FACILITATOR NOTES

1. FACILITATOR NOTES

1. INTRODUCTION

The Planning for Biodiversity Management Kit is a two module workshop series for landholders to develop skills and understanding of the principles of property management planning, and in particular techniques for the consideration and inclusion of biodiversity and habitats into the planning process, and the development of management strategies and actions.

It is intended that the Kit be delivered over two days, however the Kit has been prepared to allow flexible delivery of the two workshop modules to reflect the needs of participants and the local environment. Local knowledge and knowing your audience will be your best guide to maximising the effectiveness of these workshop materials for particular groups of participants.

The Kit has been prepared to provide background notes for the facilitators as well as notes, worksheets and management notes for participants. Facilitators will need to photocopy and assemble participants' workbooks to include these notes, worksheets, glossary and management notes. Sufficient copies of worksheets should be included so that participants can complete multiple surveys and assessments of their own properties.

Below is a summary of the contents of each section of the Kit.

1. Facilitator Notes

This section provides a brief overview of the aims and objectives of the workshop, and suggested session programming for each module, and includes resources and references. This section includes background notes on biodiversity, providing a general introduction with particular relevance for Module One, Session One. There is information on conducting baseline surveys and assessments of native vegetation, water bodies and other wildlife habitat features, relevant to Module One, Session Three. Finally there is some background on the techniques for undertaking a SWOTA analysis - relevant to Module Two, Session One. Facilitators may wish to distribute some of the tables and information provided here to participants.

2. Facilitator Resources

Overhead transparencies (OHT) are provided to assist with presentation. Facilitators can select whatever OHTs they wish to use. An Evaluation Form is also provided. Some of the overheads from the *Facilitator's Biodiversity Resource Kit* (2001) are also useful.

3. Module One: Biodiversity Assessment and Survey. Participant Notes

Module One contains participant's workshop notes. These notes need to be photocopied and distributed to participants.

4. Module Two: Management Planning. Participant Notes

Modules Two contains participant workshop notes. These notes need to be photocopied and distributed to participants.

5. Participant worksheets

These are worksheets which will be used during the workshop sessions and can also be used by landholders when undertaking property management planning on their properties at a later date. Accordingly, in some cases multiple copies will be required.

6. Glossary and references

A glossary and references list is included. The glossary should be included in the participant's notes. The references are a general list most relevant to facilitators. References for participants can be found in one of the Biodiversity Conservation Management Notes which are included in the final section of the Kit.

7. Biodiversity Conservation Management Notes

Biodiversity Conservation Management Notes provide additional information on selected topics to assist both facilitators and participants. Facilitators can include some or all of the notes with materials provided to participants.

The conservation management notes are available on the NPWS website at: http://www.nationalparks.nsw.gov.au/npws.nsf/Content/conservation_management_notes

2. MODULE ONE: BIODIVERSITY ASSESSMENT AND SURVEY

Module One is an introductory module with an emphasis on practically-based field activities. The first two sessions should ideally be conducted in an environment, where participants can discuss issues and carry out property mapping exercises, such as in training rooms, or halls with tables, chairs and space for a projector.

Session One of the module is an introduction to biodiversity and the terms used. The discussion questions, together with the use of visual stimuli, lend themselves to brainstorming activities. The *Facilitator's Biodiversity Resource Kit* (2001) provides extensive background reading, some of which is reproduced in the Additional Notes. There are also suggested activities in this Kit which facilitators may wish to incorporate into this session. *The Save the Bush Toolkit* (1997) also provides useful background.

Biodiversity in Property Management Planning - Living Systems Resource Kit. Victorian Natural Resources and Environment, 2002, available online at www.nre.vic.gov.au has relevant activities and information for facilitators delivering biodiversity planning workshops. Local case studies are appropriate for this first

session, which is also preparation for participants to develop their ecological vision for their own properties.

Session Two of the module involves participants doing mapping of their property including physical features and assets, requiring equipment such as pens and overlays. Participants need to have aerial maps of their property. Some participants may have completed this activity if they have attended other property planning workshops. Participants will also describe their ecological visions.

Session Three involves field work activities. These involve both biodiversity assessments of native vegetation, water bodies and other habitat features as well as baseline biodiversity surveying.

The assessments are based on recognising that natural, modified and artificial systems can all contain native biodiversity values. The assessment survey forms and ratings tables are to assist in identifying the opportunities for rehabilitation and restoration of key areas of the property. These activities are the focus of Module Two but will need to be flagged in Module One.

Assessments and surveys can be conducted in whatever sequence is appropriate to sites available. Activities need to be easily replicable so that participants have the confidence to conduct similar assessments on their own properties. Assessments can be done of native vegetation areas, a modified area eg orchard or cultivation paddock, a revegetated site, a farm dam or a natural or artificial wetland.

An aerial map of the site surveyed needs to be provided so that participants can have some practice in mapping the results of assessments. As this is likely to be done in the field, it needs to be an easily understood map.

Biodiversity baseline surveys can be undertaken in a range of different ways. With a large group it would be best to form into smaller groups and have experts to provide support. As well as demonstrating techniques, the session is an opportunity to extend skills in species identification using fauna and flora specialists.

Homework should not be omitted. It is most important that participants are given appropriate directions and references for following up surveys and assessments on their own properties. These surveys as well as the development of a property vision are essential prerequisites for participation in Module Two. It is important to allow enough time between the two workshop days for participants to be able to undertake tasks that form the basis of activities in Module Two

1. FACILITATOR NOTES

MODULE ONE WORKSHOP PROGRAM – BIODIVERSITY ASSESSMENT AND SURVEY

Time & duration	Content	Participant's resources	Facilitator's resources	References
SESSION 1	*Training room*			
Part 1 9.00 am-9.30 am (30 minutes)	• Introduction • Outline of learning objectives and workshop program • Participants introduce themselves and outline their personal expectations of the outcomes of the workshop		• Whiteboard or butcher's paper	• See "Activities" section of Biodiversity in Property Management Planning. Living Systems Resource Kit. NRE, Vic. (2002)
Part 2 9.30 am - 10.30 am (1 hour)	• Introduction to Biodiversity and key terms eg biodiversity, species, habitat, ecology, ecosystem • Discussion - Biodiversity on farms - natural and modified ecosystems. What is native vegetation? Why retain native vegetation? What are the benefits of biodiversity? What are the threats to biodiversity? • Introduction to visioning exercise, to be undertaken by participants next session		• OHTs – various (including those in Facilitator's Biodiversity Resource Kit) • Local case studies	• Background to concepts and biodiversity benefits in Additional Notes • Facilitator's Biodiversity Resource Kit has other activities in Section 4: Facilitation Guide eg Ecosystems Services Tender, Risk Management exercise • Nature Conservation of Farms • Biodiversity in Property Management Planning - Living Systems Resource Kit. NRE, Vic. (2002) • Biodiversity Conservation Management Notes - various
10.30 am - 10.50 am (20 minutes)	**MORNING TEA**			
SESSION 2	*Training room*			
10.50 am- 12.00 pm (1 hour 10 mins)	• Brief introduction to the planning process • Participants write ecological vision for property • Overlay mapping exercise	• Sheet 1 • Clear plastic (acetate) overlays • Aerial photo or topographic map of own property • Coloured pens	• OHT: Planning process • As an alternative to participants using own property map, supply copies of a map of property or reserve to be assessed in Session 3	• Physical Property Planning (NSW Ag.) • FFF Workshop 2 • Save the Bush Toolkit, Kit 9 "Farm planning for bushland and wildlife"
12.00 pm - 12.45 pm (45 minutes)	**LUNCH**	Allow time to get to field site		

MODULE ONE WORKSHOP PROGRAM – BIODIVERSITY ASSESSMENT AND SURVEY

Time & duration	Content	Participant's resources	Facilitator's resources	References
SESSION 3	*In the field*			
Part 1 12.45 pm - 2.30 pm (1 hour 45 minutes)	• Assessment of native vegetation area or modified farm site and/or assessment of water bodies using assessment sheets and evaluation tables. Select sites for assessment that can then be used for one or more transects for biodiversity survey. • Link assessment results to map of site or indicate how this is to be done	• Clipboards, pens, recording sheets; assessment sheets and evaluation tables • Map including physical features of property or reserve where assessment is conducted • Additional overlays; 4 colour marker pens • Sheets 2-5		• Facilitator's Biodiversity Resource Kit Section 4.3 • Nature Conservation on Farms • FFF Workshop 4 & Appendix 1 • Save the Bush Toolkit, Kits 1, 3 & 5. • Biodiversity Conservation Management Notes eg Photographic monitoring
Part 2 2.30 pm - 4.00 pm (1 hour 45 minutes)	• Biodiversity baseline survey of plants/birds/reptiles. A survey in a native vegetation area and a modified or rehabilitated area would be ideal for this activity, if feasible. • Discuss setting performance indicators and ongoing monitoring and evaluation	• Clipboards, pens, tape measure • Sheets 6-7	• Resources required will depend on what is being surveyed. (See Additional Notes – Tips for biodiversity surveying)	• Community Biodiversity Survey Manual • Flora and fauna field guides; species lists; Local experts - "Biodiversity mentors" • Biodiversity Conservation Management Notes eg Threatened Species Conservation Act; Watching Wildlife • Save the Bush Toolkits 7 and 8
HOMEWORK	• Complete evaluation form for workshop • Complete surveys and assessment of own property and overlay assessments on map • Select Biodiversity performance indicators and mark on map	• Sheets 1-7 will provide participants with a set of resources for use in assessing their own properties		

3. MODULE TWO: MANAGEMENT PLANNING

Module Two builds on the information that participants have gained about the biodiversity values of their property and guides participants in developing their own management planning strategies. Therefore it is essential that participants have completed the following activities and brought the following resources with them to be used while undertaking Module Two.

1. Ecological vision for property;
2. An aerial map of their property with the physical features and natural assets mapped on a first overlay;
3. If possible, have undertaken assessments of native vegetation and water bodies with condition of sites assessed marked on a second overlay map;
4. If possible, have undertaken biodiversity baseline survey in at least one area and, if possible, have set up at least one photopoint and/or selected performance indicators for long term monitoring.

Session One of the module restates the planning steps, asks participants to review their visions for their properties and takes the group through the process of doing a SWOTA analysis. The first activity suggested is a values identification activity which can be used as an introductory warm-up or icebreaker to the workshop. The *Facilitator's Biodiversity Resource Kit* also outlines a more structured activity, "Invest in your values", which may be appropriate for some groups. The Additional Notes have background information which supports the facilitation of this activity. (See Social and Cultural Benefits in Section 4.1.2 and OHT Values Interpretation).

Once participants have clarified and reviewed their ecological visions the SWOTA analysis can be introduced. This can be done most effectively by using a case study, local if possible, or by preparing a hypothetical example. A map, showing the property's physical assets with areas coloured to reflect native vegetation and water bodies or other assessments is useful. Biodiversity survey results or lists of wildlife sightings can be included. Facilitators can also highlight the table listing threatening processes. (See OHT). Participants should be divided into small groups and asked to do a SWOTA (Strengths/Weaknesses/Opportunities/Threats /Actions) analysis on the case study or hypothetical property. Once the different groups' responses are compared and discussed and an appropriate SWOTA analysis modelled, participants can then attempt to do a SWOTA for their own properties. It is important for the following sessions that all participants do

complete their own SWOTA, even if it is a very general set of issues. Note the fifth component – A for "Action" which has been included as part of this analysis technique. The "Actions" are the management actions to be put into plans to address opportunities and threats. It is important to include this final step so that the identified threats do not become too daunting to act upon. Opportunities and threats should be seen as a balanced way of informing planned management actions.

Session Two begins with an overview of the actions and strategies that property owners can undertake to conserve biodiversity. Again the use of case studies and appropriate visuals will add interest and colour to this session. You may wish not to brainstorm or discuss all the specific management actions at this stage, but draw on these details later, when the group is completing Management Planning Sheets (Sheet 10).

A risk management approach to biodiversity conservation is provided with a number of suggested discussion questions, if facilitators wish to pursue this approach.

The goal setting activity should be started in this session. Participants will be able to develop their goals further in the next session.

Session Three takes participants several steps further along in the biodiversity planning process. The activities require participants to review their SWOTA analysis, to identify several key issues and to also review their goals to ensure that they have developed goals to match the key issues they have now identified. These steps can be completed by participants individually or in pairs. Facilitators will need to provide multiple copies of Management Planning Sheet 10 and have an OHT version of this sheet if possible.

The aim of this session is to give participants practice in developing actions and strategies for one or more management issues. However again this can be done as a group exercise, modelling the process. When participants have identified significant issues, and if possible linked them to goals, facilitators should discuss the example in the Model Management Planning Sheet or model an issue relevant to the group. Activities 6.1 and 6.2 can be done as a group exercise selecting management issues common to participants, or as individual activities.

Use this session to give participants experience in the use of the planning tools, described in the worksheets and notes. It is not expected that participants will develop a plan for the management of their properties' biodiversity conservation by the end of the workshop, but rather that they will have the means to develop these biodiversity management plans at their own pace.

MODULE TWO WORKSHOP PROGRAM – MANAGEMENT PLANNING

Time & duration	Content	Participant's resources	Facilitator's resources	References
SESSION 1	*Training room*			
9 am-10.45 am (1 hr 45 minutes)	• Introduction • Outline of learning objectives and workshop program. Introductory activities, if new participants • Review of the planning process • Values identification exercise • SWOTA analysis developed as a group exercise and then completed by participants for their own property	• Sheet 1 • Map of property's physical assets • Property assessment and survey sheets and results • Sheet 8	• Whiteboard or butcher's paper • OHT Planning process • OHT Managing threatening processes • Local case study or hypothetical property map	• See suggested icebreakers and activities in Biodiversity in Property Management Planning - Living Systems Resource Kit. NRE, Vic. (2002) • Facilitator's Biodiversity Resource Kit (Section 4.1) • Additional Notes
10.45 am - 11.05 am (20 minutes)	**MORNING TEA**			
SESSION 2	Training room			
11.05 am-12.45 pm (1 hr 40 minutes)	• Brainstorming and presentation of management practices for biodiversity conservation on farms. • Discussion and case studies Guest speakers if appropriate • Setting short term and long term goals. Participants need to complete list of goals	• Sheet 9	• OHTs - various • Visuals including slides of local examples • Guest speakers	• Biodiversity in Property Management Planning - Living Systems Resource Kit. NRE, Vic. (2002) • Facilitator's Biodiversity Resource Kit • Managing wetlands on farms (NSW Ag.) • Nature conservation on farms (NSW Ag.) • Save the Bush Toolkit, Kits 2, 4 and 6 • FFF Workshop 4 & Appendix 1 • Biodiversity Conservation Management Notes –various
12.45 pm-1.45 pm (1 hour)	**LUNCH**			

MODULE TWO WORKSHOP PROGRAM – MANAGEMENT PLANNING

Time & duration	Content	Participant's resources	Facilitator's resources	References
SESSION 3	*Training room*			
1.45pm – 4.00 pm (2 hours) Allow for a 15 minute afternoon tea break when appropriate.	• Review of participants' vision, SWOTA and goals - individually, in pairs or small groups • Participants identify significant management issues • Completion of Management Planning Sheet(s) as group or individual activity	• Sheet 9 • Sheet 10 - multiple copies	• OHTs –various • OHT Sheet 10 Management Planning Sheet	• Save the Bush Toolkit, Kits 2, 4 & 6 • FFF Workshop 4 & Appendix 1 • Biodiversity Conservation Management Notes –various
HOMEWORK	• Complete evaluation form for workshop • Complete management planning sheets and summary sheets • Monitor and evaluate	• Sheet 11		

E.Higginson/NPWS

Homework will involve participants completing all the planning sheets for themselves, including Management Planning Summary (Sheet 11), which needs to be completed by participants outside the workshop. Participants should also be reminded of the need to monitor and evaluate their properties' ecological condition and build this into their plans.

"Use this session to give participants experience in the use of the planning tools."

4. ADDITIONAL NOTES

4.1 BACKGROUND ON BIODIVERSITY

The information below is provided as background briefing material covering both Modules One and Two. It is summarised from *Facilitator's Biodiversity Resource Kit*, NSW National Parks and Wildlife Service, Farming for the Future Project, (2001) and other relevant sources. This information is in addition to the content material provided in the Participant Workshop Notes in both Module One and Module Two.

4.1.1. BIODIVERSITY: WHAT IS IT?

Biodiversity is an abbreviation of the term biological diversity, which has been defined as: *The variety of life forms: the different plants, animals and microorganisms, the genes they contain, and the ecosystems they form. It is usually considered at three levels: genetic diversity, species diversity and ecosystem diversity.* (National Strategy for Conservation of Australia's Biological Diversity, 1996).

Genetic diversity

Genes are inherited characteristics, which are packaged in different ways with each new generation. Genetic diversity is the variety of genetic material on earth. There is genetic diversity within species, and across all species. Among all magpies, for example, no two are exactly the same, but each has a different combination of genes. Diversity in this sense ensures that some individuals are better at adapting to certain types of environment. Without genetic diversity a species cannot evolve, and cannot survive changes in its environment.

Species diversity

The next element is species diversity, which refers to the variety of species on earth. This is the most common way people think about biodiversity. 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. Biodiversity can be measured by counting the number of species in an area; it is described as "species rich" if it contains many different species.

It is not known exactly how many species exist in the world. There are vast numbers of species still being discovered. Even big organisms like mammals and trees are still revealing new species to science. Only a proportionately small number of the invertebrates has even been recorded. The number of species on earth is widely estimated at 10-100 million.

One of the consequences of biodiversity loss is the decline of plant and animal species. This decline leads to species becoming endangered, vulnerable or extinct, otherwise known as "threatened species". The diversity of life cannot be replaced. Once a species is lost from the system it is almost impossible to bring it back. The loss of any species will irrevocably change the character of an ecological community. In many cases it is only after a species becomes extinct that its significance in the ecosystem becomes clear and the full impact of extinction is realised eg. the loss of a pollinator can cause one or more tree species to become extinct.

An important component of biodiversity conservation is the protection and recovery of threatened species, populations and ecological communities.

Ecosystem diversity

Ecosystem diversity refers to the variety of natural habitat types and ecological processes. Plant and animal species interact with each other in their physical environment to form ecosystems. Australia has a broad range of ecosystems ranging from arid deserts to tropical rainforest. Ecosystems are the "web of life". They operate a cycle of energy: energy from the sun is harnessed by plants together with carbon dioxide and water and converted into nutrients - starch and sugar. These nutrients and energy are distributed through all organisms: herbivores, carnivores, parasites, and decomposers through the food web.

To illustrate the concept of species interaction and give an idea of how complex these interactions can be, the example of a single bark beetle, five millimetres long, was found to be the host to 34 mites (3 species), 883 roundworms (4 species), 100 fungal spores (3 species) and 10,000 yeast or bacteria (7 species).

The relationships between organisms are crucial to sustaining a system. The ways different species use the water, gases, and minerals create the environment they depend on. Different systems use the different elements in different ways. Nitrogen, for example, is distributed differently in different ecosystems. In alpine areas most of the nitrogen is fixed in the soil; the plants are small, the growing season is short, nitrogen demands are low. In rainforests vigorous growth has removed most of the nitrogen from the soil - it is stored in the vegetation. Clear felling a rainforest removes most of the nitrogen from the system. As nitrogen is essential for plant growth, lack of it retards regrowth of the forest.

Australian biodiversity

Australia's biodiversity is a consequence of its unique geological history. The continent has been isolated for forty million years. It has vegetation from Gondwana times; a period when Australia was a part of a larger landmass, which included what is now South America, South Africa, Antarctica and India.

The two major features of Australia's biodiversity are:

- It is "mega-diverse" which means that it has a huge range of species which can be very concentrated in some ecosystems such as rainforests.
- It has a high rate of "endemism" which means that many of Australia's native plants (flora) and animals (fauna) are unique to this continent and found nowhere else in the world.

Australia is recognised as one of twelve "megadiverse" countries, which between them contain 60-70% of the world's known species.

"Australia's biodiversity is a consequence of its unique geological history."

4.1.2 BIODIVERSITY: AN IMPORTANT ASSET

There are environmental, economic, social and cultural benefits of biodiversity. We are all dependent for our sustenance, health, well-being and enjoyment of life on fundamental biological systems and processes. The enormous diversity of life in itself is of crucial value, giving greater resilience to ecosystems and organisms.

Ecosystem services

One of the greatest benefits of biodiversity is the critical role that biodiversity plays in delivering ecosystem services which contribute to healthy agricultural systems - to sustainable clean and green production. Plants, animals and microorganisms all contribute to maintaining healthy functioning ecosystems. Some of these ecosystem services include:

- Protection of water resources to ensure water quality;
- Soils formation, structure and fertility as well as protection of soils;
- Nutrient storage and cycling;
- Pollution breakdown and absorption;
- Ecosystem relationships eg the relationship of pollinating insects like wasps and bees with plants;
- Recovery from severe environmental events, eg drought, flood, fire.

There are many examples of the economic benefits of biodiversity in agricultural production. Pollination of crops by insects and birds has been estimated to be worth up to $1.2 billion per year in Australia. We are fortunate that native insects from nearby native vegetation perform much of this unpaid work. Soil fungi associated with plant roots can effectively increase the surface area of roots by up to 200% providing a huge boost to crop/pasture productivity. Soil organisms also contribute to soil formation, delivery of water and nutrients, maintenance of soil structure and porosity. Tables 1-5 summarise the benefits of biodiversity for productive properties.

Biological Resources

Humanity derives all of its food and many medicines and industrial products, such as wood products, from the wild and domesticated components of biological diversity. About 50 per cent of species in Australia are known but only a quarter are formally described. As knowledge improves, new bioresources to increase human welfare will be discovered and developed. There is a clear relationship between the conservation of biological diversity and the discovery of new biological resources eg antibiotics from soil fungi streptomycin, solasodine used in the production of oral contraceptives and cortisone from Kangaroo Apple (*Solanum aviculare*).

Social and Cultural Benefits

There are recreational and educational benefits in biological conservation as well as the economic benefits of eco-tourism. For broadacre landholders the aesthetic value and landscape amenity of the natural bush retained on their properties has been shown to be important. A Victorian study exploring the core values of broadacre landholders showed that landholder's top four values were:

- Wellbeing (*being healthy and satisfaction with lifestyle*)
- Future environmental stability (*having a sustainable farm and a sustainable landscape and enjoying the landscape*)
- Relationships (*having close relationships with family and friends and providing for your children*)
- Economic wealth (*having a profitable business, generating new markets and managing debt*)

The survey also asked landholders why they have retained remnant native vegetation on their properties. Interestingly the results indicate that retention is closely linked to the indirect benefits of retaining native vegetation such as its intrinsic beauty and its contribution to the enjoyment of the landscape. The direct benefits of stock shelter, timber production were also identified as important rationale.

The perception of farm sustainability /profitability, personal health, pursuing excellence and sense of pride were all closely associated with the presence of native flora and fauna on the property.

Source: *Biodiversity in Property Management Planning. Living Systems Resource Kit*. Victorian Natural Resources and Environment, 2002. See www.nre.vic.gov.au.

Aboriginal people, especially those who have retained a connection with the land possess a great deal of valuable indigenous ecological knowledge such as species distributions, animal behaviour, the uses of a wide range of plant and animal species, sustainable harvesting and the preparation of native food and medicine, the seasonal availability of resources, the effects of fire on both plant and animal species and historical perspectives on environmental change. While biodiversity is a western term, because it encompasses species and ecosystems and is strongly related to the concept of land and country to which Aboriginal people are so closely affiliated, it is accurate to say that Australian Aboriginal people highly value biodiversity.

Biodiversity conservation benefits for farmers

The following tables from the *Facilitator's Biodiversity Resource Kit*, 2001, are comprehensive summaries of biodiversity benefits for productive farming enterprises. These could be photocopied as handouts for the participants.

L. Brodie/NPWS

"About 50 per cent of species in Australia are known but only a quarter are formally described."

TABLE 1. SUMMARY OF ECOSYSTEM SERVICES WHICH BENEFIT AGRICULTURAL PRODUCTION

Native bush patches	Scattered remnant trees	Native Grasslands	Wetlands/Water courses
• stock shelter/ off-shears, lambing etc • emergency stock fodder • habitat for native fauna which control pest species • soil erosion control • soil formation • water table management • nutrient cycling • microclimate control • riparian vegetation/water quality • opportunity cost of revegetation • alternative enterprise, eg. seed, honey, sustainable firewood, ecotourism • recreation • aesthetic value • property value • product marketability	• watertable management • stock shade and some shelter • emergency stock fodder • microclimatic control • habitat for native fauna which control pest species • erosion control particularly along drainage lines • local seed source for natural regeneration or propagation for use in other areas on the property • landscape amenity and aesthetic value • opportunity cost of revegetation • habitat for crop pollinating fauna such as insects and birds • indicators of species indigenous to the area/region	• stock grazing value • drought "proofing", various seasonal options • soil structure management • nutrient cycling • fire retardant sp. such as Themeda in summer • water table management by deep rooted native perennials • weed species management • riparian vegetation /water quality management • alternative enterprise • commercial native seed harvesting	• "green pick" in summer • habitat for pest species - controlling native fauna • ability to control total grazing pressure • improved stock performance • fire management • catchment-scale nutrient control, flood mitigation • opportunity cropping • alternative enterprises such as aquaculture • nutrient cycling • microclimatic control • opportunity cost of revegetation • aesthetic and recreation value • property value • domestic water supply • management of water quality which impacts on chemical effectiveness

TABLE 2. SUMMARY OF BENEFITS OF BIODIVERSITY CONSERVATION

Agroforestry (pref. native sp.)	Shelterbelts	Soils	Human infrastructure
• alternative enterprise • watertable management • habitat value for pest controlling native fauna • sustainable firewood production • alley farming opportunity • niche marketing, value adding	• Primary stock shelter • Maximisation of crop/ pasture production • animal welfare • habitat value for pest controlling native fauna • sustainable firewood production • watertable management • stock movement management	• fundamental to agricultural practice • habitat for microflora • effective water storage • nutrient supply • structural support for plants • enterprise opportunity • integrated pest species	• domestic gardens • agricultural sheds and other structures • water troughs • fences for bird perching • farm equipment may provide shelter/habitat for pest controlling native species • access tracks

TABLE 3. SPECIFIC BENEFITS OF REMNANT VEGETATION ON LIVESTOCK PRODUCTION

Results	Region/context	Reference
Over a 5-year trial, a 31% wool production increase and 6 kg (21%) more liveweight was found in sheltered areas compared with sheep without shelter. This equated to an increase of $4 per head if sold in August 1984. The plots sheltered by barriers had 18% more pasture.	Armidale, NSW rainfall 860 mm	Lynch & Donnelly (1980), Bird et al. (1984), Dengate (1983), Richmond (1992)
From 10 to 16% more lambs present at marking owing to heat load reduction on ewes at joining and lambing, as well as a faster growth rate and more wool from lambs over their first 16 months of life.	Northern Queensland	Wakefield (1989)
Availability of shelter resulted in a 50% reduction in lambing losses (average losses without shelter were 36% for twins and 16% for single births). When shelter was provided, the figures dropped to 18% for twins and 8% for single lambs.	South-west Victoria, eastern highlands.	Bird (1981), Dengate (1983)
Lambing losses decreased from 20% to 10% of the lambs born alive in sheltered areas, (with wind speed halved by adequate windbreaks), resulting in a 5% increase in the percentage of lambs at the end of lambing.	Kangaroo Island	TBA
If the lifetime of the shelter (and fencing) is taken to be 44-60 years, over 60 years total wool production will increase by 29% and $42/hectare of sheltered pasture, and total dairy production will increase by 30% (20% improved pasture growth, 10% improved milk production), and $150/ha of sheltered pasture.	Victoria	Fitzpatrick (1994)
Winter lamb mortality from birth to 48 hours was greater in an exposed group of single lambs (14%), than a sheltered group (4%). Likewise, mortality rates of twins were 9% in shelter and 28% when exposed.	Western Victoria	Squires (1983)
A 27% increase in survival of single lambs was observed in sheltered areas, but no advantage was evident to twins during periods of rain with temperatures <5 degrees C.	Southern Australia	Alexander et al. (1980) cited in Bird et al. (1984).
Up to 17% increase in dairy milk production was estimated for sheltered areas.	Not specified	Blore (1994)
On a day of 27 degrees C, unsheltered cows will have 26% less dairy milk production than unshaded stock.	Australia	Fitzpatrick (1994)

Source: Miles, C., Lockwood, M., Walpole, S. and Buckley, E., (1998) Assessment of the On-Farm Economic Values of Remnant Native Vegetation, Johnstone Centre Report No. 107, Charles Sturt University, page 20

TABLE 4. SPECIFIC BENEFITS OF REMNANT VEGETATION ON CROPS

Results	Region/context	Reference
An increase in wheat and crop yields in sheltered zones estimated between 22% and 47%.	Rutherglen, Victoria	Bird *et al.* (1993)
Crop yields from shelterbelts increased by 25% - although trees rob the crop of moisture and nutrients for a distance equal to about 1-2 times their own height, they shelter a much larger area, extending downwind for at least 15-20 times their own height.	Various study areas	Carritt (1999)
An increase in lupin yield by 19-22% was measured when the area of shelterbelts was included in the net yield/ha, and an increase of 27% on the lupin crop area between the shelterbelts.	Gibson, Southwest Western Australia	Richmond (1992)
Increased yields of 25%-45% were observed in sheltered crops of wheat, oats and lupins compared with unsheltered crops, and yield increases of 20%-100% in horticultural crops.	Not specified	Fitzpatrick (1984)
An increased net cereal yield of 15% per annum was attributed to sheltering effects of shelterbelts.	USA cereal growing area	Adamson (1988)

Source: Miles, C., Lockwood, M., Walpole, S. and Buckley, E., (1998) Assessment of the On-Farm Economic Values of Remnant Native Vegetation, Johnstone Centre Report No. 107, Charles Sturt University, page 20

TABLE 5. SPECIFIC BENEFITS OF REMNANT VEGETATION ON PASTURE GROWTH

Results	Region/context	Reference
A 20-30% higher yield was obtained in protected than in unprotected areas of a farm, with annual benefits of $38 to $66 per hectare.	Mainland Australia	Fitzpatrick (1994)
A 20% increase in average annual pasture growth was estimated for protected areas of a farm.	Australia and overseas	Radcliffe (1983)
Gross value of pasture output is at its highest level when the proportion of tree area is at 34%. Note that this figure relates to natural remnants of bushland rather than shelterbelts or windbreaks.	Gunnedah, north-west NSW	Walpole (1998)

Source: Miles, C., Lockwood, M., Walpole, S. and Buckley, E., (1998) Assessment of the On-Farm Economic Values of Remnant Native Vegetation, Johnstone Centre Report No. 107, Charles Sturt University, page 20

4.1.3 BIODIVERSITY: HOW TO PROTECT AND CONSERVE IT

The first step towards the conservation of biodiversity is to understand what contributes to biodiversity and the processes that threaten it; these encompass a broad range of human activities and are not limited to a particular industrial/production sector of the community.

On farms areas of native vegetation, significant landforms, modified and artificial systems, integrated into agricultural production can all contribute to biodiversity.

TABLE 6. MANAGING AGRICULTURAL PRODUCTION AND BIODIVERSITY

Type of Impact	Management Solutions
Inappropriate stock grazing	• Alternative grazing strategies such as rotational grazing • Fencing to control stock movement and access in sensitive areas • Grazing native grasslands on seasonal patterns
Inappropriate clearing of native vegetation	• Plan to retain areas of remnant native vegetation • Revegetation to link remnant vegetation and create wildlife corridors • Improve existing pasture • Enhance grazing management to maximise production on existing pastures
Introduction of exotic weed and feral animal species	• Alternative methods of pest control • Integrated pest control • Weed management • Feral animal management • Use of local native species
Excessive numbers of specific wildlife species	• Bore capping • Participate in the development of regional wildlife management plans
Pollution and land contamination	• Alternative waste disposal of unused agricultural chemicals
Salinity	• Modified irrigation practices • Identifying and replanting recharge areas • Protecting discharge areas and salt scalds from further degradation • Expand native vegetation

Biodiversity loss is difficult to reverse. Working to protect, conserve and prevent biodiversity loss by minimising the risk of threatening processes such as those listed above can make an important contribution. Biodiversity conservation requires the adoption of management practices, which sustain the diversity of natural ecosystems.

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;
4. Control exotic or native pests with ecological sensitivity and in cooperation with neighbours and government agencies;
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.

There is more detail regarding these strategies in the Participant Notes for Module Two.

Revegetation to buffer riparian remnant *R.Davies/Greening Australia*

"Biodiversity loss is difficult to reverse."

4.2 TIPS FOR BASELINE BIODIVERSITY SURVEYS

The information below comprises some suggestions regarding baseline surveys. It is summarised from National Parks Association of NSW and NSW National Parks and Wildlife Service, (2001) *Community Biodiversity Survey Manual*. You should consult this reference for further details before conducting a baseline survey in a workshop for the first time. There is also a useful list of reference books relevant to biodiversity surveys in the *"General Reference List"* and *"General References – update"* Notes in Section Seven of this Kit.

4.2.1 SETTING UP A TRANSECT

One of the most common methods of surveying, applicable for most types of surveys, is to use a transect. The transect method for a baseline survey is based on setting up a single line that can be 200 metres, 300 metres, 400 metres or 500 metres long. The transect should be located so that the area covered is as uniform as possible. Try to consider, in order of importance:

- the vegetation - for example, ensure that the transect is not half in woodland and half in grassland; and
- the physical environment - for example, try for a consistent slope and drainage.

A 500 metre transect has been chosen to use as an example of how to lay out a transect to search for plants, birds or signs of animals such as insects, reptiles, frogs and mammals. Use flagging tape to mark out the start and finish points and then five points, 100 metres apart, are marked out along the transect. Point one is located 50 metres from the beginning of the transect and all other points are 100 metres apart (see Figure 4.1 below).

- Find your transect starting point and hammer the first stake into the ground and tie flagging tape to the top.
- Using the compass to keep a straight line, measure out 50 metres and place the second stake and tie flagging tape to the top.
- Keeping to the straight line, measure out 100 metres and place the third stake with a piece of flagging tape attached. Repeat three times.
- Measure out another 50 metres and place the final transect stake, with flagging tape attached.
- Each sample point along the transect should be marked with flagging tape and assigned an identity number.

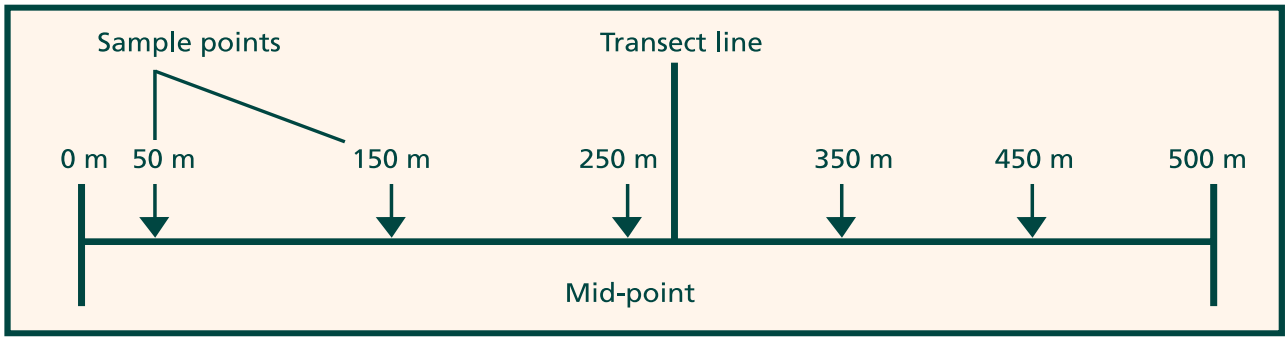

Figure 4.1 Example of 500 metre transect

- The position of each sample point on the transect (in metres) and its identity number should be written onto the flagging tape. This tape must be removed when the survey is finished as it may be confusing for future surveys. On a topographic map, record where the transects are located and keep this as a permanent record.
- The next step is to mark out areas that surround each sample point as squares 50 metres x 50 metres (sample areas) as shown in Figure 4.2 below.
- Then spend a few minutes mentally dividing the first square up into equal portions so that you can systematically search the area for reptiles and frogs.
- How long it will take you to survey each square depends on whether you allocate a part of each square to a person in the team or not. It should take about four people 10 to 15 minutes to do a quarter of the square each.

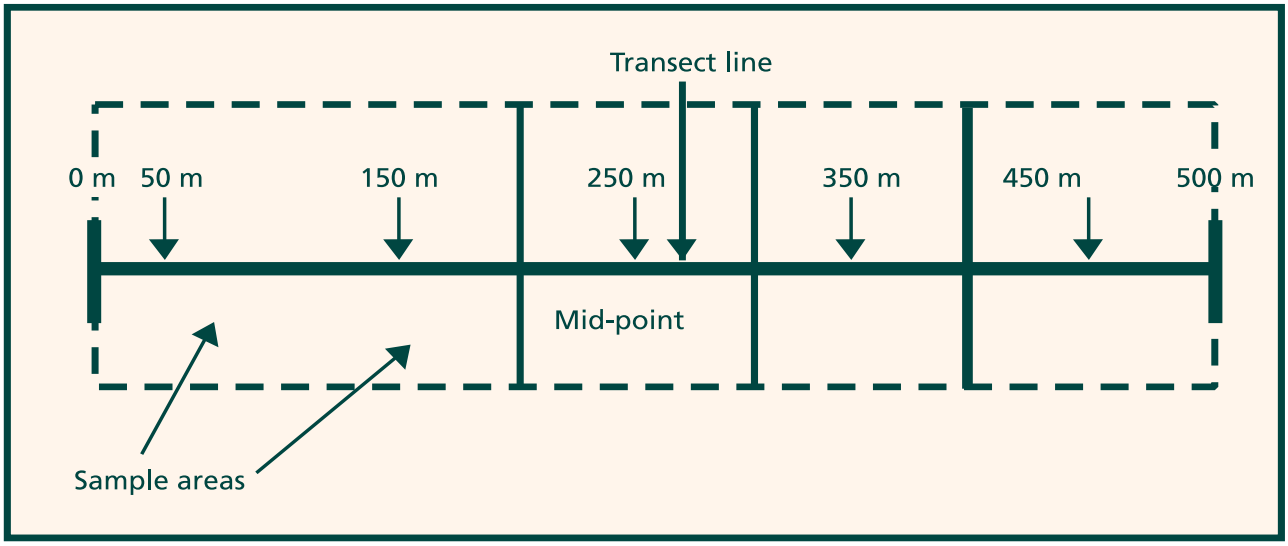

Figure 4.2 Example of how to mark out sample areas

4.2.2 MAMMAL SURVEYS

Sign search

There are many mammals that leave signs of their presence. These include scats (that is, droppings), tracks, scratches on trees, diggings, shelters and bones. Sign search can be applied in all habitat types.

Look for tracks or footprints in areas of soft soil or mud. Good places to look are around dams, puddles, or along the sides of dirt roads and vehicle tracks. Tracks are best seen in slanting light, so searching in likely spots in the early morning or late afternoon is ideal. Look for scratches on trees caused by arboreal marsupials such as gliders, possums and koalas. Any skulls or other bones may be collected and the species identified from a field guide or by referring the material to experts.

Scat collection

Scats or animal droppings are an interesting and a very efficient way to survey for mammals. The identity of the species can usually be determined from the size and shape of the scat. Several useful field guides have been published to aid you in this. Not only can you identify mammals from their scats but also sometimes what they had for dinner. This is particularly the case with carnivores or meat eaters, such as Owls, though it can also be done for herbivores, plant eaters. However this is much more difficult because there are far more plant species to be accounted for and very highly skilled people are required to perform the identifications of microscopic plant material.

The situation is much better for predators and very useful information can be gathered on other species of animals present in an area by examining the contents of predator scats, looking for things such as hair, feather and bone fragments. This still requires expert assistance, but the range of possible prey species is much narrower and sufficient reference material is available to ensure that accurate identifications are usually possible. Scat collection can be attempted in all habitats but may be difficult to do in wetlands. It is fun detective work and there are just a few things to be aware of:

- For health and safety, use disposable gloves, or a small plastic bag worn like a mitt, to pick up the scat and place it in a paper envelope. Do not handle scats with your bare hands. Seal the envelope. If it is not a press-seal envelope, do not lick it! Use a moistened sponge, or handkerchief.
- Be careful to accurately record all the necessary information after scats are collected, so that you relate the

identifications provided by experts to your field records. If you are unsure of how to prepare scats for submission to an expert, contact them and discuss their requirements.

4.2.3 BIRD SURVEYS

Point count method

A basic method involves setting up a single line at each site called a transect. Birds can be identified either visually, or by their calls. This method involves identifying all the birds you see or hear while standing at a series of points along a transect. It is always good to identify favourite places to watch for birds. Then throughout the year you can regularly visit this site and observe the seasonal changes and the changes over the years, in response to differing conditions.

A systematic search (over a fixed area and/or for a fixed time, say 10-20 minutes at each point) has the added advantage of providing an index of the abundance of individuals and species, which can be later compared with other sites where the same systematic search method was used. The reliability of the abundance index can be reduced by either overestimates or underestimates of bird numbers. To reduce overestimates, particularly when several team members are observing, try to ensure that each individual bird is recorded only once. Less experienced bird watchers may need to refer to books to aid identification, which will reduce the time spent watching and may result in underestimates of abundance. Hence, ensure that a least one member of the team is watching at all times.

Bird survey teams should be small in size with two to four members in each team with one team member nominated as the scribe. All should speak and move quietly and avoid sudden movements. Bird counts are best conducted at the start of first light which is before sunrise. This is the time when birds vocalise most, - the dawn chorus. It is also a time of maximum bird movement as birds move through the bush to begin feeding.

4.2.4 REPTILE AND FROG SURVEYS

An intensive daytime search of habitat will reveal reptiles and frogs sheltering under logs, leaf litter, rocks, loose bark, trees and bushes, around the base of in-stream vegetation, and in rocky crevices. Human rubbish such as corrugated iron sheeting and log piles often provide shelter for larger species. Animals can be captured by hand for closer identification, a skill that requires quick wits and quick reflexes. Some species are distinctive enough to be identified without handling the animal, and commonsense would suggest it is wise to

avoid handling large goannas and most snake species. Observation is more effective relatively early in the day when reptiles are not too active.

Systematic frog call recognition

The males of most frog species call to advertise their location to potential rivals and mates during the breeding season. The species of the caller can be identified from the call. By recording those calls, you make a permanent record which can be checked by others or compared at leisure to reference tapes of frog calls made by experts. Bear in mind that many species may congregate at a single water body and many individuals of one species may drown out the calls of a few individuals of another species.

You can survey for frogs at points along the transect, for example, the centre points of each quadrat or in significant patches of habitat for frogs, away from the sample area. You can base your work on the spot call recognition during a fixed 30 minute listening time, or make a recording for 30 minutes which will be analysed later to identify calling frog species. You could use both forms of information gathering in one session at a site.

The species you detect may depend on the time you record. The best opportunities for frogs are when it rains. Some species are more diurnal, calling most at dawn and dusk or during the day after rain, while others call more at night. Hence, to detect a good range of species present, it is best to make more than one recording at any one location, one at dusk and one a few hours later. Remember also that different species will breed in response to different environmental conditions, so that several visits to a single location over spring summer and autumn may enable you to detect a wider range of species.

4.2.5 INVERTEBRATE SURVEYS

There are very few places where invertebrates cannot be found. Look in the air, on plants, under logs and rocks in leaf litter, in soil, on dead animals and on other invertebrates themselves. They are most numerous in the warmer months but can also be found in the depths of winter, although you just might need to search a little harder. When surveying you should search as many different habitats within your survey site to find as many macroinvertebrates as possible.

Simply searching an area thoroughly (giving attention to all potential hiding places or types of microhabitat) is an effective method for revealing the diversity and abundance of invertebrate species within an area. A systematic search is a search of a fixed area

TABLE 7: MACROINVERTEBRATES THAT WILL BE DETECTED BY THE BASELINE METHODS

Method	Invertebrate types that will be detected	Some examples
Opportunistic	Many, but mostly large or colourful species and parasites of humans	Butterflies, ticks, leeches
Systematic search	Wide range if all habitat types are searched, including some soil dwellers. Will not sample many flying insects, tree canopy species, or boring species very well	Snails, slugs, oecophoridans, earthworms, leeches, landhoppers, woodlice, slaters, spiders, scorpions, harvestmen, mites, ticks, millipedes, centipedes, springtails, cockroaches, termites, mantids, earwigs, grasshoppers, stick insects, leaf insects, beetles, ants, bugs
Pitfall trapping	Ground surface dwellers, particularly more highly mobile species and life stages	Adult carabid beetles, grasshoppers, wolf spiders (Lyosidae), scorpions, ants, centipedes and millipedes
Light trap	Night-flying insects	Beetles and moths

with a fixed level of search effort, and ensures that the results can be compared between sites and between surveys conducted at different times where the same area and effort levels were used. This method is suitable for all habitats.

Pitfall traps

Pitfall trapping is an effective means of sampling the ground-active invertebrates of an area. A pitfall trap is simply a container sunk into the ground so that the top of the container is level with the ground surface. Ground-active animals fall into the trap while moving about, and generally cannot escape, but this will depend on the depth of the trap, the slipperiness of its sides, and the ability of the species to climb or fly away.

Small barriers, "drift fences" are often set up around the trap to direct any passing animals towards the trap. Pitfall traps for invertebrates can be either "dry" or "wet". "Wet" pitfall traps contain a fluid which kills and preserves the animals which fall into the trap. The method outlined in the *Community Biodiversity Survey Manual* is for dry pitfall traps which capture animals alive.

Light Traps

Light traps are a good way of live-trapping invertebrates that are attracted to lights at night. Most will be insects such as moths and beetles, but lacewings, bees, wasps, spiders and flies may also be attracted. The trap consists of

a vertical sheet held taut between two poles, and illuminated by an ultra violet (UV) light. Invertebrates fly or crawl towards the light, and may be picked off the vertical sheet or another sheet spread out under the trap.

It is important whether using pitfalls traps or light traps, or any other trapping device, to have respect for living things. For example do not leave pitfall traps out for long periods without checking and releasing animals not needed.

4.2.6 PLANT SURVEYS

To identify a plant properly you will need to take the relevant identification books into the field or bring part of the plant to the identification books. It will be very difficult in most cases to identify the plant from memory or a photograph. In most instances it is necessary to examine the parts of the flower, fruit and leaves in detail.

To conserve the biodiversity of species, collection of all plants should be undertaken with care. Note that you may need a licence to pick or collect native plants.

Method of collection

Collect several pieces of the plant that you wish to identify, you should try to include at least:

- leaves;
- flowers; and
- fruits.

It is best to collect larger pieces of plant with these different parts attached to a stem.

Store them in a plastic bag with a label that lists:

- the survey site where they were collected;
- date of collection;
- what the whole plant looked like (for example, a tree, shrub, vine or herb);
- the height of the plant; and
- flower colour, as this will fade if it is stored for longer than a day.

Keep the plastic bag cool and work on identifying them as soon as possible. If you are not able to work on the plants until later, you can store them in the refrigerator for a day or two. Longer storage will require pressing and drying the plants.

Equipment needed:

- **Magnifying glass**

  If you are going to buy one a 10X magnification hand lens is recommended.

  This can be purchased from most optical suppliers.
- **Scissors or secateurs**
- **A "how to…" text. Recommended is "How to identify Plants" by G. Harden and J. Williams.**
- **Field Guide covering plants growing in your area**

4.3 SWOTA ANALYSIS

SWOTA Analysis:

Strengths, Weaknesses, Opportunities, Threats, Actions.

SWOTA analysis is an effective method of identifying strengths and weaknesses, which then provide the basis for examining opportunities and threats that landholders may face. Often carrying out an analysis using the SWOTA framework will be enough to reveal changes which can be usefully made.

Below are some questions to be considered when carrying out a SWOTA Analysis. These should be considered both from a personal point of view and from the point of view of others eg neighbours or others working in the same field. It is important to assess realistically.

Strengths:

What are your advantages?

What do you do well?

Weaknesses:

What could be improved?

What is done badly?

What should be avoided?

Opportunities:

Where are the good chances facing you?

What are the interesting trends?

What are the possible changes in technology and markets on both a broad and narrow scale?

What are the possible changes in context eg government policy, funding?

What are the possible changes in social patterns, population profiles, lifestyle changes, etc?

What opportunities could be provided by local events?

Threats:

What obstacles do you face?

What are your neighbours doing?

Is changing technology threatening your position?

Do you have cash-flow problems?

Actions:

Given these SWOTAs, what management actions need to be taken to:

Build on strengths

Minimise weaknesses

Capture opportunities

Address threats.