the number of hours that group members have contributed to the project. Combined with a few simple questions, this record can yield more information about the activities and times of the year that are most popular with the group and other reasons that people attend. Questions could include:

- *What motivated you to join the group?*
- *What group activities interest you the most? Why?*
- *Who did you know in the group when you first joined?*
- *Who do you know who may be interested in joining the group?*
- *Why have you decided to leave the group?*

There are other activities that could be used to monitor community participation in the project which are not covered here. For more information see a local Bushcare Network officer, Rivercare Officer or Community Landcare Coordinator.

3.3 Monitoring project administration

Monitoring project activities generally involves monitoring both the resources used (inputs) and the progress made towards the projects goals (outputs). This is crucial to the evaluation of the efficiency or cost-effectiveness of the project.

Project inputs should be measured periodically to give an indication of how well the project is proceeding, particularly in terms of the project's budget and schedule. Cost and time are usually the most important project inputs to measure:

1. *Project expenditure should be monitored in detail, with attention paid to each task. It is important to have a planned cost for each task, and cost-sharing arrangements should also be recorded to assist with accountability later.*

2. *All projects that have volunteer hours defined as in-kind contributions require these hours to be monitored. An accurate record of volunteer time may assist the group undertake planning for future projects. It is also useful to monitor costs associated with generating these volunteer hours.*

A good project plan will have an estimated time assigned to each task. It is important to monitor how these compare with the actual times. Because many of the tasks are linked, running overtime on some parts of the project may have a serious effect on another part of the project. For example, seed collection can only be carried out at certain times of the year, and will affect planting if not completed on time.

Monitoring project outputs generally entails recording activities or tasks undertaken as part of the project. Often it is not possible to monitor all tasks and activities undertaken. In this case it is useful to select a subset of activities that most closely reflect or relate to the project goals.

***Record Sheets 11, 12** and **13** (pp. 62 and 63) may be adapted for recording expenditure, on-ground activities and in-kind contributions.*

RECORD SHEET 11

Recording Expenditure

Project Name: .....
Recorder's Name: .....
Year: .....

Site Location: .....
Main activities:.....

Date	Item	Invoice Number	Supplier	Cost (incl. GST)	Associated activity/task
13/11/2001	*20 x 5' Star pickets*	*1999490*	*Pacific Hardware*	*$89.60*	*Fencing*

***Activities can be categorised to match budget items such as administration, fencing, planting, promotion and publicity, maintenance, etc.**

RECORD SHEET 12

Recording on-ground activities

Project Name: .....
Recorder's Name: .....
Year: .....

Site Location: .....
Main activities: .....

Date	Location	Activity (weeding, planting, seed collecting)	No. hours	No. volunteers	Area treated (ha)	Materials used (fencing, mulch, herbicide etc.)	Notes
13/11/2001	*Johnson's farm*	*Weeding*	*3*	*7*	*250 ha*	*5 L of Roundup*	*Not all herbicide used*

RECORD SHEET 13

Recording in-kind contributions

Project Name: .....
Recorder's Name: .....
Year: .....

Site Location: .....
Main activities: .....

Date	Description of activity	Materials and equipment	In-kind labour (eg. Consultants, experts, volunteers)	No. hours (on day and preparation)	Rate $/hour	Travel (kms)	Other expenses	Total $
13/11/2001	*Planting day*	*Tubestock invoice No 1234*	*Volunteers*	*12 people 3 hours*	*-*	*35km*	*12 phone calls, 50x postage*	*$302*

Notes

4. ANALYSING AND REPORTING YOUR RESULTS

KEY MESSAGES

- **Data without analysis and evaluation is worthless.**
- **Analysis and evaluation will greatly increase learning from experience.**
- **Reporting allows the record of experience to be used by others over a range of places and times.**

Monitoring during the project allows evaluation closer to the time a change occurs. This can lead to a better understanding of the cause and effect of management. For example, regular monitoring of plant regeneration rates in a degraded remnant that had recently been fenced will show whether the plant density and diversity is changing.

Evaluation seeks to explain why the activities have been successful. This understanding can then be used to influence management in the future, by assisting people to make decisions about what might be done differently next time around. Evaluation encourages people to examine their assumptions about what constitutes progress and face up to the contradictions and conflicts that can emerge from the results. In the above example of monitoring of regeneration in a remnant, evaluation of the monitoring results show that little regeneration occurred except in a few patches where weeds were suppressed by a litter layer. This suggests that weed control is necessary inside the fenced remnant to allow regeneration to occur.

Projects that address native vegetation rehabilitation or nature conservation are generally fraught with uncertainty and surprise.There is very little absolute information on what activities constitute best practice management. The best way to increase confidence about your activities and develop better techniques is to evaluate work that is being done.

There are a number of other reasons to undertake evaluation. Evaluation ensures that learning occurs as a result of the project and that management practices are implemented accordingly. This learning can then be passed on to other groups undertaking similar activities, helping them avoid mistakes and to make improvements. Evaluation is also necessary for any project supporters, who will want to know whether the project has achieved its aims. Lastly, evaluation is important for maintaining the momentum of stakeholders. Continuous evaluation means that the project is maintained as it proceeds, ensuring that stakeholders remain committed to activities.

Evaluation consists of two parts: analysis and reporting. The information collected from monitoring activities is collated and analysed to explain the results and allow conclusions to be drawn. To complete the evaluation, these conclusions must be used to produce recommendations that are then reported to the community so that management practices can be continued, modified or implemented accordingly. Together, analysis and reporting ensure that both the thinking and the learning components of evaluation actually occur, that is, that the conclusions are prepared and that there is a mechanism for communicating and acting upon them (adaptive management).

***Box 3** shows how the Robinup Catchment Group came to the conclusion that monitoring and evaluation would be worthwhile in their project.*

Box 3 Monitoring and evaluation – the Robinup Catchment Group's experience

The members of the Robinup Catchment Group are discussing their project. In previous years, they have undertaken a significant amount of replanting in their catchment, with the aim of improving habitat for quendas in the area. The area has been affected by drought in the last two years, and it is not known how greatly this has affected the original plantings, although some have died. The group are now discussing whether they should spend money on replanting the lost plants, or focus on different ways to improve habitat through direct seeding and fencing remnant vegetation in other areas.

The landholders advocating a change in activities argue that:

1. *alternative techniques are being widely adopted elsewhere in the region so may be of benefit here; and*
2. *the previous plantings probably don't have significant habitat value anyway.*

Those landholders arguing to replace and augment the existing plantings argue that:

1. *it would be better to build on work that has already been done; and*
2. *the plantings may have been affected by something other than the drought.*

During the discussion, both sides realise that they have no factual information to back up their arguments, just a general impression about the best action to take. They decide that the group will monitor the existing plantings to find out how successful they have been, and then evaluate their use as habitat. The group has also agreed to undertake some of the other proposed habitat regeneration and revegetation activities and to monitor them carefully. They hope that this time, if the plantings fail they may be able to work out why, and whether the remaining plants have any habitat value.

*To fully plan for evaluation, the timeframe and responsibilities for both analysis and report writing must be considered. The following questions should be asked. **Exercise 6** will help you prepare a table recording your decisions.*

1. *When will the evaluation (analysis and reporting) be done?*
2. *Who will be responsible for completing it and who will participate?*
3. *How long will it take to complete and prepare any reports?*
4. *Who will receive the reports?*
5. *Who will be responsible for disseminating the findings of the reports?*
6. *Who is responsible for ensuring that the recommendations from the reports are acted upon?*

Exercise 6 Identifying responsibilities and the reporting timeframe

***Worksheet 6** (p. 94) has been provided as an example of the format that should be used to identify the reporting responsibilities and timeframe. On the worksheet, your group should record their answers. Note that the format of the report and to whom the report will be distributed to should have already been recorded in **Worksheet 4** (p. 93).*

4.1 Analysis

The first stage in evaluation is undertaking an analysis. Analysis entails reviewing the results for themes, issues and trends, so that conclusions can be drawn from them and recommendations made accordingly.

The analysis of the information will include several steps:

1. *Check the raw data and prepare for analysis.*
2. *Conduct an initial analysis based on the evaluation plan.*
3. *Conduct additional analyses based on the initial results.*
4. *Integrate and synthesise the findings.*
5. *Draw conclusions and make recommendations.*

4.1.1 Check the raw data and prepare for analysis

It is likely that a number of people will have collected the information and it is possible that they may have used different ways of recording it. You should confirm that the same methodology has been used for all data collected.

Confirm correctness and accuracy of the data if possible. Determine whether there are any gaps in the data and if so, how these will be handled. Where applicable, assess whether the data between sites is comparable. Was the data collected in the same way, over the same period, at the same scale and if not, how will this be handled?

The information should then be collated and formatted in such a way that it can be used to identify trends, themes or issues. For example, information from revegetation sites might be collated into a table so that the results from each site can be compared.

4.1.2 Analyse the data in terms of the objectives and the monitoring and evaluation program

The analysis of results can be fairly straightforward – a matter of comparing photographs or plans of sites before and after activities. More complex evaluation may take the form of statistical analysis. In this case, it is vitally important to have considered the analysis at the planning stage of the monitoring program, as many statistical techniques are restricted by the information that can be used.

Using the analysis selected in the monitoring schedule, compare the information collected with the original information recorded for that site. This can then be plotted on a graph, for example, survival rates of plants in a revegetation site. There are a number of ways of aggregating the information and it is important to choose the one that works the best for the people who are going to use it. The options include adding changes to plastic overlays for original project maps, collating computerised data on spreadsheets or plotting data on graphs or tables.

4.1.3 Review the initial analysis and carry out any further analyses as necessary

Review the information or graphs to see what changes have happened over time. Where changes have occurred, speculate on the reasons for the change. This will assist in determining whether these changes are the result of the project activities. Care should be taken to look for the causes of the problem rather than the symptoms. For example, increase in weed coverage in a remnant could be due to a reduction in ground cover as a result of hot fires year after year. In this case, the problem is not the increase in weed coverage or loss of ground cover; it is the frequency and timing of the fires.

4.1.4 Integrate and synthesise the findings

In the analysis, it is important to look for those things that are similar to what was expected, and those that were not. For example, do the facts about how the project funding was used meet with people's perceptions about how it was used? Where a number of different sources of information lead to the same conclusion, it is possible to be confident that the results are on track. However, if there are contradictions, further investigation may be indicated.

Consider the Robinup Catchment project example that undertook to develop a vegetation corridor between two patches of remnant vegetation (Table 1, p. 17). The information collected prior to the corridor activities should be compared to see whether the number of target animals or the variety of animal species in the bushland has increased. This will assist in determining the level at which the corridor is functioning. Such an indicator might suggest why some species are more common, while others have disappeared after a period of time.

4.1.5 Draw conclusions from the analysis and make recommendations for action

When undertaking analysis, it is important that conclusions are drawn from the results. This requires thinking about what the results show, and whether they can be used to change management practices. In arriving at conclusions, it is often useful to think in terms of issues, trends and themes. Following recognition and concern about an issue or several issues, monitoring can enable a group to identify trends and themes. Themes give rise to discussion on desirable changes and priorities for action. It is important to identify whom these different themes affect, for example, individual landholders, the catchment group or government agencies.

The final task is to develop some conclusions from the information. This can guide changes in management practices so that they are better targeted and more effective. For example, the analysis might show that direct seeding activities are more effective over larger areas than the planting of tubestock. This might suggest that in future, tubestock is limited to those areas where direct seeding has not worked well.

In making recommendations, consider whether management practices need to be changed. If so, the activities should be continually assessed to ensure that they are working effectively.

Sometimes, the most interesting results are those that were not anticipated. Continually reviewing the information can mean that the analysis is never completed. In the end, deciding when the analysis is finished becomes a matter of balancing available time and money against the level of interest and the need to know. It is also possible that different information may not give the same results all the time. While it is always preferable to produce a report that is able to explain differences and contradictions, sometimes the findings must simply be allowed to stand as they are, unresolved and thought provoking, which will lead to further investigation through monitoring.

4.1.6 Acting on the basis of the monitoring and evaluation program (Adaptive Management)

In natural resource management situations, it is often rare to find complete information upon which to make decisions. However, the lack of perfect information about cause and effect should not prevent satisfactory management of the project and it is particularly important that the effects of the project are evaluated so that management can be improved or altered to lead to better outcomes. This approach is known as adaptive management (see Figure 10 opposite).

There are two main ways that projects can improve their management:

1. *Learning from doing. The problems and skills in managing native vegetation projects can best be learnt from doing the work. Opportunities for improvement are usually obvious to those doing the work.*
2. *Learning from others. Many people have had similar experience and information needs and have documented it.*

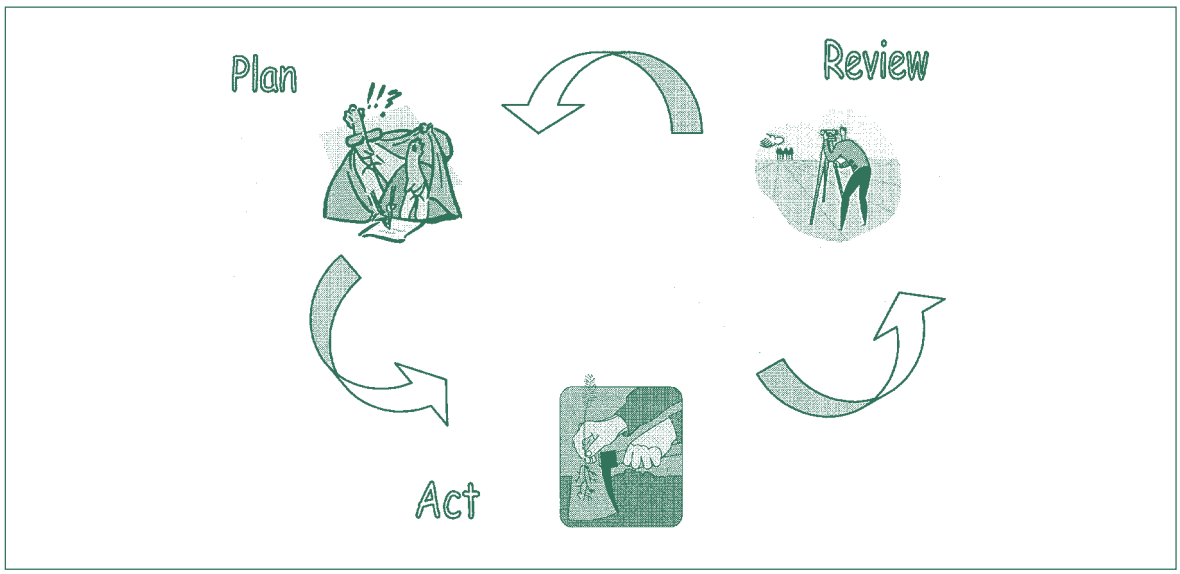


Figure 10: The adaptive management cycle.

4.2 Reporting

The second stage of evaluation requires that the conclusions and recommendations made during the analysis stage be included in a report so that they are passed on to other people and, where required, used as a resource for improving project management. Generally, it is the responsibility of the project manager to prepare the project report. However, it is important that the people involved in the project be included in the evaluation. This encourages ownership of the process as well as improving confidence in the results.

Reporting serves four important functions.

1. *It encourages critical examination of the results in their entirety.*
2. *It is directed at improving management.*
3. *It provides an enduring record.*
4. *It makes all the information accessible to stakeholders and external parties.*

Reports do not have to be only written. They can be verbal presentations at field days or community meetings and they can be presented at any stage throughout the life of the project. However, the application of the report by others is likely to be imperfect and short-lived unless a permanent record is maintained and available.

It is also important to keep in mind that communication is a two-way process, in that both a sender and a receiver are involved. Communication does not take place if the message is sent but is not received or understood. Communication is of little use if the information conveyed could not be used, or if it is received at the wrong time to be used. Reporting may be done at any stage of the project, but it is important that reports are provided when they are needed, not after. It is also essential that the writer consider whom the audience is when preparing the report, so that they are able to understand the conclusions and act on them.

Apart from providing information to assist the project's implementation, monitoring and evaluation activities can also be used in a number of other ways, such as advertising the project's work and supporting further applications for funding.

Think carefully about how to make the best use of the conclusions to ensure that the evaluation effort is not wasted. Conclusions from an evaluation might be used in project planning to:

- *revise the plan of the current project;*
- *plan a new phase or extend the current project; or*
- *plan a new project.*

4.2.1 Written reports

The content of a written report will depend on the intended audience. The interpretation of the methodology and the results needs to be very clear, and prevent misinterpretation. The language used needs to be directed to the key audience.

As in all writing, the three main rules to writing reports are i) clarity; ii) accuracy; and iii) brevity. To achieve these, the use of tables, charts, photographs and other visual information is encouraged.

As a rule, the report should include a summary, an introduction, a brief description of the methods used and results, a discussion, any conclusions and recommendations.

***Summary (or Executive Summary):** Every report should begin with a short executive summary, preferably no more than one or two pages, that concisely summarises the purpose of and the anticipated audience for the report, gives a brief description of the project and the main conclusions of the report including any recommendations for action. It should contain all of the important information that someone who may not have time to read the whole report should know. It should be specific wherever possible, without a lot of detail. Undoubtedly, this section is the most important part of the entire report and considerable care should be given to writing a concise, informative summary that can convey the important findings and meaning of the evaluation. This should be at the front of the report. The report itself should be thought of as a back-up to the executive summary, that is, it provides the detail needed to fully understand and comprehend the conclusions of the report.*

***Introduction:** The introduction should clearly state the purpose of the evaluation, whom the evaluation is intended for and the questions it is designed to answer. It may also include a review of background information on the project, in order to inform those who may not be familiar with the project. This background information could be placed in a separate section, if desired.*

A key component of the introduction will be the stated goals, objectives and targets of the project, against which accomplishments are to be evaluated. Goals and objectives should be restated even though the evaluators may think that they are known and readily accessible to everyone.

***Results (Actual accomplishments):** This section should describe the methods used to monitor outputs and outcomes and state actual accomplishments in terms of planned goals, objectives and targets, point by point. It should also include accomplishments that were not directly related to planned goals, objectives and targets.*

***Discussion:** This section should evaluate actual accomplishments in terms of those that were planned, identifying any discrepancies and explaining any significant deviations. An attempt should be made to present an overall evaluation of the project in light of its actual achievements to date. The evaluation methods and criteria used should also be described.*

***Conclusion:** Based on the evaluation, existing or potential problems should be identified with the project as should opportunities that could and should be exploited and changes that should be made. Any barriers that might have to be overcome in solving the problems and/or in taking advantage of the opportunities should also be identified.*

***Recommendations:** This section should lay out a recommended course of action, taking into consideration the results of the project evaluation, and suggest a plan of action to deal with special problems or opportunities including the additional resources in terms of people, facilities and funds that might be required to carry this out. Recommendations may also form the basis for new projects.*

Evaluation reports should contain all of the necessary information in a form that readily conveys the essential points to the intended user. Tables, graphs and photographs can be effective in summarising and visually portraying results.

Presenting the information in a report-style document along with complete and accurate descriptions of the methods used, means that others can use it for future monitoring.

Because performance indicators do not always explain why the results show what they do, or who or what contributed to the results, there may be some concern over the misinterpretation or misuse of information in reports. This problem can be overcome by providing more in-depth information that allows readers to make informed judgements about performance within a broader context.

The conclusions need to be understood by the people they are aimed at. They should be presented by people who have been involved in the project, in ways that will encourage the results to be accepted. This could be through easy to read reports, colourful presentations, group workshops, or site inspections that show what has been done and what the effects have been.

4.2.2 Alternative reporting processes

While a written report should be seen as the primary project reporting method, it is only one way that the results of the project evaluation may be disseminated to stakeholders and the broader community.

Depending on the audience and intent of reporting, other means of getting the information across may be more effective. Most adults learn best from hearing and seeing something demonstrated and even more from being involved and doing the thing themselves.

Drawing from the written report, a range of communication options is available for disseminating project results. They include:

- *public presentations (e.g. meetings, field days, a poster display in a public venue);*
- *newsletters and newspaper articles;*
- *slides and videos;*
- *radio and television; and*
- *training and hands-on experiential learning.*

Any alternative reporting process should include the purpose or goal of the project, a description of the project activities and a discussion of the results achieved and lessons learnt throughout the process.

Notes

5. SYNTHESIS

KEY MESSAGES

- **Monitoring and evaluation are an integral part of the project management and planning process.**
- **This guide provides the framework for integrating best practice monitoring and evaluation into a project planning process.**
- **This guide provides monitoring techniques that best answer the information needs for native vegetation projects.**

Recent experience with projects funded through the Natural Heritage Trust has provided many learning opportunities about the importance of having realistic and well-understood project objectives.

Chapter 1 *of this Guide encourages project managers and community groups to focus on the planning and design of a monitoring and evaluation program. By incorporating a monitoring and evaluation program into the overall project design, project participants will:*

- *have an opportunity to build their skills and understanding;*
- *judge the success of the project and the need for any changes;*
- *gain information for planning a new project;*
- *be able to justify and promote the project to the wider community;*
- *have documented feedback for funding bodies; and*
- *may be able to contribute information to broader monitoring and evaluation programs.*

With this in mind, **Chapter 2** *looks at the selection of project objectives and expected outcomes, and explains the difference between outputs and outcomes, these being both the quantitative and qualitative results from the project. This is an important distinction to make, because project progress is unlikely to be measured by output-related information alone. The use of performance indicators to measure outcomes is identified as an effective way to gauge project success. Even though they are difficult to develop and may require information from more than one source, performance indicators are worthwhile for measuring long-term project success.*

A selection of monitoring techniques that could be used in a native vegetation and land management monitoring program has been included in **Chapter 3**. *These activities will not be applicable to all monitoring programs and it is important that activities are selected that will provide useful information; not just activities that match the skills of the group. Whilst the group may consider their available time and commitment to monitoring* before *selecting monitoring activities it is probably far more beneficial to determine those activities that will provide the best results and* then *match the level of commitment and the information needs of the stakeholders. As a result, monitoring may be conducted less frequently, but the information obtained will be more useful.*

The activities in **Chapter 3** *cover both the environmental and social outcomes expected from a project. It is recommended that project managers seek other sources of information for additional monitoring activities (see* **Appendix I,** p. 75*), or develop their own ways of recording and evaluating such information.*

There are two essential components to evaluation: analysis and reporting. Analysis is the review of project information so that conclusions can be drawn about the results. These must then be incorporated into either a written or verbal report so that the learning from them can be passed on to other members of the project.

Chapter 4 *presents the analysis component of the monitoring and evaluation program as a series of steps (***Section 4.1,** p. 67*). Following these steps will help project managers ensure that the project information is in a suitable format for drawing conclusions and recommendations. Although the scope of the evaluation may vary from project to project depending on its size, objectives and level of complexity, these steps should remain relevant to all projects.*

In conclusion, this Guide provides project managers with a step-by-step process for developing a monitoring and evaluation program using a project's objectives as the basis for selecting indicators and monitoring activities.

Monitoring and evaluation is a key component of project design, and enables information to be fed back into the project and any appropriate changes made.

Evaluation, both analysis and reporting, is critical to the learning process. Identifying a project's reporting needs provides a mechanism to ensure that the evaluation actually takes place and all involved take away some new knowledge, understanding and skills from their experience.

APPENDICES

Appendix I
Further information

Useful books for identifying plants

Bell, U., 1999, *A guide to native grasses in the Perth Hills*, Wildflower Society of Western Australia.

Blackall, W.E. and Grieve, B.J., 1980, *How to Know Western Australian Wildflowers: a key to the flora of the extratropical regions of Western Australia Part IIIA*, University of Western Australia Press, Perth.

Brown, A., Thomson-Dans, C. and Marchant, N., 1998, *Western Australia's Threatened Flora*, Department of Conservation and Land Management, Como.

Coates, D. and Atkins, K., 1997, *Threatened Flora of Western Australia: a focus for conservation outside reserves*, University of Queensland Centre for Conservation Biology, Brisbane.

Gardner, C. A. and the Western Australian Herbarium, 1984, *Keys to Various Plant Genera and Species: Largely from unpublished flora of Western Australia*, Western Australian Herbarium, South Perth.

Grieve, B.J., 1998, *How to know Western Australian Wildflowers: A key to the flora of the extratropical regions of Western Australia Part II*, University of Western Australia Press, Perth.

Hussey, B.M.J., Keighery, G.J., Cousens, R.D., Dodd, J. and Lloyd, S.G., 1997, *Western Weeds: A guide to the weeds of Western Australia*, The Plant Protection Society of Western Australia (Inc.), Victoria Park.

Marchant, N., 1991, *The Vascular Flora of South Western Australia*, Association of Societies for Growing Australian Plants, Perth.

Marchant, N.G., Wheeler, J.R., Rye, B.L., Bennett, E.M., Lander, N.S. and McFarlane, T.D., 1987, *Flora of the Perth Region Parts One and Two*, Western Australian Herbarium and Department of Agriculture.

Marshall, J., 1990, *Field Guide to the Wildflowers of the West Coast Hills Region*, Quality Publishing Australia.

Meney, K.A. and Pate, J.S., 1999, *Australian Rushes*, UWA Press, Perth.

Neville, S. and McQuoid, N., 1998, *Guide to the Wildflowers of South Western Australia*, Simon Neville Publications, South Fremantle.

Robinson, C. J., 1992, *Report on Survey and Inventory of the Flora of Wetlands of the South Coast of Western Australia,* Karridale.

Sainty, G.R. and Jacobs, S.W.L., 1994, *Water plants in Australia: A field guide*, Sainty and Associates, Darlinghurst.

Van der Moezel, P.G. and the Western Australian Herbarium, 1990, *The Vascular Flora of a Part of the Mallee Region North of Esperance*, Western Australian Herbarium, South Perth.

Water and Rivers Commission, 1997, *Native vegetation of estuaries and saline waterways in south Western Australia*, Water and Rivers Commission, Perth.

Water and Rivers Commission, 1997, *Native vegetation of freshwater rivers and creeks in south Western Australia*, Water and Rivers Commission, Perth.

Water and Rivers Commission, 2000, *Weeds in waterways*, Water Notes WN15, Water and Rivers Commission, Perth.

Water and Rivers Commission, 2000, *Rushes and sedges*, Water Notes WN20, Water and Rivers Commission, Perth.

Water and Rivers Commission, 2001, *Using rushes and sedges in revegetation of wetland areas in the south-west of WA*, Water and Rivers Commission, River Restoration Report No. RR8.

For a comprehensive list of local and genera-specific guides for Western Australia see the WA Wildflower Society's webpage <http://members.ozemail.com.au/~wildflowers/> or contact your district Department of Conservation and Land Management office.

Useful books for identifying animals

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Appendix II
Remnant structure classification

Structural formatio lasses for plants (Keighery 1994 adapted from Muir 1977 and Aplin 1979)

Life form / Height class	Canopy Cover (%)			
	100 – 70	70 – 30	30 – 10	10 – 2
Trees > 30 m	Tall closed forest	Tall open forest	Tall woodland	Tall open woodland
Trees 10 – 30 m	Closed forest	Open forest	Woodland	Open woodland
Trees under 10 m	Low closed forest	Low open forest	Low woodland	Low open woodland
Tree mallee	Clos ee mallee	Tree mallee	Open tree mallee	Very open tree mallee
Shrub mallee	Closed shrub mallee	Shrub mallee	Open shrub mallee	Very open shrub mallee
Shrubs over 2 m	Closed tall scrub	Tall open scrub	Tall shrubland	Tall open shrubland
Shrubs 1 – 2 m	Closed heath	Open heath	Shrubland	Open shrubland
Shrubs under 1 m	Closed low heath	Open low heath	Low shrubland	Low open shrubland
Grasses	Closed grassland	Grassland	Open grassland	Very open grassland
Herbs	Closed herbland	Herbland	Open herbland	Very open herbland
Sedges	Closed sedgeland	Sedgeland	Open sedgeland	Very open sedgeland

Definitions:

Tree: *woody plant more than 2 m tall with a single stem or branches well above the base.*

Tree mallee: *woody perennial plant usually of the genus* Eucalyptus. *Multi-stemmed with less than 5 trunks of which at least 3 are larger than 100 mm in diameter at breast height. Usually more than 8 m tall.*

Shrub: *woody plant, multi-stemmed at the base (or within 200 mm from ground) or, if single stemmed less than 2 m tall.*

Mallee shrub: *commonly less than 8 m tall, usually with more than 5 trunks.*

Grasses: *Non-woody plants with inconspicuous individual flowers, pollinated by wind, have split leaf sheaf with ligule.*

Sedges: *Tufted or spreading plant with unsplit leaf sheaf without ligule.*

Herbs: *All plants with non-woody stems that are not grasses or sedges. Generally not more than 500 mm tall. Herbs can be annuals (renewing from seed or underground storage organ) or perennial.*

Appendix III
Classification of remnant vegetation quality for regions other than the Swan Coastal Plains

1. Position in Landscape	
Site dominantly situated in upper-landscape (recharge area)	*5*
Spans both upper and mid landscape	*4*
Site dominantly situated in mid-landscape	*3*
Spans both mid and lower-landscape	*2*
Site dominantly in lower-landscape (discharge area, creek-line)	*1*
2. Threatened Species/Communities (Flora/Fauna)	
Contains threatened species / threatened community	*5*
Contains priority species on property	*4*
Threatened species / community on nearby land / reserve	*3*
No evidence to indicate remnant contains threatened species / community	*2*
Does not contain threatened species / community	*1*
3. Size (hectares)	
> 50	*5*
30 – 50	*4*
15 – 30	*3*
5 – 15	*2*
< 5	*1*
4. Shape	
Circular	*5*
Square, triangular	*4*
Rectangular, indentations or extrusions	*3*
Long and thin or fragmented	*2*
Long and very thin	*1*
5. Nearest remnant/reserve	
Attached to large area of native vegetation/reserve	*5*
Nearest remnant within 500 m	*4*
Nearest remnant 500 m – 1000 m	*3*
Nearest remnant 1 km – 2 km	*2*
Nearest remnant > 2 km	*1*
6. Corridors	
Attached to a wide (>50 m) corridor	*5*
Attached to a thin (<50 m) corridor	*4*
Nearest corridor >500 m	*3*
No corridor (attempting to create)	*2*
No corridor	*1*
7. Remnant Protection Priority Classification (see Table A)	
Highest	*5*
Very High	*4*
High	*3*
Medium	*2*

8. Weeds

No weeds	*5*
Weeds restricted to periphery or small area	*4*
Dense peripheral weeds with some incursion up to 30%	*3*
Weed coverage up to 50% of surface cover	*2*
Weed coverage 100% or presence of declared weed	*1*

9. Litter Layer

Litter layer present over whole area	*5*
Litter layer present, but thin or absent in weed infested sections <10%	*4*
Litter layer sparse, or absent in weed infested sections <30%	*3*
Litter layer sparse or absent in weed infested sections <50%	*2*
Leaf litter generally absent	*1*

10. Health of Vegetation

All plant layers present, all ages represented, no evidence of prior disturbance	*5*
All plant layers represented, few younger plants, evidence of light grazing / fire	*4*
Plant communities simplified with loss of groundcovers, evidence of grazing / fire	*3*
Absence of shrub and groundcovers, evidence of heavy grazing, fire, abundance of dead branches	*2*
Few remaining original species, heavily grazed, parkland remnant	*1*

11. Salinity (only if not naturally saline)

No salinity in remnant or surrounding catchment	*5*
No salinity in remnant, salinity in catchment	*4*
No salinity in remnant, saline area adjacent	*3*
Part of remnant is saline, otherwise is unaffected	*2*
Saline creekline, vegetation impacted	*1*

12. Landholder participation

The landholder(s) highly committed to conserving remnant, have management plan and / or covenant agreement in place or planned.	*5*
The landholder / majority landholders committed to developing management plan, surrounding landholders are not	*4*
The landholder(s) do not have a management plan or covenant for site	*3*
The landholder(s) do not have a management plan or covenant for site, some neighbouring landholders may clear part of remnant	*2*
Single landholder with no participation from other affected landholders in project, neighbouring landholders have plans to clear.	*1*

SCORE SHEET

Total score	Rating	Remnant Quality Class
50 – 60	5	Excellent
40 – 50	4	Very high
30 – 40	3	High
25 – 35	2	Medium
< 25	1	Low

Table A : Remnant Protection Priority Classification for Central wheatbelt, northern and southern sandplains and the southwest (modified from Hussey and Wallace 1993).

Vege-tation	Priority Class	REGION		
		Central Wheatbelt	Northern & Southern Sandplains	Southwest
1	**Highest**	• Woodlands of banksia or salmon gums • Shrublands on sandy soils • Freshwater wetlands • Brackish wetlands • Vegetation on greenstone or quartzite outcrops	• Woodlands of salmon gum • Freshwater wetlands • Brackish wetlands • Vegetation on greenstone or quartzite outcrops	• Woodlands • Mallee vegetation • Freshwater wetlands • Brackish wetlands • Vegetation on greenstone or quartzite outcrops
2	**Very High**	• Woodlands of wandoo or blue mallet • Mallet on loams and clays • Shrublands on gravelly soils • Vegetation on granite outcrops	• Woodlands of powder bark wandoo, silver or blue mallet • Shrublands on gravelly or clay soils • Mallet on loams and clays • Shrublands on gravelly soils	• Woodlands of tuart or yate
3	**High**	• Woodlands of jarrah, marri, brown mallet and sheoak bark wandoo, • Mallet on sands or gravels • Shrublands of wodjil, tamma or broombush	• Woodlands of jarrah, marri, brown mallet and sheoakmarri, • Mallet on sands or gravels • Shrublands on sandy soils	• Woodlands of powder marri, wandoo, Albany blackbutt or sheoak • Shrublands or sedgelands on wet flats • Shrublands on coastal sand dunes
4	**Medium**	• Wetlands of samphire • Wetlands of saltpans • Wetlands of creek lines	• Wetlands of samphire • Wetlands of saltpans • Wetlands of creek lines	• Woodland or forest of jarrah • Wetlands of saltpans

Appendix IV
Classification of remnant vegetation quality for the Swan Coastal Plains

1. Threatened Species/Communities (Flora/Fauna)	
Contains threatened species / threatened community	*5*
Contains priority species on property	*4*
Threatened species / community on nearby land / reserve	*3*
Anecdotal or no evidence to indicate remnant contains threatened species / community	*2*
Does not contain threatened species / community	*1*
2. Size (hectares)	
> 30	*5*
15 – 30	*4*
5 – 15	*3*
2 – 5	*2*
< 2	*1*
3. Shape	
Circular	*5*
Square, triangular	*4*
Rectangular, indentations or extrusions	*3*
Long and thin or fragmented	*2*
Long and very thin	*1*
4. Nearest remnant/reserve	
Attached to large area of native vegetation/reserve	*5*
Nearest remnant within 500 m	*4*
Nearest remnant 500 m – 1000 m	*3*
Nearest remnant 1 km – 2 km	*2*
Nearest remnant > 2 km	*1*
5. Corridors	
Attached to a wide (>25 m) corridor	*5*
Attached to a thin (<25 m) corridor	*4*
Nearest corridor >500 m	*3*
No corridor (attempting to create)	*2*
No corridor	*1*
6. Remnant Protection Priority Classification (see Table B)	
Highest	*5*
Very high	*4*
High	*3*
Medium	*2*
7. Weeds	
No weeds	*5*
Weeds restricted to periphery or small area	*4*
Dense peripheral weeds with some incursion up to 30%	*3*
Weed coverage up to 50% of surface cover	*2*
Weed coverage 100%	*1*

8. Litter Layer

Standing litter layer present over whole area	*5*
Standing litter layer present, but thin or absent in weed infested sections <10%	*4*
Standing litter layer sparse, or absent in weed infested sections <30%	*3*
Standing litter layer sparse or absent in weed infested sections <50%	*2*
Standing leaf litter generally absent	*1*

9. Health of Vegetation

Vegetation structure intact, localised areas showing some disturbance, weeds are non-aggressive species and confined to perimeter / localised patches.	*5*
Vegetation structure altered, few younger plants, obvious evidence of disturbance such as light grazing, repeated fires, presence of some more aggressive weeds, selective logging or dieback.	*4*
Vegetation structure significantly altered, loss of groundcovers, very obvious evidence of multiple disturbance such as grazing, very frequent fires, the presence of very aggressive weeds at high density, partial clearing or dieback.	*3*
Vegetation structure severely impacted, shrub and groundcovers maybe absent. Major disturbance caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback or grazing. Abundance of dead branches.	*2*
Few remaining original species, heavily grazed, parkland remnant with flora comprising weed or crop species with isolated native trees or shrubs.	*1*

10. Responsible authority / community participation

The responsible authority / landholder(s) / community highly committed to conserving remnant, have management plan and / or covenant agreement in place or planned.	*5*
The responsible authority / community are committed to developing management plan, landholder(s) are not	*4*
The responsible authority, landholder(s) do not have a management plan or covenant for site no "Friends" group.	*3*
The responsible authority, landholder(s) do not have a management plan or covenant for site, no security of tenure, surrounding native vegetation zoned other than reserve no "Friends" group.	*2*
The responsible authority / landholder(s) do not support the protection of the Remnant, no "Friends" group.	*1*

11. Security of tenure

Nature reserve with conservation as main purpose	*5*
Other Crown reserve, parks or recreation reserve	*4*
Freehold with very high level of support from land owner	*3*
Freehold	*2*

SCORE SHEET

Total score	Rating	Remnant Quality Class
45 – 55	5	Excellent
35 – 45	4	Very high
25 – 35	3	High
20 – 30	2	Medium
< 20	1	Low

Table B: Vegetation complexes Protection Priority Classification for the Swan Coastal Plain (after English and Blyth 1997, WA Planning Commission 2000 "Bush Forever" Vol 2).

VEGETATION	PRIORITY CLASS		
Highest	**Very High**	**High**	**Medium**
FOOTHILLS/PINJARRA PLAIN			
• *Eucalyptus calophylla*– *Kingia australis* woodlands on heavy soils • *Eucalyptus calophylla* – *Xanthorrhoea preissii* woodlands and shrublands	• Southern wet shrublands	• Eucalyptus calophylla Eucalyptus marginata woodlands on sandy clay	• Eucalyptus haematoxylon E. marginata woodlands on Whicher foothills • Southern Eucalyptus calophylla woodlands on heavy soils • Eucalyptus wandoo woodlands (Scarp)
SEASONAL WETLANDS			
• Sedgelands in Holocene dune swales	• Shrublands on dry clay flats	• Herb rich saline shrublands in clay pans • Herb rich saline shrublands in clay pans • Dense shrublands on clay flats • Forests & woodlands of deep seasonal wetlands • Shrublands on calcareous silts	• Melaleuca preissiana damplands • Mixed shrub damplands • Weed dominated wetlands on heavy soils • Shrublands on southern ironstones • Wet forests and woodlands • *Melaleuca teretifolia* and/or *Astartea* aff.*fascicularis* • Deeper wetlands on heavy soils • Highly saline seasonal wetlands • *Melaleuca rhaphiophylla – Gahnia trifida* seasonal • Woodlands over sedgelands in Holocene dune swales • Deeper wetlands on sandy soils • *Astartea* aff. *fascicularis*/ *Melaleuca* species dense shrublands • Northern *Pericalymma elliticum* dense shrublands • Wet sedgelands on sandy clays • *Regalia ciliata* Dandaragan Plateau wetlands • *Acacia saligna* wetlands • Northern dense low shrublands • Northern woodlands to forests over tall sedgelands • *Eucalyptus rudis*/*Agonis lineanfolia* wetlands in Bassendean dunes • Dense tall shrublands • Northern shrublands
UPLANDS CENTRED ON BASSENDEAN DUNES AND DANDARAGAN DUNES			
• Eastern shrublands woodlands	• *Banksia attenuata* woodlands over species rich dense shrublands • Eastern *Banksia attenuata* and/or *Eucalyptus marginata* Woodlands		• Dandaragan plateau shrublands and woodlands • Central *Banksia attenuata – Eucalyptus marginata* • Southern *Banksia attenuata* woodlands • Low lying *Banksia attenuata* woodlands or shrublands • *Banksia ilicifolia* woodlands • Central *Banksia attenuata – Banksia menziesii* woodlands

Table B: Vegetation complexes Protection Priority Classification for the Swan Coastal Plain *(continued).*

VEGETATION	PRIORITY CLASS		
Highest	**Very High**	**High**	**Medium**
UPLANDS CENTRED ON BASSENDEAN DUNES AND DANDARAGAN DUNES (CONT)			
			• Northern Banksia attenuata – *Banksia menziesii* woodlands • North-eastern *Banksia attenuata* – *Banksia menziesii* woodland • *Banksia attenuata* woodlands over dense low shrublands • *Calothamnus sanguineus* dense low shrublands on sandy laterites • Mixed dense shrublands on yellow brown sands • *Eucalyptus marginata*/ E*ucalyptus calophylla* woodlands on laterites
UPLANDS CENTRED ON SPEARWOOD DUNES AND QUINDALUP DUNES			
Spearwood Dunes			
	• *Melaleuca huegelii - Melaleuca acerosa* Shrublands on limestone ridges		• Northern Spearwood shrublands and woodlands • Southern *Eucalyptus gomphocephala* – *Agonis flexuosa* woodlands • Woodlands and mallees on limestone • Species poor mallees • Spearwood *Banksia attenuata* or *Banksia attenuata Eucalyptus* woodlands
Quindalup Dunes			
		• Callitris preissii and/or *Melaleuca lanceolata* forests and woodlands	• Coastal shrublands on shallow sands • *Acacia* shrublands on taller dunes • Woodlands and shrublands on Holocene dunes • Quindalup *Eucalyptus gomphocephala* and/or *Agonis flexuosa* woodlands • Northern *Acacia rostellifera* – *Melaleuca acerosa* shrublands • Rottnest Island M*elaleuca lanceolata* and/or *Callitris preissii* forests and woodlands • Northern *Olearia axillaris* – *Scaevola crassifolia* shrublands • *Spinifex longifolius* grassland and low shrublands
SOUTHERN SWAN COASTAL PLAIN COMPLEXES CENTRED ON QUINDALUP DUNES, YOONGARILLUP OR VASSE COMPLEXES			
Shrublands on ironstone			

Appendix V
Worksheets

Worksheet 1 – Clarifying the goals and objectives of the project

Worksheet 2 – Selecting indicators

Worksheet 3 – Recording monitoring activities and frequency

Worksheet 4 – Making a record of reporting and evaluation

Worksheet 5 – Preparing the monitoring schedule

Worksheet 6 – Identifying responsibilities and the reporting timeframe

WORKSHEET 1

Clarifying the goals and objectives of the project

SMART OBJECTIVES

Vague or very general project objectives will make project management and evaluation difficult. Check to see that the project's objectives are:

Specific – what will be achieved is clearly defined
Measurable – there is some way of measuring what will be achieved
Achievable – the objective is realistic given the resources available
Relevant – the objective is essential to the project vision and goals
Time-bound – there is a time by which the objective will be met

In the space below you should list your project objectives:

1. ***Example:*** *Within 2 years, exclude stock from all areas of remnant vegetation larger than 10 hectares*

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2. .....

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WORKSHEET 2

Selecting indicators

In the space below using ***one** of the objectives identified previously, complete the table with the indicators that you will use:

Objective: ***Example:*** *Within 2 years, exclude stock from all areas of remnant vegetation larger than 10 hectares*	
Output Measure	**Performance Indicator**
Number of kilometres of fencing erected.	*Change in remnant quality over time, measured by an increase in number of target species.*
Number of areas of remnant vegetation from which stock have been excluded.	*80% or more of areas of remnant vegetation over 10 ha protected by fencing.*

* You will need to repeat this exercise later for each objective.

Examples of short term project objectives with associated measures and indicators and an explanation of how these would demonstrate success. An explanation of how the indicator links to the objectives is also provided. See glossary for definitions of terms.

Objective	How success would look	Output measure	Performance indicator	How the indicator links to objectives
Revegetate, using direct seeding, a 10 ha area over 2 years, to establish a 50 m wide native vegetation corridor between blocks of remnant marri forest	Vegetation structure changed from a pastoral paddock dominated by annual agricultural grasses, to a revegetated linkage between remnant native vegetation that resembled the canopy structure of the surrounding marri forest, but at an immature stage and with a reduced species diversity	Area direct seeded (ha)	Corridor resembles the immature canopy structure of the surrounding marri forest	Revegetation activities aim to restore an area of native vegetation that is similar in structure to surrounding remnant vegetation. The structure of the surrounding remnant vegetation is used as a baseline indicator of habitat value that supports target native fauna.
		Weight of seed distributed (kg per ha)		
		Plant density after 6 months (Plants per ha.) see *Monitoring Technique E*		
	The corridor acts as a link between remnant blocks, of marri forest, providing habitat for fauna species, including the target fauna species, quenda *Isoodon obesulus*	Number of indigenous plant species established at 6 months (species per ha) see *Monitoring Technique E*	Corridor supports the movement of quenda (*Monitoring Technique I*)	The observation of quenda movement in the revegetation site, indicates that the revegetation activities have been successful in providing habitat suitable for movement of native fauna
Rehabilitate by planting seedlings of indigenous vegetation over a 2 year period to provide fauna habitat in a 2 ha abandoned gravel pit within a Wandoo woodland	The 2 ha site changes from a bare gravel pit, dominated by annual weed species, to one that contains indigenous groundcovers, low shrubs and native grasses. Wandoo canopy will not be present because of depleted soil structure	Number of seedlings planted in the gravel pit	Vegetation contains indigenous representatives of low shrubs, grasses and groundcovers	Revegetation of gravel pit aims to restore an area of native vegetation that provides suitable habitat to assist in the protection of native fauna such as native quail. The plant density of the surrounding remnant vegetation indicates the coverage suitable for native fauna
		Survival rate of seedlings at 6 months (per cent survival) see *Monitoring Technique E*		
		Number of species used		Revegetation of remnant aims to restore an area of native vegetation to be similar in species composition without the tree canopy (due to depleted soil depth) to surrounding remnant vegetation.
	The rehabilitated gravel pit supports the movement of native fauna that are present in the surrounding wandoo woodland as indicated by the presence of native quail *Coturnix spp.*	Plant density after 2 years (Plants per ha) see *Monitoring Technique E*	The rehabilitated gravel pit supports the movement of native quail (*Monitoring Technique J*)	

Objective	How success would look	Output measures	Performance indicator	How the indicator links to objectives
To restore a 30 ha remnant banksia woodland site over 3 years by reducing weed cover by 50 %	Removal of weeds has allowed natural regeneration to take place in remnant	Area within which weeds have been controlled (ha) Percentage reduction in weed cover (% cover. Revegetation activities 4.1.1.6)	As a result of weed control, natural regeneration has occurred and represents the species present in the 30 ha banksia woodland	Weed control allows natural regeneration of native species
To restore a 40 ha remnant jarrah forest site over 3 years by fencing to exclude domestic stock	Exclusion of domestic stock has allowed natural regeneration to take place in remnant	Area which has had stock excluded by fencing (ha) Length of fencing (km)	As a result of fencing activities, natural regeneration has occurred and represents the species present in the 40 ha jarrah forest	Fencing to exclude stock removes the threatening processes of grazing, trampling, and soil compaction
To improve the level of protection of small fauna in 50 ha remnant wandoo woodland by controlling fox populations	Control of fox population by baiting has allowed populations of small mammal species including the phasgogale observed in the 50 ha remnant to increase and assisted in their long-term protection	Area baited (ha) Number of fox baits distributed	Increase in the number of observations of scorpions	Reducing the population of the main predator allows a greater protection of small fauna as represented by the target fauna species phasgogale
To protect a population of critically endangered spiral fruited wattle Acacia cochlocarpa in a 50 ha scrub heath site by controlling the rabbit population over 2 years	Control of rabbit population has allowed natural regeneration of 30 ha of the remnant. Including several seedlings of the spiral fruited wattle	Number of bait distribution points Per cent reduction in active warrens	As a result of rabbit control, natural regeneration has occurred and represents the species present in the 30 ha scrub heath As a result of rabbit control, natural regeneration of seedlings of the spiral fruited wattle occurred	Control of rabbit population allows the natural regeneration of remnant native vegetation

WORKSHEET 3

Recording monitoring activities and frequency

Chapter 3 of this guide provides a selection of activities that could be conducted for monitoring nature conservation projects. You can refer to this section when selecting your activities.

In the space below, using the same objective as the one from the previous exercise, record your activities and frequency for monitoring.

Objective:

Example: *Within 2 years, exclude stock from all areas of remnant vegetation larger than 10 hectares*

.....

Output measure	Performance indicator	Monitoring activities	Frequency of monitoring	Date for monitoring
Number of kilometres of fencing erected.	*80% or more of areas of remnant vegetation over 10 ha protected by fencing.*	• *Complete on-ground outputs record sheets.* • *Review catchment maps.*	*Reviewed every six months and reported annually*	*November and June*
Number of areas of remnant vegetation from which stock have been excluded.	*Change in remnant quality over time, measured by an increase in number of target species.*	• *Complete on-ground outputs record sheets.* • *Undertake flora and fauna surveys.*	*Annually for 50% of the sites, every two years for the other sites.*	*Every November*

WORKSHEET 4

Making a record of reporting and evaluation

Remember: Make sure that more than one person has a copy of this schedule so that it is not lost!

Project Name: .....

Project Manager: .....

Stakeholder	Information required	Frequency of reporting	Date for reporting	Format for report (newsletter, newspaper article, full annual report)	Person responsible
Project participants	*Information on project progress, both environmental and social, for example, kilometres of fencing erected, number of people participating in field days*	*Quarterly*		*Newsletter*	
Local community	*Overall project progress*	*Bi-annually*		*Newspaper articles*	
State funding program	*Overall project progress, including details of inputs, outputs and outcomes*	*Annually / when seeking further funding*		*Standard format, including report, graphs, table, synthesis, financial statement*	
National funding program	*Overall project progress, including details of inputs, outputs and outcomes*	*Annually*		*Standard format, including report, graphs, table, synthesis, financial statement*	

WORKSHEET 5

Preparing the monitoring schedule

Remember: Make sure that more than one person has a copy of this schedule so that it is not lost!

Project Name: ....

Project Manager: ....

Objective	Output indicator	Performance indicator	Monitoring activity	Schedule for monitoring	Person responsible	Analysis *
Within 2 years, exclude stock from all areas of remnant vegetation larger than 10 hectares	*Number of kilometres of fencing erected.*	*Change in remnant quality over time, measured by an increase in number of target species.*	• *Complete on-ground outputs record sheets.* • *Undertake flora and fauna surveys.*	*Reviewed every 6 months. To be monitored each November and June.*		*Gather fencing figures and review progress each year. Report and make changes as required to management. Include results in final report.*
	Number of areas of remnant vegetation from which stock have been excluded.	*80% or more of areas of remnant vegetation over 10 ha protected by fencing.*	• *Complete on-ground outputs record sheets.* • *Review catchment maps.*	*Annually for 50% of the sites, every 2 years for the other sites. To be monitored each November.*		*Gather and review results each year and identify changes and trends that may be evident. Report the results and make changes as required to management. Include results in final report.*

*** Check accuracy and uniformity of gathered information. Organise information into groups and then use these to calculate averages, ranges and identify trends and possible causes.**

WORKSHEET 6

Identifying responsibilities and the reporting timeframe

Remember: Make sure that more than one person has a copy of this schedule so that it is not lost!

Project Name: .....

Project Manager: .....

Format of report	Frequency of reporting	Person responsible for preparing report	People participating	Report to be provided to	Person distributing the reports and following up on conclusions	Person responsible for supervising this process
Newsletter / community meeting	*Quarterly*	*John Smith*	*Project management group*	*Editor of newsletter and community group*	*Roger Jones*	*Jenny White*
Newspaper article	*Bi-annually*	*John Smith*	*Various landholders*	*Local journalist*	-	*Jenny White*
Report / application and financial statement	*Annually / when seeking further funding*	*John Smith / Roger Jones*	*Project management group*	*State funding program*	*Roger Jones*	*Jenny White*
Report, synthesis	*Annually*	*John Smith / Roger Jones*	*Project management group*	*National funding program*	*Roger Jones*	*Jenny White*

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Rutherfurd, I., Jerie, K. and Marsh, N., 2000, *A Rehabilitation Manual for Australian Streams,* CRC for Catchment Hydrology and Land and Water Resources Research and Development Corporation, Canberra.

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RECORD SHEET 1

Baseline information

This proforma can be used for collecting baseline information at each site within a project. It should be completed only once before starting any activities at the site. If your project site occurs along a waterway, you may prefer to use the foreshore survey proforma in Record Sheet 2.

Project Title:	**Current Date:** ..... **Expected date of completion of activities:** .....
Project Number:	**Site Number:** .....
Property Name:	**Landowner:** .....
Map reference: ...../	**GPS:** S ..... E .....

Land use and disturbance and history

Native habitat or vegetation types historically present at the site (this may be obtained through early maps and aerial photographs, oral histories, and explorers' records...)

.....

Previous activities, land uses or major known disturbances on the project site (if possible include a description of the natural disturbance regimes present if known, eg. fire frequency and timing).

.....

Current activities, land uses or disturbances on the project site (include an estimate (as a percentage) of the proportion of remnant vegetation present and its condition, and current fire regime).

.....

Area of site (ha): .....

Position in landscape: Ridgeline Mid-slope Valley floor

Shape of site:

Circular Square, triangular Rectangular, indentations or extrusions
Long and fragmented Long, thin and fragmented Bordering waterway or wetland

Proximity of site to remnant of native vegetation or reserve

Attached to large area of native vegetation or conservation reserve
Nearest area of significant native vegetation is within 500 m
Nearest area of significant native vegetation is within 500 - 1000m
Nearest area of significant native vegetation is within 1 – 2 km
Nearest area of significant native vegetation is more than 2 km

Corridor formation

Forms corridor wider than 50 m between blocks of native vegetation or conservation reserve
Forms corridor less than 50 m wide between blocks of native vegetation or conservation reserve
Does not form corridor

Priority Class (Refer Appendix III and IV)

Highest
Very High
High
Medium

Soils

Sandy	Clayey	Loamy
Alluvial	Modified/imported soil	Other .....
pH (if known):	Erosion evident	Affected by salinity

Major vegetation type (see Appendix II for definition of terms)

Dominant Vegetation			
	Trees > 30 m	Trees 10 - 30 m	Trees under 10 m
	Tree mallee	Shrub mallee	
	Shrubs > 2 m	Shrubs 1 - 2 m	Shrubs under 1 m
	Grasses	Herbs	Sedges

Canopy cover of dominant vegetation (per cent)

100 – 70 % 70 – 30 % 30 – 10 % 10 – 2 %

Structural formation class (Use information above and Appendix II to identify class)

Presence of weeds

No weeds
Weeds restricted to periphery or small area
Up to 50 % of site is covered by weeds
Whole site is covered by weeds

Litter layer

Standing litter layer present over whole area
Standing litter layer sparse or absent in 30% of site
Standing litter layer sparse or absent in 50% site
Standing Litter layer generally absent

Salinity

No salinity in site or surrounding catchment
No salinity in site, but some in surrounding catchment
No salinity in site but adjacent to saline area
Some evidence of salinity in site

Hydrology

Flowing water/creeks	Waterlogged	Wetland
Stagnant ponds	Mostly dry	Spring/seeps
Stormwater drains	Ephemeral (intermittent)	Rising groundwater

Vegetation condition *(can tick more than one box)*

Tree understorey present	Ground cover present	Up to 50% of canopy has dead branches
Dead branches absent in canopy	All ages of vegetation present	Dead trees present

Habitat Opportunities

Trees with hollows	Logs/trees on ground	Tree falls/dead wood in waterways
Rocks, caves, crevices	Clumps of reeds, grass or shrubs	Vegetation overhanging waterway
Deep waterholes	Shallow ponds	Water flow over rocks

Fire History

No evidence of fire
Signs of an old fire event
Signs of recent fire event

.....

RECORD SHEET 2

Foreshore Condition Assessment Form

Filling out the foreshore assessment form

Paddock scale surveys: quick reference guide to filling out assessment forms	
General Details	Answer as many questions in this section as possible. ESSENTIAL INFORMATION: Your name, date of survey, the farm name, the nearest road intersection to the farm and the location number or lot number* of the property on which the survey was carried out (if known). Please indicate whether the survey was conducted with the assent of the property owner. OPTIONAL INFORMATION: Your contact address and phone number, the farm name and address. ** The location or lot numbers will help to locate the property, if not already known, on 1:50,000 topographical/cadastral maps from the Department of Land Administration,*
Foreshore assessed	Indicate whether one or both sides of the stream are being assessed. Generally, if the stream is at the boundary of the paddock, assess only the adjacent side. If it passes through the paddock assess both sides, using only one form.
Site diagram	Draw a sketch of the farm property, shading in the area where the paddock is located, indicating the general location of the stream. Include any other information which will be useful, such as roads, other streams, prominent features, lot numbers, etc. If you are doing more than one paddock, a single sketch will do. Just number the paddocks on the first sketch and refer to it on subsequent forms.
Foreshore grade (for south-west waterways)	In the basic survey, you grade the foreshore into one of four categories: **A grade:** Pristine to slightly degraded. Where the foreshore has healthy native bush, similar to that which you would see in most nature reserves, state forests or national parks. **B grade:** Degraded. Where the bush along the stream has been invaded by weeds, mainly grasses, and looks like typical roadside bush. **C grade:** Erosion prone to eroded. Where the foreshore supports only trees over weeds or pasture, or just plain pasture, and bank erosion and subsidence may be occurring, but only in a few spots. **D grade:** Eroding ditch to weed infested drain. Here, think of the typical drains you have seen, especially those just having been cleaned out with a backhoe. *Detailed survey* For more detailed surveys grade the foreshore using the sub-categories (A1, A2, ...D2, D3).
Fenced off	Indicate whether the stream is fenced off from livestock. Tick yes only if the fence is in good order and actually functioning as a fence.
Stock access	Tick the yes box if it appears that stock have had access to the river / creek recently, even if the streamline is fenced off.
Crossing point	Indicate whether there is a livestock or vehicle crossing point across the stream.
Comments	Any general comments or specific points regarding fences or livestock or vehicle access should be noted here.

ADDITIONAL INFORMATION	*The following sections provide some useful additional information to help gain an overall picture of the vulnerability and health of the river system. Fill out one or more of the boxes as appropriate.*
Bank steepness	Steep banks are more prone to erosion and collapse than more moderately sloped ones. Combined with soil cohesion information, this will highlight points of high erosion hazards. Tick the box which best represents the foreshore being surveyed.
General soil cohesion	The degree of cohesiveness of the stream embankment determines how vulnerable it is to erosion and subsidence once the supporting vegetation has been lost. Rocky embankments are extremely cohesive and the erosion of sediment is limited. Clayey soils are reasonably cohesive and only erode slowly, although loose surface sediment is quickly lost. Non-cohesive embankments of sand, loam or dispersive clays are the most prone to erosion and collapse. Tick the box which best represents the foreshore being surveyed.
Major erosion / siltation	Any point of erosion that produces more than a trailer load worth of sediment can be considered 'major'. Erosion types include simple cutting into the stream bank, undercutting of stream banks, firebreak or track washouts, and subsidence. Also indicate if there are large heaps of excess sediment, usually seen as white sand. Use the comments to give additional information such as the extent of the erosion or whether sediment is filling a river pool. This information will be used to identify "black spot" areas. Tick the appropriate boxes (you may tick several boxes).
Vegetation health	Use this section to give a general description of the health and vigour of the vegetation. This information is needed to identify section so the foreshore that may become unsupported by trees in the near future. Be sure to note the presence or absence of regenerating trees. The mature trees may be dead or sick looking, but if young ones are present, they may replace the old ones. Alternatively, adult trees may be healthy but no regeneration is occurring. Tick the appropriate boxes (you may tick several boxes).
Comments	Any general comments, special notes or specific points should be included here. For example, reference to cultural features or Aboriginal sites of significance.
Overall stream environmental rating	Assess each of the given parameters using Table C. Add all the scores together to obtain the *total score*. Use this score to calculate the *stream environmental rating*. An explanation of the parameters is given below. **Floodway and bank vegetation:** This vegetation grows in the floodway or on the banks and is the major natural source of nutrients and carbon for the stream ecosystem. The canopy is the tree cover that overhangs the stream. Plant roots stabilise the floodway and banks against erosion and subsidence. Stems and foliage dissipate the energy of floodwaters, reducing erosion and promoting sedimentation. **Verge vegetation:** The stream verge extends from the top of the embankment to a paddock fence, backyard fence or road, and is usually about 10-50m wide. Verge vegetation provides habitat next to water, increases the value of the riparian zone as an ecological corridor and stabilises the stream banks by anchoring them with tree roots to adjacent land. **Stream cover:** Fish and other aquatic organisms require snags, leaf litter and rocks to shelter from predators and fast flowing water, to reproduce, establish territories and for navigation. Aquatic plants are also very important for fish and other creatures in the stream. They have a direct effect on the available oxygen in the water, which in turn can effect the type of fish and other animals found. Protruding snags and rocks provide roosting and preening sites for birds and help to oxygenate water in fast flowing sections. Overhanging and emergent vegetation provides shade to which many aquatic animals retreat during the hot days of summer and autumn. Insects blown from flowers and leaves are a very important source of food for fish and other animals. **Bank stability and erosion:** Banks erode naturally, especially on bends (meanders). However when vegetation is cleared for agricultural activities and urban development, the stream banks can become unstable, resulting in extensive erosion along the floodway and the build-up of sediment that is then slowly washed downstream. Erosion and bank collapse can also be caused by increased runoff from impervious surfaces (e.g. car parks), from pipes and drains and by straightening or channelling the stream. **Habitat diversity:** Different habitat types in steams include cascades, rapids, riffles, waterfalls (which are quite rare), runs, meanders, pools and floodplains. Stream sections that have a range of habitat types can support a greater variety of species. Rapids occur where rocks and snags protrude through rapidly flowing water. Areas where water flows quickly over stones and rocks, or between tree stems, are known as riffles. Areas where the water surface is essentially flat are known as runs. Rapids and riffles provide habitat for invertebrates. It is common for the stream floodway, including rapids and riffles, to be

	heavily vegetated. The vegetated floodways are usually broken by deep pools which provide habitat for fish, turtles, marron and other animals. Pools are often the only parts of streams to retain water over summer, providing an essential drought refuge. Long broad sections of vegetated or clear floodway are typical of the lower reaches of our larger south-west rivers. They provide different types of habitat because the cutting action of water at bends creates deeper areas and variable water speed. Seasonal floodwaters adjacent to the stream may provide important breeding and feeding habitat for aquatic life. **Surrounding land uses:** The surrounding land use activities will contribute greatly to the ecological value of the stream. An area of national park or remnant bush contribute to, and benefit from, a wider biological diversity than can be found in either the stream or the bushland alone. A stream in an agricultural setting will have elevated sediment and nutrient levels, while a stream in an urban or industrial area will be more vulnerable to weed invasion and pollution. Native animals living in urban and semi-rural areas benefit from a stream environment and from the remnant bush along its flanks.

FORESHORE CONDITION ASSESSMENT FORM :

FOR PADDOCK SCALE SURVEYS

General details

Date:.....

Recorder's Name: .....

.....

Recorder's Contact Details: .....

.....

Farm Name:.....

Farm Address:.....

.....

Nearest road intersection:.....

.....

Catchment:.....

Stream name:.....

Location or Lot No:.....

Aerial Photo Ref:.....

Owner/manager consent obtained:
Yes / No

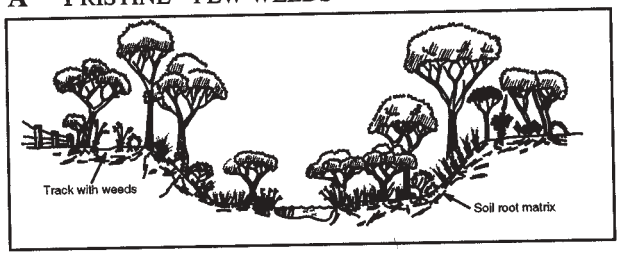
Owner/manager present during survey:
Yes / No

Foreshore assessed:
left ☐ right ☐ (facing upstream) both ☐

Site diagram

FORESHORE GRADE

A PRISTINE - FEW WEEDS ☐

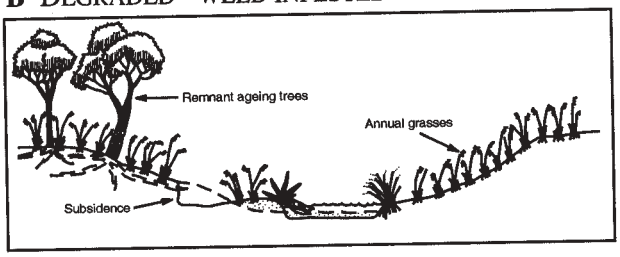


A1 Pristine: no weeds ☐

A2 Near pristine: some weeds ☐

A3 Slightly disturbed: local weed infestations ☐

B DEGRADED - WEED INFESTED ☐

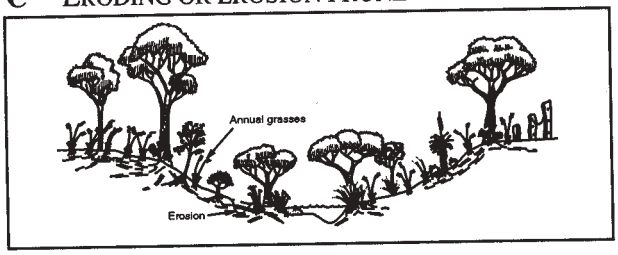


B1 Weed infested: understorey mainly natives ☐

B2 Heavily weed infested: natives = weeds ☐

B3 Degraded: understorey weed dominated ☐

C ERODING OR EROSION PRONE ☐

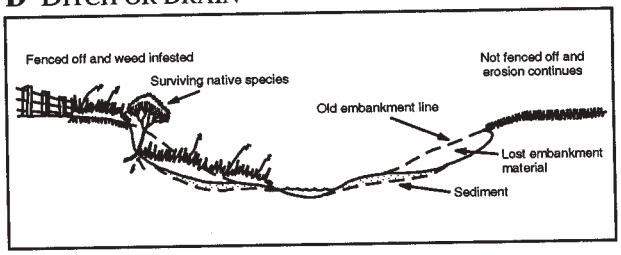


C1 Erosion prone: understorey weeds only ☐

C2 Surface erosion: soil exposed ☐

C3 Erosion and subsistence present ☐

D DITCH OR DRAIN ☐



D1 Eroding: extensive erosion and siltation ☐

D2 Freely eroding (ditch): erosion / siltation out of control ☐

D3 Weed infested (drain): highly eroded ☐

FENCING STATUS

Fenced off: Yes ☐ No ☐

Stock access to foreshore: Yes ☐ No ☐

Crossing point present: Yes ☐ No ☐

Comments:.....
.....
.....

ADDITIONAL INFORMATION

General bank steepness

- ☐ >60° — Very steep
- ☐ 45-60° — Steep
- ☐ 10-45° — Moderate slope
- ☐ 0-10° — Slight slope

General soil cohesion

- ☐ Excellent - rock, stone
- ☐ Good - clay, clayey loam
- ☐ Poor - sand, loose loam

Major erosion/siltation

- ☐ None
- ☐ Points of cutting/undercutting
- ☐ Major undercutting
- ☐ Firebreak/track washouts
- ☐ Bank subsidence
- ☐ Large sediment deposits

Vegetation health

- ☐ Looks healthy
- ☐ Some sick trees
- ☐ Many sick and/or dying trees
- ☐ Many dead trees
- ☐ Mainly long dead trees

Tree seedlings and saplings present: Yes ☐ No ☐

Comments

Stream environmental health rating (refer to Table C)

Rating	Floodway & bank vegetation	Verge vegetation	Stream cover	Bank stability & sediment	Habitat diversity
Excellent	(15)	(8)	(8)	(8)	(6)
Good	(12)	(6)	(6)	(6)	(4)
Moderate	(6)	(4)	(4)	(4)	(2)
Poor	(3)	(2)	(2)	(2)	(1)
Very poor	(0)	(0)	(0)	(0)	(0)

Surrounding landuse:

- ☐ Conservation reserve (8)
- ☐ Remnant bush (6)
- ☐ Rural residential (4)
- ☐ Urban (2)
- ☐ Agricultural (2)
- ☐ Commercial/industrial (1)

Score	*40-55*	*30-39*	*20-29*	*10-19*	*0-9*
Rating	*Excellent*	*Good*	*Moderate*	*Poor*	*Very poor*

Total score = ...

Environmental rating = ...

LIVING STREAMS SURVEY: INFORMATION TO DETERMINE OVERALL STREAM ENVIRONMENTAL RATING

	Floodway and Bank Vegetation	Verge Vegetation	Stream Cover	Bank Stability and Erosion	Habitat Diversity
Excellent	• Healthy undisturbed native vegetation. • No weeds. (15 points)	• Healthy undisturbed native vegetation. • Verges more than 20m wide. (8 points)	• Abundant cover: shade, overhanging vegetation. • Snags, leaf litter, rocks and/or aquatic vegetation in stream. (8 points)	• No erosion, subsidence or sediment deposits. • Dense vegetation cover on banks and verge. • No disturbance. (8 points)	• Three or more habitat types. • Some permanent water. (6 points)
Good	• Mainly healthy undisturbed native vegetation. • Some weeds. • No recent disturbances. (12 points)	• Mainly healthy undisturbed native vegetation. • Verges less than 20m wide. (6 points)	• Abundant shade and overhanging vegetation. • Some cover in the stream. (6 points)	• No significant erosion, subsidence or sediment deposits in floodway or on lower banks. • May be some soil exposure and vegetation thinning on upper bank and verge. (6 points)	• Two habitat types. • Some permanent water. (4 points)
Moderate	• Good vegetation cover, but a mixture of native and exotic species. • Localised clearing. • Little recent disturbance. (6 points)	• Good vegetation cover, but mixture of exotic and native species. • Verges 20m wide or more. (4 points)	• Some permanent shade and overhanging vegetation. • Some instream cover. (4 points)	• Good vegetation cover. • Only localised erosion, bank collapse and sediment heaps. • Verges may have sparse vegetation cover. (4 points)	• Mainly one habitat type with permanent water, or a range of habitats with no permanent water. (2 points)
Poor	• Mainly exotic ground cover. • Obvious site disturbance. (3 points)	• Narrow verges only (< 20m wide). • Mainly exotic vegetation. (2 points)	• Channel mainly clear. • Little permanent shade or instream cover. (2 points)	• Extensive active erosion and sediment heaps. • Bare banks and verges common. • Banks may be collapsing. (2 points)	• Mainly one habitat type with no permanent water. (1 point)
Very Poor	• Mostly bare ground or exotic ground cover (i.e. pasture, gardens or weeds but no trees). (0 points)	• Mostly bare ground or exotic ground cover (i.e. pasture, gardens or weeds but no trees). (0 points)	• Virtually no shade or instream cover. (0 points)	• Almost continuous erosion. • Over 50% of banks collapsing. • Sediment heaps line or fill much of the floodway. • Little or no vegetation cover. (0 points)	• Stream channelised. • No pools, riffles or meanders. • The stream forms a continuous channel. (0 points)

RECORD SHEET 3

Photopoints

Photopoint location:	Date:	Time:
Location details:	Compass bearing:	GPS: S E
Direction of photo:	Negative number:	
Lens type/other camera settings:	Photographers name:	
Purpose of photo/site observations:		
Attach photograph here		

Photopoint location:	Date:	Time:
Location details:	Compass bearing:	GPS: S E
Direction of photo:	Negative number:	
Lens type/other camera settings:	Photographers name:	
Purpose of photo/site observations:		
Attach photograph here		

RECORD SHEET 4

Vegetation transect notes

Project Name: ..... **Project location:** .....

Recorders Name: ..... **Date recorded:** .....

Tick if applicable

In the transect identify which of the following apply:

Soil / Habitat

- Heavy leaf litter, twigs
- Evidence of active erosion (gullies or rills, exposed roots)
- Large patches of bare earth
- large loose rocks
- Signs of salinity present
- Fallen hollow logs
- site degraded by stock

Other

_____

_____

_____

_____

Fauna

- evidence of rabbits
- evidence of foxes
- bird calls

Vegetation

- a range of tree ages
- signs of insect attack
- degraded vegetation
- fungal disease
- signs of dieback
- exposed roots
- signs of dieback
- aquatic plants
- regrowth
- domination by weeds
- branch tips with no leaves
- an understorey of shrubs
- regeneration evident

Measurable attributes

% weed cover = ...
No. weed species = ...
No. regenerating species = ...
% canopy cover = ...
Canopy height (m) = ...
% Ground cover = ...
Soil pH = ...
Soil litter depth (mm) = ...

Management actions/project activities conducted within transect

.....
.....
.....
.....
.....
.....

Additional notes: (i.e. time of year, climate, rainfall patterns, average temperature or unusual events)

.....
.....
.....

Notes (whether the site is patchy or consistent in terms of soil, vegetation or hydrology may also be noted)

.....
.....
.....

RECORD SHEET 5

Monitoring Regeneration and Planting Success

This record sheet has been designed to record the results of *Monitoring Techniques D and E*. This sheet can be used to record data for all species or for individual species at the site. The species list for the site should be recorded as an attachment to this sheet.

Project Name: ..... **Recorder's Name:** .....

Location of site: ..... **Size of activity area:** .....

Date of initial planting: ..... **No. of species planted:** .....

Planting method used: .....

Observation date	Number of species present	Plant density	Survival rate	Notes
1/2/1992	*15*	*340 plants per hectare*	*89%*	*Seedlings appear to be growing well but some weed control is indicated*

RECORD SHEET 6

Monitoring Weeds

Project Name: ..... **Site location:** .....

First year of observation: ..... **Site description:** .....

Recorder's Name: ..... **Transect length and quadrat size:** .....

Weed species: ..... **Scientific Name:** .....

Control methods: .....

Observation date	Monitoring Location	Density	Notes (growth stage, status)	Next management action
22/3/2000	*Transect 1*	*<5%*	*Mature plants with fruit, environmental weed*	*Hand removal of remaining mature plants prior to seeding*

RECORD SHEET 7

Vegetation quality assessment results

Project Name: ..... **Site location:** .....

First year of observation: ..... **Site description:** .....

Recorder's Name: .....

Management activities undertaken at site:

.....

.....

Observation date	Monitoring Location	Assessment rating	Assessment of remnant quality	Next management action indicated by assessment
22/3/2000	*Transect 1*	*42*	*Very high*	*Some weed control indicated, fence at north end needs to be repaired.*

RECORD SHEET 8

Fauna Observations

Project Name: ..... **Recorder's Name:** ..... **Year:** .....

Site Location: .....

.....

Common Name	Date Observed	Weather conditions on day	Location (map reference or GPS reading if available)	Time	Notes (i.e. seen or heard mammal, male, female, vegetation types observed in, dawn/dusk, general conditions etc)
Kangaroo	*12/7/2000*	*Cold/cloudy*	*E 115 34 06.3 S 34 12 16.5*	*6.40pm*	*In a mob of thirty, some with joeys, by the dam*

Threatened fauna report form

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

FILE# _____ PRECISION: _____ DATABASE RECORD# _____

SPECIES _____ NO. SEEN: _____

DISTINGUISHING FEATURES OBSERVED: _____

CERTAINTY OF IDENTIFICATION: ☐ Very certain ☐ Moderately certain ☐ Not sure

AGE AND SEX:

No. of Adults: _____ Male _____ Female _____ Sex unknown

No. of Juveniles: _____ Male _____ Female _____ Sex unknown

COLLECTOR/OBSERVER: _____ PHONE NO: _____

SURVEY DATE: _____ TIME: _____

SHIRE: _____ CALM REGION: _____

LOCALITY: _____

MAP REF: _____ CALM MAP NAME: _____ Grid Reference _____

(Complete one line ONLY)

Latitude ☐☐° ☐☐ ☐☐ S Longitude ☐☐☐° ☐☐ ☐☐ E

AMG Zone ☐ 49 ☐ 50 ☐ 51

Northing ☐☐☐☐☐☐☐ Easting ☐☐☐☐☐

LAND STATUS:

☐ Nature Reserve ☐ State forest ☐ Private Property ☐ Road Verge Shire

☐ National Park ☐ Vacant Crown Land ☐ Road Verge MRD

☐ Pastoral Lease ☐ Other reserve ☐ Unknown

VEGETATION TYPE:

☐ Forest Significant species _____ ☐ Grassland

☐ Woodland Significant species _____ ☐ Sedgeland

☐ Mallee Significant species _____ ☐ Rock communities

☐ Tall Shrubland Significant species _____ ☐ Wetland

☐ Heathland Significant species _____ ☐ Other _____

OBSERVATION/COLLECTION METHOD:

☐ Daylight sighting ☐ Night sighting ☐ Heard ☐ Caught or trapped ☐ Diggings

☐ Droppings ☐ Feathers ☐ Bones ☐ Dead ☐ Other

BEHAVIOUR:

What was the animal doing? _____

BREEDING:

☐ Pregnant ☐ Lactating ☐ Mating ☐ Male in breeding colours ☐ Eggs/young in nest ☐ Other

FIRE HISTORY:

☐ Not known Year burnt _____ Month (approx) _____

☐ Next prescribed burn: Year _____ Month _____

CURRENT LAND USE:

☐ Nature Conservation ☐ Agriculture ☐ Pastoralism ☐ Mining

☐ Forestry/Multiple purpose ☐ Recreation ☐ Other

FERAL ANIMALS:
Habitat damaged by feral animals ☐ Yes ☐ No ☐ Unknown
Feral species and damage type_____

SPECIMEN:
☐ Retained by collector ☐ WA Museum ☐ Other _____ ☐ Not retained

ATTACHED: ☐ Map ☐ Mud map ☐ Photo ☐ Notes
ACTION, TAKEN/REQUIRED:_____

OTHER COMMENTS: _____

COPY SENT TO: ☐ Regional Office ☐ District Office ☐ Head Office

Signed: _____ Date:_____

PLEASE SEND COMPLETED FORM TO SENIOR ZOOLOGIST, WILDLIFE BRANCH, DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT, LOCKED BAG 104 BENTLEY DELIVERY CENTRE W.A. 6983

[RECORD NO.]

RECORD SHEET 9

Bird Observations

Project Name:	**Recorder's Name:**	**Date:**
Site location:		

Species	Yes	Species	Yes	Species	Yes
Cockatoos and Parrots		**Honeyeaters and Chats**		**Swallows and Martins**	
Red-tailed Black Cockatoo		White-eared Honeyeater		Welcome Swallow	
White-tailed Black Cockatoo		Brown-headed Honeyeater		White-backed Swallow	
Carnabys Black Cockatoo		Spiny-cheeked Honeyeater		Tree Martin	
Pink and Grey Galah		New Holland Honeyeater		Fairy Martin	
Corella		Singing Honeyeater			
28 - ringneck		Yellow-plumed Honeyeater		**Owls, nightjars and frogmouths**	
		Brown Honeyeater		Southern Boobook	
Hawks, Eagles and falcons		Tawny-crowned Honeyeater		Barking Owl	
Black Shouldered Kite		Crimson Chat		Masked Owl	
Brown Goshawk		White-fronted Chat		Barn Owl	
Australian Hobby (Little Falcon)		Red Wattlebird		Owlet Nightjar	
Australian Kestrel		Yellow-throated Miner		Tawny Frogmouth	
Spotted Harrier					
Peregrine Falcon		**Robins, Whistlers and Shrike-thrushes**		**Waterbirds**	
Wedge-tailed Eagle		Red-capped Robin		Black Swan	
Little Eagle		Jacky-Winter		Australian Shelduck	
Brown Falcon		Golden Whistler		Australian Wood Duck	
		Rufous Whistler		Grey Teal	
Pigeons		Grey Shrike-thrush		Musk Duck	
Common Bronzewing		Western Yellow Robin		White-faced Heron	
Crested Pigeon		Southern Scrub-robin		Straw-necked Ibis	
				Australian White Ibis	
Crows and Ravens		**Fairy wrens and scrub wrens**			
Australian Raven		Splendid Fairy-wren		**Other**	
Little Crow		White-winged Fairy-wren		Magpie-lark	
		Shy Hylacola		Richard's Pipit	
Fantails and Flycatcher		Rufous Fieldwren		Bush Stone-curlew	
Grey Fantail				Striated Pardalote	
		Thornbills		Mallee fowl	
Restless Flycatcher		Yellow-rumped Thornbill		Magpie	
Willie Wagtail		Chestnut-rumped Thornbill		Emu	
		Western Thornbill		Mistletoe bird	
Sitellas and Treecreepers		Inland Thornbill		Black-faced Cuckoo Shrike	
Rufous Treecreeper				Western Gerygone	
Varied Sitella		**Kingfishers & Bee-eaters**		Weebill	
		Rainbow Bee-eater		White-browed Babbler	
		Sacred Kingfisher			

RECORD SHEET 10

Recording Macroinvertebrates

Group:_____		Site:_____	
Contact:_____		Sampling Net:_____	
Date:_____	Time:_____	Sampling time:__(*mins*)	Sorting time:____(*mins*)

Macroinvertebrate	Classification	Present (✓)	Comments
PHYLUM ARTHROPODA – CLASS INSECTA			
Stonefly larvae	Plecoptera (order)		
Mayfly larvae	Ephemeroptera (order)		
Caddisfly larvae	Trichoptera (order)		
Dragonfly larvae	Odonata (order)		
Damselfly larvae	Odonata (order)		
Water boatmen	Corixidae (family)		
Backswimmers	Notonectidae (family)		
Water scorpion	Nepidae (family)		
Water measurer	Hydrometridae (family)		
Water strider	Gerridae (family)		
Riffle beetle adult/larvae	Elmidae (family)		
Predacious diving beetle adult/larvae	Dytiscidae (family)		
Water scavenger beetle adult/larvae	Hydrophilidae (family)		
Whirligig beetle adult/larvae	Gyrinidae (family)		
Mosquito larvae and pupae	Culicidae (family)		
Blackfly larvae	Simuliidae (family)		
Soldierfly larvae	Stratiomyidae (family)		
Biting midge larvae	Ceratopogonidae (family)		
Springtails	Collembola (order)		
PHYLUM ARTHROPODA – CLASS CRUSTACEA			
Freshwater crayfish	Parastacidae (family)		
Freshwater prawn	Decapoda (order)		
Water flea	Cladocera (suborder)		
Clam shrimp	Conchostraca (suborder)		
Amphipod	Amphipoda (order)		
Ostracod	Ostracoda (subclass)		
Copepod	Copepoda (subclass)		
Shield shrimp	Notostraca (order)		
Fairy shrimp	Anostraca (order)		
Isopod	Isopoda (order)		
PHYLUM ARTHROPODA – CLASS ARACHNIDA			
Water mite	Acarina (order)		
Water spider	Araneae (order)		
PHYLUM MOLLUSCA			
Freshwater mussel	Bivalvia (class)		
Freshwater snail	Gastropoda (class)		
PHYLUM ANNELIDA			
Segmented worm	Oligochaeta (class)		
Leeches	Hirudinea (class)		
PHYLUM NEMATODA			
Roundworms	Nematoda (phylum)		
PHYLUM PLATYHELMINTHES			
Flatworms	Turbellaria (class)		
MACROINVERTEBRATE DIVERSITY (TOTAL)*			

* Add up the number of ✓'s to determine the total number of different macroinvertebrates found. The presence of various freshwater macroinvertebrates may vary according to season, lifecycle, water flow, habitat and water quality.

RECORD SHEET 11

Recording Expenditure

Project Name: .....
Recorder's Name: .....
Year: .....

Site Location: .....
Main activities:.....

Date	Item	Invoice Number	Supplier	Cost (incl. GST)	Associated activity/task
13/11/2001	*20 x 5' Star pickets*	*1999490*	*Pacific Hardware*	*$89.60*	*Fencing*

***Activities can be categorised to match budget items such as administration, fencing, planting, promotion and publicity, maintenance, etc.**

RECORD SHEET 12

Recording on-ground activities

Project Name: .....
Recorder's Name: .....
Year: .....

Site Location: .....
Main activities: .....

Date	Location	Activity (weeding, planting, seed collecting)	No. hours	No. volunteers	Area treated (ha)	Materials used (fencing, mulch, herbicide etc.)	Notes
13/11/2001	*Johnson's farm*	*Weeding*	*3*	*7*	*250 ha*	*5 L of Roundup*	*Not all herbicide used*

RECORD SHEET 13

Recording in-kind contributions

Project Name: .....
Recorder's Name: .....
Year: .....

Site Location: .....
Main activities: .....

Date	Description of activity	Materials and equipment	In-kind labour (eg. Consultants, experts, volunteers)	No. hours (on day and preparation)	Rate $/hour	Travel (kms)	Other expenses	Total $
13/11/2001	*Planting day*	*Tubestock invoice No 1234*	*Volunteers*	*12 people 3 hours*	-	*35km*	*12 phone calls, 50x postage*	*$302*