BIODIVERSITY ASSESSMENT AND SURVEY

3

3. MODULE ONE: BIODIVERSITY ASSESSMENT AND SURVEY

PARTICIPANT NOTES

1. Introduction and learning outcomes
2. Biodiversity: an important asset
3. Planning the biodiversity management of your property
4. Mapping your property's native vegetation and water body areas
5. Assessing your property's current ecological condition
6. Surveying your property's biodiversity
7. Setting biodiversity performance indicators

1. INTRODUCTION

This is Module one in the two module series *Planning for Biodiversity Management*. These two modules will help you and your family to plan how to manage and conserve the biodiversity that occurs on your property and how this links with other decisions you need to make in managing your property as a whole.

The primary aim of Module One is to provide you and your family with an increased awareness and understanding of biodiversity conservation on your own property. This module enables you to collect the information you need to assess the current health of your property's biodiversity.

These practical skills in biodiversity assessment and understanding will assist you in your ongoing development of property management plans for your whole property. This recognises the importance and contribution of biodiversity conservation to environmentally, economically and socially sustainable land management.

LEARNING OUTCOMES

On completion of this workshop you will be able to:

- Recognise how your property's health and productivity is supported through biodiversity management and conservation;
- Understand the meaning of terms such as biodiversity, genetic diversity, species diversity, ecosystem diversity, sustainability, ecosystem, ecological community, and threatened, vulnerable and endangered species;
- Have an appreciation of the economic, social and environmental values of conserving biodiversity and have a greater understanding of the range of threatening processes to biodiversity;
- Identify, describe and assess native vegetation and modified, artificial environmental systems with regard to biodiversity values;
- Assess water bodies, such as creeks, dams and wetlands for their health and wildlife habitat value; and
- Conduct a baseline biodiversity survey.

"This module enables you to collect the information you need to assess the current health of your property's biodiversity."

2. BIODIVERSITY: AN IMPORTANT ASSET

Biodiversity is the variety of all life forms on Earth, including plants, animals and micro-organisms. It includes the genes of all species, the communities they form and ecosystems of which they are a part.

Biodiversity can be considered on three different levels: genetic, species and ecosystem diversity. In surveys or assessments of an area, a measure of biodiversity can be made by identifying the number of species in that area.

A species is a group of organisms, which shares a combination of genetic variations that make its members different to all other species. Members of a species can breed only with other members of the same species; they cannot breed with members of other species.

The number of species on earth is widely estimated at 10-100 million. In Australia there is a distinctive and diverse range of native plants and animals. Australia's history as an isolated landmass has resulted in a high level of species richness and uniqueness compared to many other parts of the world; for example there are an estimated 25,000 plant species alone, not to mention the vast numbers of invertebrates. There are more ant species on Black Mountain, overlooking Canberra, than there are in the whole of Britain. (Tim Flannery, *The Future Eaters*, Reed, 1994, p.75).

Australia is one of only twelve mega-diverse countries and its native biodiversity is of global significance. In these workshops the term biodiversity will be used to refer to the native Australian ecosystems and their components - the plants, animals and microorganisms. On farm properties this is the original vegetation or bushland - the remaining vegetation of trees, shrubs and grasses and all the native organisms - the animals, birds, insects, fungi, bacteria etc which use the bush and soil for habitat or in some way are a part of this natural system. The term habitat means the place - the living space - where a plant or animal lives. Habitat is shelter and food; it is made up of different components and consists of different things for different species. To ensure a variety of life we must ensure a variety of habitat.

Much of Australia's precious biodiversity exists on privately owned properties in agricultural landscapes.

DISCUSSION QUESTION 2.1

Think about your own property. How many species might it contain? Which areas of your property might provide the best habitat or have the highest biodiversity values? How do the modified areas on your property also provide habitat?

Since 1788 the natural environment of Australia has been significantly modified. More than 70% of native vegetation in NSW has been removed or substantially changed by human activity. In NSW over 80 native plant and animal species are presumed extinct with another 600 species considered either endangered or vulnerable. Forty percent of the mammal species that are extinct or endangered were common 200 years ago. The growing list of species threatened with extinction is an indicator of the loss of biodiversity.

DISCUSSION QUESTION 2.2

Think about the native birds or animals you remember from your childhood. What changes have occurred? What native birds or animals seem to have adapted to the agricultural or other changes you have made to your property?

Healthy bushland and waterways are now quite scarce in much of the agricultural areas of NSW. Many of the existing patches of bush on farms are small and often in decline due to impacts such as clearing, grazing, changes to fire regimes, pest and weed competition, increased nutrient input from fertilizers and animal manure and changes in ground water levels affecting salinity.

Wildlife species move across the landscape seeking food and shelter. Private lands cover a large part of the NSW landscape and provide valuable habitat for a diverse range of native plant and animal species and ecosystems. The remaining vegetation on private land tenure provides linkages and corridors of wildlife habitats to protect and support the sustainable conservation and management of our native biodiversity, including many endangered species and ecosystems.

THE IMPORTANCE OF BIODIVERSITY CONSERVATION

Biodiversity is vital in supporting all life on Earth. It affects us all and is a fundamental part of our lives and agricultural production. Biodiversity provides what are termed "ecosystem services", which is the provision of clean air and water and fertile soils. Biodiversity provides all of our food and the raw materials for clothing and many industrial products and medicines. It provides opportunities for recreation, tourism, scientific research and education and is a source of cultural identity for many Australians.

Biodiversity, the plant and animal species that interact with each other in their physical environment, is essential to the rural, agricultural landscape and agricultural land management systems as it provides the "nuts and bolts" of a healthy ecosystem.

An "Ecosystem" is the organisms in a community and the associated non-living factors with which they interact.

Generally, the more complex or diverse an ecosystem, the less likely it is that a disturbance will cause an individual species to die out, and the system remains stable. So, in natural ecosystems, there is a relationship between diversity and stability. The more variety in a system, the more robust the system and the better it can survive a disturbance or a major environmental event such as drought, flood or fire.

Farms, although managed for production of food and/or fibre, have natural ecosystems (remnant vegetation), and modified and artificial systems integrated with agricultural production systems, which all support and sustain native biodiversity. The natural ecosystems can provide the robustness and be an important component in managing risk.

DISCUSSION QUESTION 2.3

What are some of the impacts of your enterprises upon biodiversity?

Farming systems modify the natural ecosystem to achieve a specific result. For example clearing of native vegetation and pasture improvement create an environment suited to increased grazing by stock. Because parts of a farm ecosystem relate to each other in a complex system, all actions produce an effect, sometimes unintended.

UNDERSTANDING YOUR PROPERTY'S ECOLOGY

Ecology is the study of the relationship between living organisms and the environment or the study of ecosystems.

Ecosystems are the "web of life", made up of a diverse range of plant and animal species that interact with each other in their physical environment. Since humans are a part of or have an influence on the ecosystem, it is important for us to remember that any damage to the environment has a potential impact upon us.

Your property can also be described as an ecosystem because each part interacts with at least one other to contribute to the overall functioning. A change in one part will affect many other parts of the whole ecosystem.

Figure 2.1 Straw-necked Ibis *RAOU 1984*

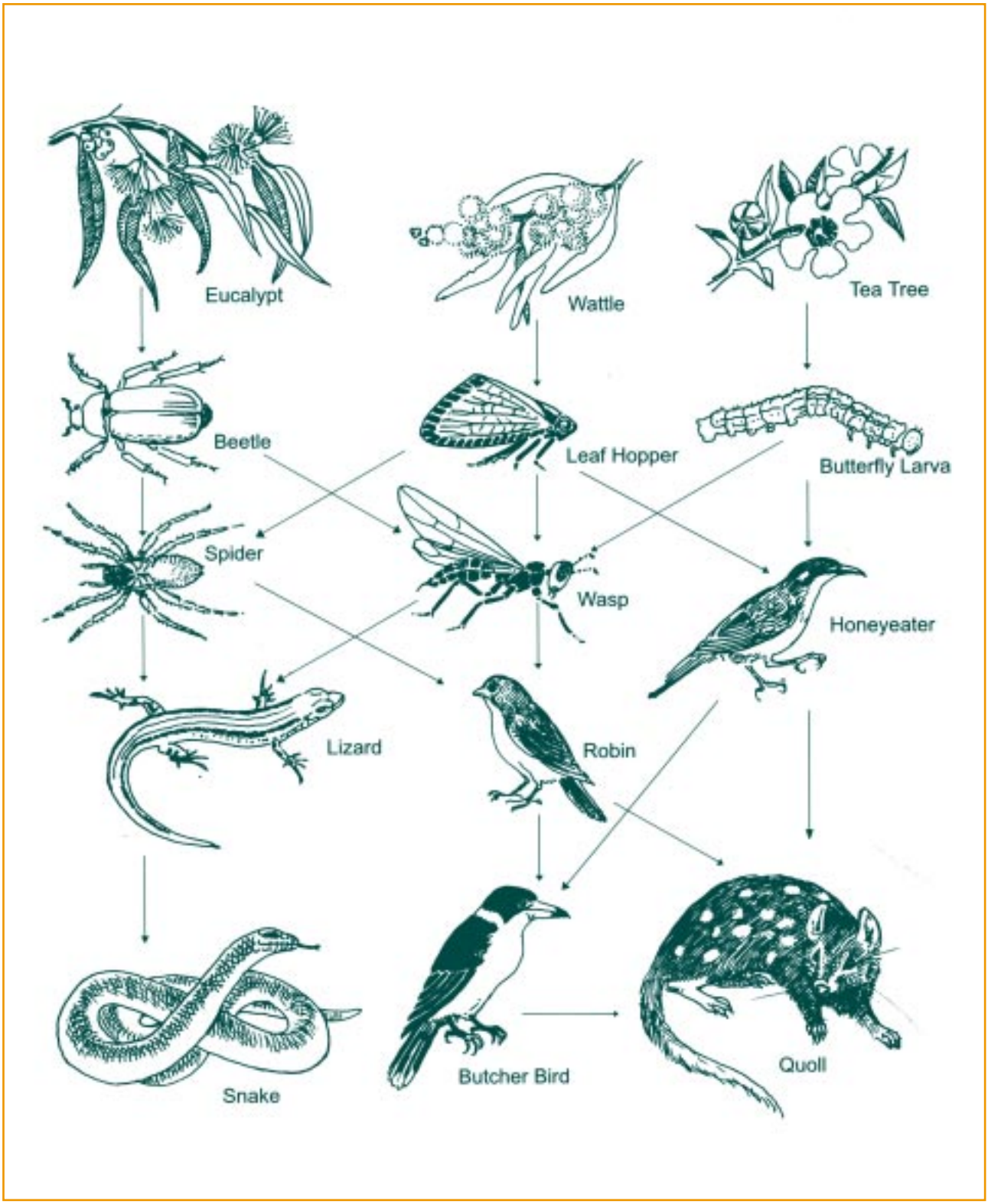

Figure 2.2. A food web develops in the ecosystem and humans are often a part of the system *J.Miller*

DISCUSSION QUESTION 2.4

What are the different components of your property's ecosystem? How healthy is it? How would it respond to a major disturbance or extreme environmental event?

Parts of your property's ecosystem may include: stock, crops, pastures, trees, native bush, soil, creeks, dams, gullies, soil organisms and a variety of other native plants and animals. We now realise that there are many benefits to integrating the natural ecosystems with agricultural and grazing practices and the farm ecosystem.

THE BENEFITS OF HAVING NATIVE PLANTS AND ANIMALS ON YOUR PROPERTY

It is hard to put a value on the quality of life that the Australian landscape, the characteristic trees, animals and birds, provide for those who live on the land. However a considerable amount of scientific research has been done in recent years to show the economic value landholders derive from retaining native vegetation and having native plants and animals on productive properties.

DISCUSSION QUESTION 2.5

Brainstorm the benefits that come from having native plants and animals on a farm. Consider the value of the bush around this farm dam.

Can you assess the risks to your farm production and farm management of biodiversity loss and loss of its associated ecosystem services?

Figure 2.3 Landholders can benefit from retaining native vegetation on their properties *S.McMahon/NPWS*

Some of the main benefits to consider are listed below.

1. The ability of many of our native wildlife species to control pests. For example:

- Honeyeaters can consume 24-36 kg of insects per hectare per year from woodland areas. Honeyeaters require a well developed native vegetation understorey for nesting and a variety of nectar producing plants.
- A flock of 100 Straw-necked Ibis will eat over 25,000 pasture insect pests in one day. Vegetation near water will provide safe night time roosts for Ibis.
- One insectivorous bat can consume up to 600 small flying insects in an hour. Bats are known to eat army worms, moths and mosquitoes and need safe places to camp during the day, such as hollow bearing trees, caves and sheds.
- One sugar glider consumes the equivalent of well over 4,000 Christmas beetles or 23,000 Autumn gum moths per year. Sugar gliders need a diverse native vegetation understorey and hollow bearing trees for survival.

Figure 2.4 Sugar Glider *NPWS*

- Native wasps may parasitise over 90% of eggs in some locust egg beds. Native wasps also need a diverse native vegetation understorey to survive.

Consider the savings in pest control if you had all of these farm workers on the payroll!

TABLE 2.1 SUMMARY OF SOME ADVANTAGES OF ENCOURAGING WILDLIFE TO CONTROL PESTS *(NSW Agriculture 1996)*

Pest Type	May be controlled by
Insect pest species of pasture and trees	Echidnas, sugar gliders, bats, parasitic wasps, magpies and other birds
Mice, rats, hares, rabbits	Predatory birds such as owls, hawks and eagles
Carrion that may spread disease or blowflies	Crows, ravens, goannas and some lizards
Mistletoe	Possums and some butterflies
Insects, rats and mice	Lizards, snakes, frogs and spiders
Insect pests of trees (eg. scarabs that contribute to dieback)	Parasitic wasps

2. Shelter and shade provided by native vegetation, especially in times of poor or extreme weather:

- Significantly reduces the need for supplementary feeding of stock. Wethers, in shelter provided by vegetation, require around one third the amount of supplementary feed to maintain liveweight as unsheltered wethers.
- Dramatically reduces stock losses off shears or following lambing.
- Reduces heat and cold stress in stock, resulting in increased milk production, increased liveweight gain, increased wool growth, increased fertility and increased birth weights.
- As shelterbelts, reduce the microclimatic impacts of wind, increasing downwind yields of crops and pastures by an average of approximately 20 per cent.

3. The pollination of crops by insects and birds:

- Was last estimated (1990) to be worth between $600 million and $41.2 billion per year in Australia. Native insect pollinators will travel from nearby areas of native vegetation and wetlands.

4. Soil fungi associated with plant root mycorrhiza:

- Can effectively increase the surface area of roots by up to 2000 times, providing a huge boost to plant productivity.

5. Clean water from areas managed as wildlife habitat as well as stock water supply can affect stock production:

- An overseas trial showed that over the course of 71 days, 18-month old steers drinking clean, fresh water gained 23 per cent more weight than steers drinking dirty water from poorly managed dams.

6. Wetlands are places of intense biological activity which provide many benefits:

- They filter and break down nutrients in farm runoff, reducing the risk of blue-green algal blooms and improving catchment water quality;
- They provide green fodder in summer, while being retained as a valuable wildlife habitat, encouraging native water birds and other wildlife onto the property that feed on insect pests;
- They are also important for recreational activities eg: fishing, hunting, canoeing and camping; and

- Dry wetlands reduce the damage caused by floods by absorbing large volumes of water which would otherwise be confined to the main river channel.

MANAGING FOR BIODIVERSITY

We all benefit from the conservation of biodiversity and the products and services it provides and we hope will continue to provide for future generations. It is also a major challenge due to population growth, settlement patterns and our consumption of resources, which are all exerting major stresses on our natural environments.

Damage to the environment and biodiversity loss is difficult to reverse. By understanding the things that threaten biodiversity we can work to protect, conserve and minimise further loss of our natural resources. These threats come from a broad range of human activities and are not just limited to one particular sector of the community.

However on farming lands activities such as clearing, inappropriate grazing, inappropriate water extraction, pests, weeds, pollution, contamination, soil loss and salinity all contribute to the threats to biodiversity.

Biodiversity conservation requires the adoption of management practices, which sustain the diversity of natural ecosystems. You also need to have an awareness of how your modified and artificial systems integrated in agricultural production can contribute to biodiversity. Your property planning and management objectives need to include biodiversity conservation as part of achieving productive and sustainable farming systems.

Some of the basic things that can be done to conserve biodiversity on farms include:

1. Retain and protect by fencing all natural vegetation, whether areas of remnant, native grassland or isolated paddock trees;
2. Protect all watercourses and wetlands;
3. Leave adequate ground debris - logs, branches, rocks and leaf litter for shelter and food for plants and animals, if it is safe to do so;

> "Damage to the environment and biodiversity loss is difficult to reverse."

4. Control exotic or native pests with ecological sensitivity;
5. Control weeds with ecological sensitivity;
6. Revegetate strategically using local native species to restore and rehabilitate areas;
7. Control soil erosion and maintain soil health and
8. Manage fire for both protection of built assets, as well as considering the protection of biodiversity from inappropriate fire regimes.

Biodiversity is linked to achieving ecological sustainability and is a pillar of sustainable land management.

Ecologically Sustainable Development (ESD) is development which aims to meet the needs of Australians today, while conserving our ecosystems for the benefit of future generations of all species.

(Learning for Sustainability, NSW Environmental Education Plan 2002-5)

Your efforts to adopt sustainable property management practices will significantly contribute to your property's ecological health, productivity and future viability, ensuring that your property is a valuable asset either for resale or transfer to your family's next generation. You will also contribute to health of your entire catchment or sub-catchment.

Managing for biodiversity and property planning to make sure you look after all the resources of your property is the focus of the second biodiversity planning workshop, Module Two.

Fire in grassland *Higginson/NPWS*

3. PLANNING THE BIODIVERSITY MANAGEMENT OF YOUR PROPERTY

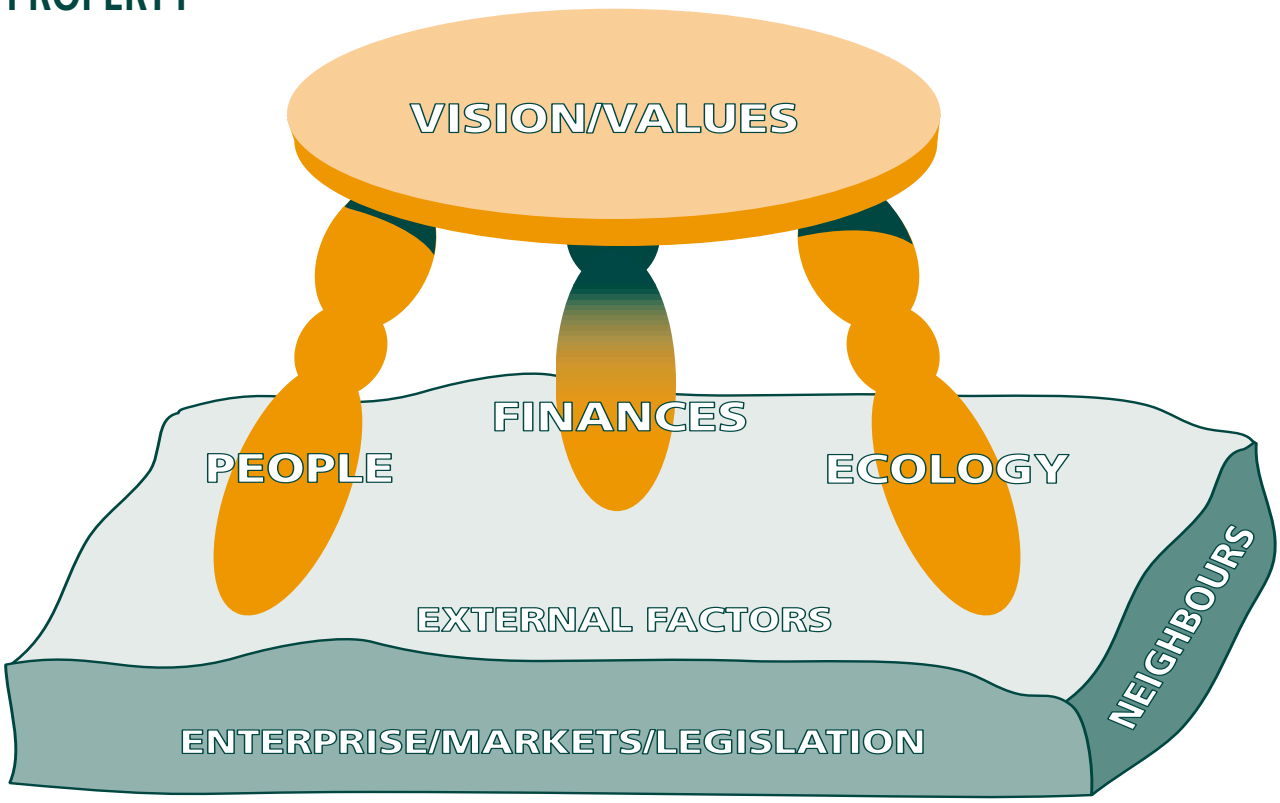

Figure 3.1 The planning context

This stool diagram shows the key aspects that need to be considered when undertaking the planning process for your property's management. Your property rests on the three "legs" of people (human resources), the finances (financial resources) and the ecology (natural resources). The stool is placed on a platform of external factors and considerations that you must be aware of and take into account and which change over time. These include legislation, council planning regulations, neighbour's values and attitudes, climatic factors and market factors. If too much emphasis is placed on any one of the three legs or the platform shifts or changes, the stool, ie your property's management, becomes unbalanced and falls over. The two workshops in *Planning for Biodiversity Management* are focussed on the Ecology "leg".

In order to manage your property, including biodiversity considerations, it is helpful to undertake long term planning. This process includes looking to the future to identify a vision as to where you wish your property to

be, in the long term. The next step is to identify what the situation is now and then to identify how to work toward achieving your vision through doing tasks and actions. Acknowledging that things change, a plan should not be a static document but one that can be adapted and changed as circumstances change and tasks are achieved. Monitoring and evaluating the actions that have been identified in the plan over a time period means that the plan remains valid, current and a working document for ongoing use and guidance. In this Module we will consider the *where* and the *now*. In Module Two the *how*, *do it* and *monitor* and *evaluate* steps of the planning process will be outlined.

"WHERE" - YOUR PLANNING VISION

An essential part of the planning process is to think about *where* you would like to be, with regard to your property's ecological condition, at some time in the near future. This vision of what you would like your property to look like in the future will guide you and your family's planning decisions.

"NOW"- YOUR ECOLOGICAL STOCKTAKE

Now means an assessment of your property's current health. This is carried out through a range of stocktakes, surveys and assessments. The first step will involve mapping of your resources, followed by an assessment of their condition. There are then a range of surveys that you can undertake to get a snapshot of your property's biodiversity as well as the means to systematically monitor its ongoing state.

ACTIVITY 3.1 DETERMINING YOUR VISION FOR YOUR PROPERTY'S ECOLOGICAL CONDITION

In developing a vision for your property's ecology ask yourself how you would ideally like to see your property in the future - say ten years from now. Think of a place or places on your property that make you feel good. What is there? What are the things you most value about the natural resources of your property?

Consider the following checklist:

- Areas of remnant native vegetation
- Wildlife dams
- Vegetated laneways
- Shelterbelts
- Revegetated areas
- Native pastures

Now create the image of your property's ecological vision in your mind, complete with all the detail you can manage.

Use Sheet 1. Write your ideas about your vision.

4. MAPPING YOUR PROPERTY'S NATIVE VEGETATION AND WATER BODY AREAS

The first step in surveying the biodiversity component of your property's natural resources is to complete a map of the features of your property. This involves using an existing map or an aerial photo and marking on clear plastic overlays information such as the land uses on the property and the types of vegetation and habitats. This valuable information gathering process can be a starting point for assessing biodiversity on your property. The map and overlays become a management tool, assisting

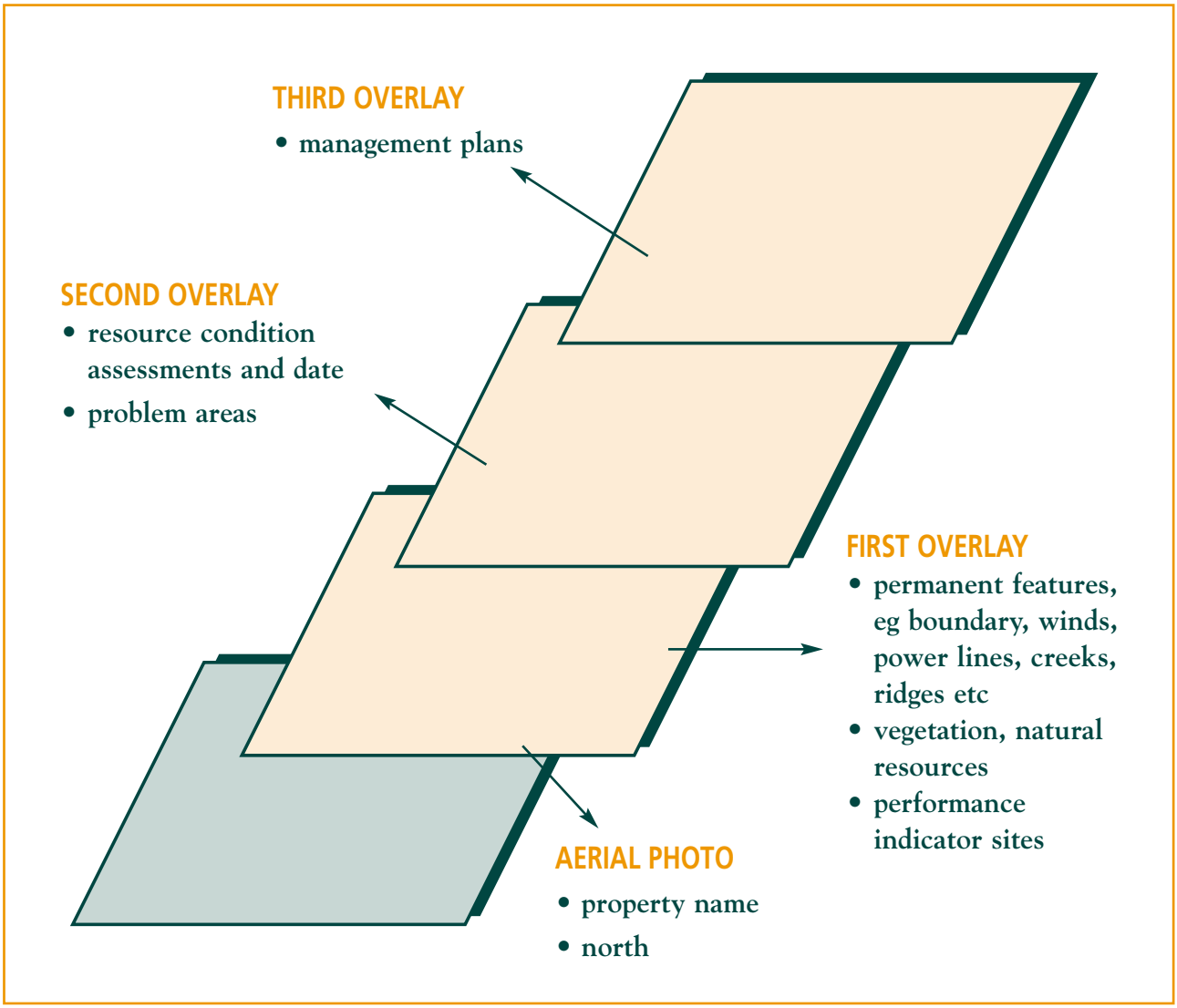

Figure 4.1 Overlays for your Biodiversity Property Plan *S.McMahon/NPWS*

you and your family in planning and monitoring the management of your property's ecological resources.

ACTIVITY 4.1 COMPLETING A MAP OF THE FEATURES OF YOUR PROPERTY

Step One: Mapping features

Mark on the first of your clear plastic overlays for your map (topographic map or aerial photo) the following items. Use a black pen for features and boundaries. Use blue pens for creeks, dams and wetlands.

- **Location of houses, buildings**
- **Native vegetation areas** (eg patches of native bush, grassland, corridors.) Mark these by drawing a line around the vegetation patch in question. Identify each patch of vegetation with a number or name or the vegetation type, if known. Patches can be labelled R1, R2 for remnant 1 etc.
- **Scattered paddock trees**

  Mark individual trees "ST"

  If there are a large number of scattered trees in a paddock (eg. more than 20 in a 50 acre or 20 hectare paddock) add "ST" next to the paddock's name (or number).
- **Creeks / rivers**
- **Dams and wetlands "D" or "W"**
- **Wildlife sightings**

  Mark any sightings of useful, common or important usual native animals, eg. sugar gliders, ibis or bats. Note sightings in modified as well as natural areas of your property.
- **Features** such as rare plant species, geological formations, cultural heritage.
- **Other landuses**
- **Zones**

  Mark the areas of common landuse/features that will be managed as one area with common strategies and actions.

"Mark any sightings of useful, common or important usual native animals, eg. sugar gliders, ibis or bats."

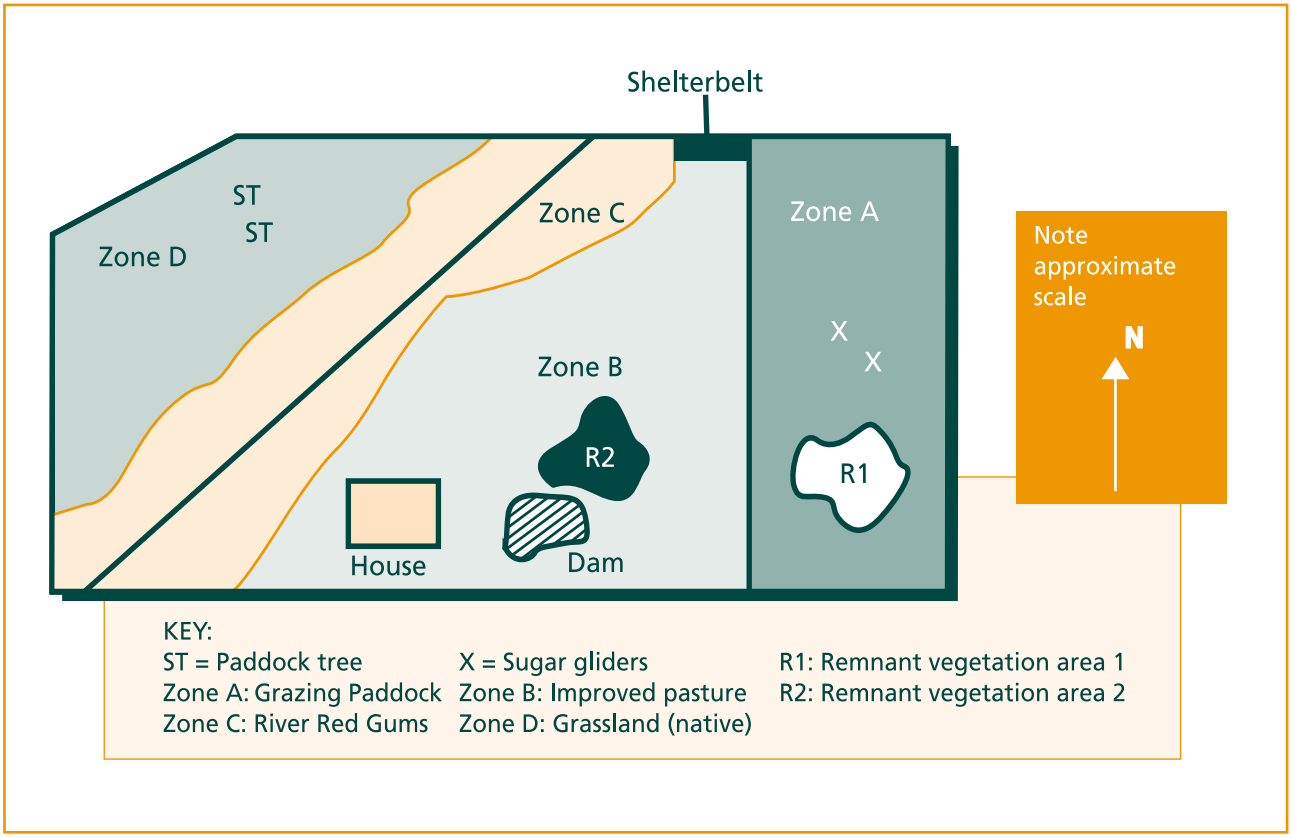

Figure 4.2 A map such as this can be used to show information about the ecology of your property

Step Two: Evaluating mapping outcome

Look at the map of your property's features. What percentage of your property consists of original vegetation? How big are the patches of remnant vegetation? What shape are they? How does your current property condition differ from the ecological vision you have just formulated? Compare your map with others in the group and consider the biodiversity implications of each property map.

For further information on preparing a physical property plan contact your local office of NSW Agriculture, Department of Land and Water Conservation, NSW National Parks and Wildlife Service, or your nearest TAFE College. You can also find useful information on how to prepare these plans in the Farming for the Future/NSW Agriculture 1999 publication "Physical Property Planning" available through NSW Agriculture, Phone: 1800 025 520.

5. ASSESSING YOUR PROPERTY'S CURRENT ECOLOGICAL CONDITION

The next step towards planning for the management of your property's biodiversity is to describe and assess the property's ecological health. This gives you information about its condition with regard to its value as healthy ecosystems and wildlife habitats as well as a productive agricultural system.

In this section we describe the rapid assessments you can do of areas of your property using a question sheet and evaluation table. You may also want to explore the biodiversity values of some of these same areas in more depth by surveying for different species of plants, animals or birds. The guidelines for these surveys are in the notes in the next section of this module.

There is also a sheet to help you identify possible habitat areas on your property that are not areas of native vegetation but may nevertheless be relevant for biodiversity conservation.

Rapid assessments of selected areas of native vegetation (eg large patches of remnant forest or woodland, native grassland, discernible clumps of trees in a paddock or even isolated paddock trees), modified areas (eg crops and introduced pastures) and water bodies (particular sections of creeks or rivers or entire dams and wetlands) can be made using a series of two or more assessment sheets. The first step is to select some key sites that represent typical aspects of your property and should tie into the zones that you have selected. Each site can be recorded on Sheet 2 and can include a photo of the site from an identified photopoint. This photopoint can then be used in the future to record changes at the site over time. These should include areas of typical vegetation types, water bodies and perhaps other areas that provide good habitat for native species, eg along the side of a paddock or roadside. The next step is to assess the condition of each of these sites and Sheets 2-5 can be used for these assessments. You should keep a clear master copy of these sheets and use it to make multiple copies for current and future use.

PURPOSE OF ASSESSMENTS

These assessments will help you to:

- Identify which areas are healthier;
- Identify which areas should be given higher priority for management actions;
- Identify management practices that will help to retain and protect these areas and restore and rehabilitate them;

- Identify which areas can be restored; and
- Monitor the impacts of implemented management practices on these areas by establishing a benchmark for future reference and repeating the assessment at regular intervals.

WHAT AREAS TO ASSESS

When planning which parts of the property to conduct assessments, it is suggested that you carry out an assessment in each of the different environments or habitat types in each quarter of the property. For example select areas along your creek bank, in bushland, grassland, cropping areas with occasional trees and wetland (swamp) areas. You can also select features such as rocky areas. By selecting a few sites to assess in each habitat type you will get a good idea of the overall habitat health on your property. These can be marked on a separate plastic overlay of your property plan.

Conducting assessments in different habitat types in each quarter of your property will provide a more accurate overall assessment for the whole property, and _highlight_ areas requiring greater attention.

WHEN TO CONDUCT ASSESSMENTS

Assessments can be conducted at any time of the year but you will find them easier to carry out when plants are flowering and animals are more active, ie late winter through to late spring. Some animals seasonally migrate or hibernate and are therefore only present at certain times of the year. Therefore, to get a good picture of the site's condition, you could, in the first year, conduct a number of assessments throughout the year.

Repeating your assessments on a yearly basis, at similar times and in a similar way, gives you the opportunity to observe the cycles and observe things coming back. Your observations can guide you to make changes, and monitoring the response to the changes feeds into your ongoing management. The more you do, the more information you will collect and the more you will learn about the property's health and changes from year to year.

ACTIVITY 5.1 ASSESSMENT OF NATIVE VEGETATION SITES

Sheets 2 and 3 apply to the description and assessment of areas of bushland and native grassland and the condition of scattered paddock trees. Table 3.2 in Module Two summarises the management actions that are recommended according to the identified condition ratings.

Step One: Site selection

Select areas of native vegetation on all four quarters of your property that you wish to assess to give you a representative picture of the health of vegetated habitat on your property. You need to eventually assess all patches of remnant vegetation so that you can properly manage all the natural resources of your property. Refer to the map of your property's features. You will need to complete a separate set of assessment forms for each site.

Step Two: Completion of site description form - Sheet 2.

i) Identify native vegetation type

- To identify your broad vegetation type you need to note the physical features of the vegetation community, such as the height of the vegetation and the spacing between the tallest plants. Descriptions you may use include "open forest", "woodland", "shrubland" and "grassland". Look at the matrix in Table 5.1 and describe the type of

TABLE 5.1 VEGETATION TYPES.

Vegetation Type	Description
Rainforests Closed forests	Trees > 2 m tall, single stemmed, canopies touching or separated by less than tree height
Open Forests Woodlands	Trees > 2 m tall, single stemmed, canopies separated by less than 20 x tree height
Shrublands Mallee Shrublands	Top vegetation layer often multi-stemmed, < 8m tall
Heathlands	Top vegetation layer < 2 m tall, most plants have small leaves
Dry Grasslands Sedgelands	Top vegetation layer usually < 1 m tall, most plants grass/reed-like shape; not subject to regular waterlogging
Wetlands	Ground subject to regular waterlogging
Moss gardens Lichens Liverworts Seaweed mats	Top vegetation layer usually < 0.2 m tall

(From Community Biodiversity Survey Manual - NPA/NPWS 2001)

the vegetation that is present at this site eg. Open Forest.

- Now examine the species of plants present. Usually the plants, trees, shrubs or grasses, which are dominant in the vegetation are the most important in the description. Sometimes, there may be two or three species that are equally dominant. Consider which species are the main ones on the site. Often, only one species will be dominant eg. Spotted Gum (*Corymbia maculata*). See field guides and Biodiversity Conservation Management Notes for help in species identification.

  NOTE: Vegetation types are named by using both the general description and the species.

- Decide on the best description for your vegetation, eg the above examples would be combined to describe the vegetation as "Spotted Gum Open Forest". A grassland dominated by Kangaroo Grass (*Themeda* spp.) would be described as a "Themeda Grassland".

- Write the description on the site description form (under "vegetation description").

ii) Select photopoints and take photo(s).

Select fixed points in or near the assessment site from where you can take regular photos to monitor changes in vegetation or identify things of interest. For sites involving larger patches of native vegetation, you may wish to establish two photopoints, one at the centre and one at the boundary, or where the vegetation changes. You need to complete a separate site description sheet for each photopoint. For more information on setting up photopoints see Biodiversity Conservation Management Note: Photographic Monitoring.

iii) Complete all other details on Site description form, Sheet 2

Attach the photos to the site description form and write the description for the photopoint. Date the assessment sheet according to the date you take the photo(s). For each site complete the site description details of land use history etc.

Step Three: Completion of Condition assessment – native vegetation.

i) Complete Sheet 3: Condition Assessment – native vegetation.

Answer "yes" or "no" to each of the questions asked about the condition of the vegetation. You will notice that some questions will be relevant to the particular site and some will not. Don't worry! Just answer the questions that are relevant to the site you are observing. You may put N/A for questions that are not applicable to your site.

ii) Total the number of "yes" responses

Step Four: Determination of Condition Rating

Now refer to Vegetation Condition Rating Table at the bottom of the sheet and determine the condition rating of your site. The site's condition rating will indicate the management requirements necessary to retain and enhance this area of vegetation for its production and habitat values.

These assessment results can be used as a benchmark for future assessments which forms part of an ongoing monitoring program for your property. Try to repeat this assessment for each site once every 12 months. Repeated assessment allows you to monitor the ongoing health of the sites and to gauge the success of the management practices you adopt.

The questions in Sheet 3, *Condition Assessment - Native Vegetation*, provide an indication of the sort of features or conditions necessary to constitute a healthy patch of native vegetation. Brief explanations of the reasons behind these questions appear in italics under most questions.

ACTIVITY 5.2 ASSESSMENT OF WATER BODIES.

Identify sites along particular sections of creeks or rivers or entire dams and wetlands, either natural or artificial. You need description and assessment sheets for every site, so ensure that you have plenty of copies of these sheets to enable repeated assessments of sites. Refer to the Water Bodies Condition Rating Table at the bottom of Sheet 4 to interpret the assessment, establish the condition of each site and identify management recommendations to retain and enhance identified sites as a property water supply and habitat area.

Using Sheets 2 and 4 complete the relevant Steps 1-4, following the same procedures used in the native vegetation assessment site.

ACTIVITY 5.3 IDENTIFICATION OF OTHER HABITAT FEATURES ON YOUR PROPERTY

Parts of your property which are not water bodies or remnant vegetation can also have biodiversity value. It is important to identify these areas so that you can include them in your management actions, for example in cultivation areas where you may have identified endangered native wildlife. There are many different places on a property which support native biodiversity, but this will vary

from place to place. It is up to you and your family to be aware and monitor these sites. Based on your observations, you may wish to complete a site description form (Sheet 2) for a selected area that you chose to follow up and monitor.

Use Sheets 2 and 5 to identify other habitat areas on your property and to assess their condition as habitat. Complete the relevant Steps 1-4, following the same procedures used in the native vegetation assessment site.

ACTIVITY 5.4 LINKING YOUR ASSESSMENTS TO YOUR MAP

The information from your assessments can be marked onto your map of your property's features. (Activity 4.1). This will provide you with a better picture of the condition of the resources you are managing.

Note: Ensure that you create a map legend on your property plan/map that lists features mapped and the relevant symbol and/or colour. Also indicate a north point.

Step One: Name the vegetation types

The native vegetation areas have been marked on the first overlay of your map (see Figure 4.2). On this first overlay, write the name of each vegetation type as determined during the description and assessments.

Step Two: Record condition of native vegetation areas

i) On a second clear plastic overlay record information about the identified vegetation remnant. Write on the overlay the date of the assessments.

ii) On this new overlay, record the assessment rating onto each patch of vegetation by either shading the patch or underlining the patch name with the relevant colour ie green, blue, yellow or red, established following the site assessment and condition rating process.

Step Three: Record condition of scattered paddock trees

i) On the second overlay, using the coloured pens, give individual trees the assessment rating determined eg. green, blue, yellow or red.

ii) Where there are a large number of scattered trees which are marked as "ST" next to the name of the paddock, underline the "ST" with the relevant colour.

"There are many different places on a property which support native biodiversity."

Step Four: Record condition of creeks, rivers, dams and wetlands

i) On the second overlay, mark sections of your creeks and rivers using the pen colour that is relevant to the determined assessment rating for that section of creek or river.

ii) On the same overlay, draw a coloured line around the boundary of assessed water bodies, using the colour that corresponds to the assessment rating.

Step Five: Mark other identified habitat areas

In a different coloured pen, mark the other habitat areas you have identified from Sheet 5. For example use a purple pen to shade or circle these areas. You may have already marked significant features and wildlife sightings on your base map. These can also be marked in purple. If you considered some areas more valuable than others, use a darker shading for the more important and a lighter tone for less significant.

Figure 5.1 Name the vegetation type and record the condition of native vegetation *NPWS*

6. SURVEYING YOUR PROPERTY'S BIODIVERSITY

What is the native wildlife on your property? What are the native plants, birds and animals that can be found there at different times and in different habitats?

WHY SURVEY?

There are a range of surveys that you can undertake to get a snapshot of your property's biodiversity. Regular surveys will give you the means to systematically monitor your property's ongoing state. With the information you get you will be able to measure, over time, how well you are sustaining the ecological values which themselves sustain your property enterprises.

WHAT TO SURVEY

A biodiversity survey is an inventory of the plant and/or animal life of an area including their habitats. To get an indication of biodiversity you can survey plants, birds, invertebrates (insects), mammals, frogs and reptiles, as well as describe their habitats. You can survey all of these at one time, but you may choose to survey for only one or two things as a starting point, such as plants and birds, and progressively fill in the picture.

- Birds are often used as an "indicator species", that is their presence can indicate the health of the whole ecosystem; and they are relatively visible and easy to identify.
- The presence of frogs, their diversity and abundance, can be an indicator of suitable water habitats, and frogs, as consumers of insects also make a contribution to the overall health of your property's ecology. Frogs are sensitive to a range of chemicals used on most farms, particularly those which end up in water bodies.

A specific methodology is used for surveying plants and each different animal group, although all the survey methods suggested here are based only on observation - or sometimes, in the case of frogs or birds by identification through hearing and recognising calls. The choice of what to survey is likely to depend on where your strengths in identification lie. Whatever the case, a set of good reference books on local native plants and animals are invaluable for identification, and should be an essential part of your farm biodiversity "toolkit". Local scientific experts can also provide further assistance or advice. See Sheet 12 for a suggested list and complete the contact details.

WHERE TO SURVEY

Ideally you should survey each different environment or habitat type on your property, eg your creek bank, bushland, pasture, grassland or wetland. You will find different plants and animals according to soil type, topography and climate- all factors which help create the particular ecological niches of your property.

You can also survey modified parts of your property, that you may have identified as habitat, areas such as cultivation paddocks, farm yards, woodlots or gardens. By selecting a few sites to survey in each habitat type you will get a good idea of the range of animals and plants that use the different habitat types on your property. The survey transect (see Figure 6.1) should be located so that the area covered is as uniform as possible i.e of similar habitat or vegetation type (grassland, woodland, wetland etc) and physical environment (slope, aspect and soil type).

WHEN TO SURVEY

Surveys can be conducted at any time of the year but it is easier to identify plants when they are flowering (eg late winter and early spring for many shrubs, summer for native grasses) and certain animals are more likely to be seen at particular times of the day or night. For example reptiles will be more active during the day in warmer months. Some animals seasonally migrate or hibernate and are therefore only present at certain times of the year. So to get a good picture of what is there, you should conduct a number of surveys throughout the year.

It is up to you how often you repeat your survey, but as a general guide, repeating your surveys on a yearly basis, and also observing and monitoring at key times, will give you a chance to note changes over time. The more you do, the more information you will collect

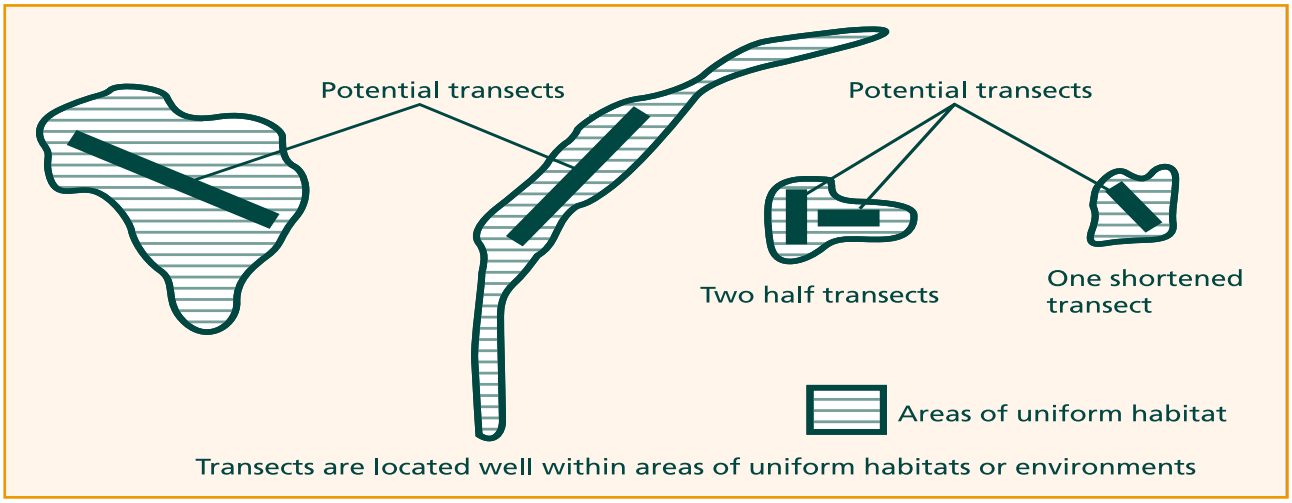

Figure 6.1 Possible transect locations which allow for consistent conditions NPA/NPWS

and the more you will learn about the property's biodiversity and the seasonal changes throughout a year.

HOW TO SURVEY

The important thing is to establish a biodiversity survey method that works for you. For some people this will be as easy as keeping a species list of native plants for your property and recording opportunistic wildlife sightings. Sheet 7 provides a sample proforma for this.

If you want to maintain a regular monitoring program based on the baseline survey techniques outlined below you need to ensure that you establish a survey methodology - a time frame, location, setting etc which you can sustain comfortably over the longer term. To reliably monitor change to reflect your changing management strategies, you need to be as systematic and consistent as possible in your survey methods.

A baseline survey is a recommended method to systematically record plants, birds or animals in particular patch on your property. It is simple and inexpensive to conduct, and does not require any prior survey experience, scientific training or special equipment, apart from identification field guides. The baseline survey methods outlined in this module and listed in Table 6.1 are explained in detail in the NSW National Parks Association /National Parks and Wildlife Service 2001 publication *Community Biodiversity Survey Manual* (Second Edition).

TABLE 6.1 SURVEY METHOD SELECTION

What you intend to survey	Which methods are suitable
Mammals	• Scat Collection • Sign search • Sand trapping • Opportunistic sightings
Birds	• Point count • Opportunistic sightings
Reptiles	• Day search • Opportunistic sightings
Frogs	• Search and frog call recognition • Opportunistic sightings
Invertebrates	• Pitfall traps • Light traps • Systematic search • Opportunistic sightings
Plants	• Identification survey

ACTIVITY 6.1 SURVEYING YOUR PROPERTY'S BIODIVERSITY

Exercise One

Record the biodiversity history of your property

i) Interview people (family, previous property managers) and/or consult written records which can give you information about your property's past biodiversity. Record the information you collect on Sheet 7 (Wildlife Record Sheet). You may wish to set up separate sheets for birds, reptiles, frogs, plants etc or even different paddocks or remnant patches if appropriate to your property.

ii) Contact your nearest NSW National Parks and Wildlife Service office for more details or consult databases such as the Atlas of NSW Wildlife on the NPWS website at www.nationalparks.nsw.gov.au to find out about your locally occurring species.

iii) Ensure that you have a recording sheet to note down opportunistic wildlife sightings on your property from now on.

Prepare lists of native species which:

- **occur in one habitat type only;**
- **occur across a range of habitats;**
- **are known to breed on your property;**
- **are occasional visitors just passing through;**
- **are endangered or vulnerable in NSW or Australia wide.**

Exercise Two

Conduct a baseline biodiversity survey

An introductory survey method is the baseline survey which will give you an indication of the species present in a selected patch.

This method involves setting up a single line called a transect, which can be 200-500 metres in length. At the mid-point of this transect, a 20 metre by 20 metre square called a quadrat, is marked out and used to survey plants and insects. Along the transect there are sample points set up 100 metres apart where birds, mammals and reptiles are surveyed for given periods of time.

i) Select the area/s to be surveyed and decide on what you will survey for.

ii) Refer to Table 6.1 to decide the relevant survey method for your site.

iii) Make sure you have notebook, pen, field guide.

iv) Complete the background details on the recording sheet - Sheet 6.

v) Select your survey transect site. Your transect should be a single line from 200 to 500 metres long. Remember, the transect should be located so that the area covered is as uniform as possible.

vi) Mark up your transect accordingly to your survey type.

vii) Carry out the relevant surveys and record the results

viii) Repeat this survey along the same transect at times that will give you the best results and that fit in with your property management schedules.

Animal care issues

- **Avoid damaging the habitat that you are searching. Replace any disturbed rocks, logs, bark or leaf litter as best you can.**
- **Do not handle or touch any animals unless there is someone present who has both a licence from NPWS and animal ethics approval.**

For example, repeating your surveys once every 12 months, sometime between late winter and late spring (when wildlife are most active) will give you a chance to monitor changes over time. The more you do, the more information you will collect and the more you will learn about the property's biodiversity and the seasonal changes throughout a year.

Even if you repeat at intervals greater than 12 months for 3-5 years, your information will show change. Regular updates will be able to show you whether changes are temporary or show a long term trend.

Figure 6.2 Always wear gloves when handling scats *L.Brodie/NPWS*

Common Scats:

Fox *V.Bear*

Swamp Wallaby *V.Bear*

Long-nosed Bandicoot *V.Bear*

Figure 6.3 Common Scats.

Note: Drawings are not to scale. For more detailed information on identification of scats please refer to Triggs, Barbara, 1996, Tracks, Scats and other Traces, *Oxford University Press, Melbourne*

WHAT TO DO WITH YOUR SURVEY RESULTS?

The information you have gathered about the native plants and animals living on your property can inform your future management practices to increase both agricultural production and biodiversity conservation. Compare your survey results with historical records to discover which species are no longer there.

For example, the recent absence of a bird species may have led to an increase of insect pests feeding on pasture or crops. To improve agricultural production it may be beneficial to consider why the bird species is no longer living on your farm and what actions can be taken to encourage its return to the area. It is possible that a particular understorey shrub, which the bird species relied upon for shelter and/or food has since been cleared for grazing. In this case, restoring the understorey of your remnant native bushland may result in the return of the bird species to continue its valuable role in natural pest control on your property.

WHAT TO DO IF YOU FIND A THREATENED SPECIES ON YOUR PROPERTY

It is quite possible that you may find a species listed as threatened on your property.

(See Biodiversity Conservation Management Note, The Threatened Species Conservation Act: An Overview for more details). The first thing to recognise if you identify a threatened species on your property, is that something good is happening in the management of that land to enable such species to continue to exist. Congratulations for successfully ensuring the ongoing survival of the species on your land to date. You should look at your current management practices and continue using them. If you are considering changes it is important to look at the risks to threatened species. The NPWS prepares Recovery Plans for threatened species which outline management actions for conserving these species. You may be able to get involved in the development of these plans and help in their implementation.

You can report your finding to the NSW National Parks and Wildlife Service via the Atlas of NSW Wildlife Database. This will increase the knowledge of species across the state and will lead to a better understanding of the species, which will assist in its recovery. The NPWS does not aim to take over management of lands where threatened species are found, and any routine agricultural activities are able to continue. There may be financial support available to help you.

The NPWS can help with technical advice on how to ensure the continued survival of the species which may involve taking some basic steps in conservation such as:

- Retain natural revegetation, in particular, established mature trees with hollows.
- Leave adequate ground debris such as fallen logs and branches, leaf litter and rock in place. These provide vital shelter and food sources for many native plants and animals.
- Co-operate with neighbours and government agencies in control of pest animals such as foxes, dogs, cats and rabbits.
- Utilise local, native species for plantings.
- Minimise the use of pesticides and herbicides.

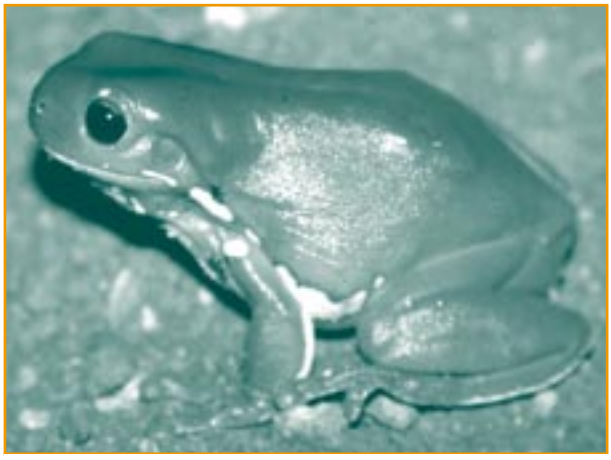

Figure 6.4 Blue Mountains Tree Frog *NPWS*

Module Two will provide further information on planning the management of your property's ecological resources.

7. SETTING BIODIVERSITY PERFORMANCE INDICATORS

As discussed above, many ecological resource issues have to be measured over a long period of time for any indicators of change to be detected.

It is a good idea to select one or a number of performance indicator sites on which to do regular tests. The chosen sites should be either representative of a large portion of your property (same soil type, land capability and vegetation), be a site given high management priority following your resource assessments, (described in Section 5 in this module), or have an obvious or suspected land degradation problem.

Identifying performance indicator sites

Locate and label your performance indicator sites onto your map (first overlay) using the symbols PI 1, PI 2, PI 3, PI 4 etc.

> "It is a good idea to select one or a number of performance indicator sites on which to do regular tests."

Determining indicators of change (performance indicators)

Determine indicators of change that you can use to monitor physical changes on your farm. The list below provides examples of indicators. Obviously, your vegetation and water bodies assessments will be on this list.

- Records of sightings of birds species. These will show trends in the ecological health of your farm - an increase in the number and diversity of species signals better environmental conditions.
- Assessments carried out in Section 5.
- The variety and number of frogs as an indicator of environmental quality (healthy populations show that a stream or wetland system is in reasonable condition).
- Water quality - water "bugs" survey, using "Water Bug Detective Guide" or measuring salinity levels.
- Changes of vegetation eg an increase in understorey shrubs, by comparison of photos taken at your photopoint sites.