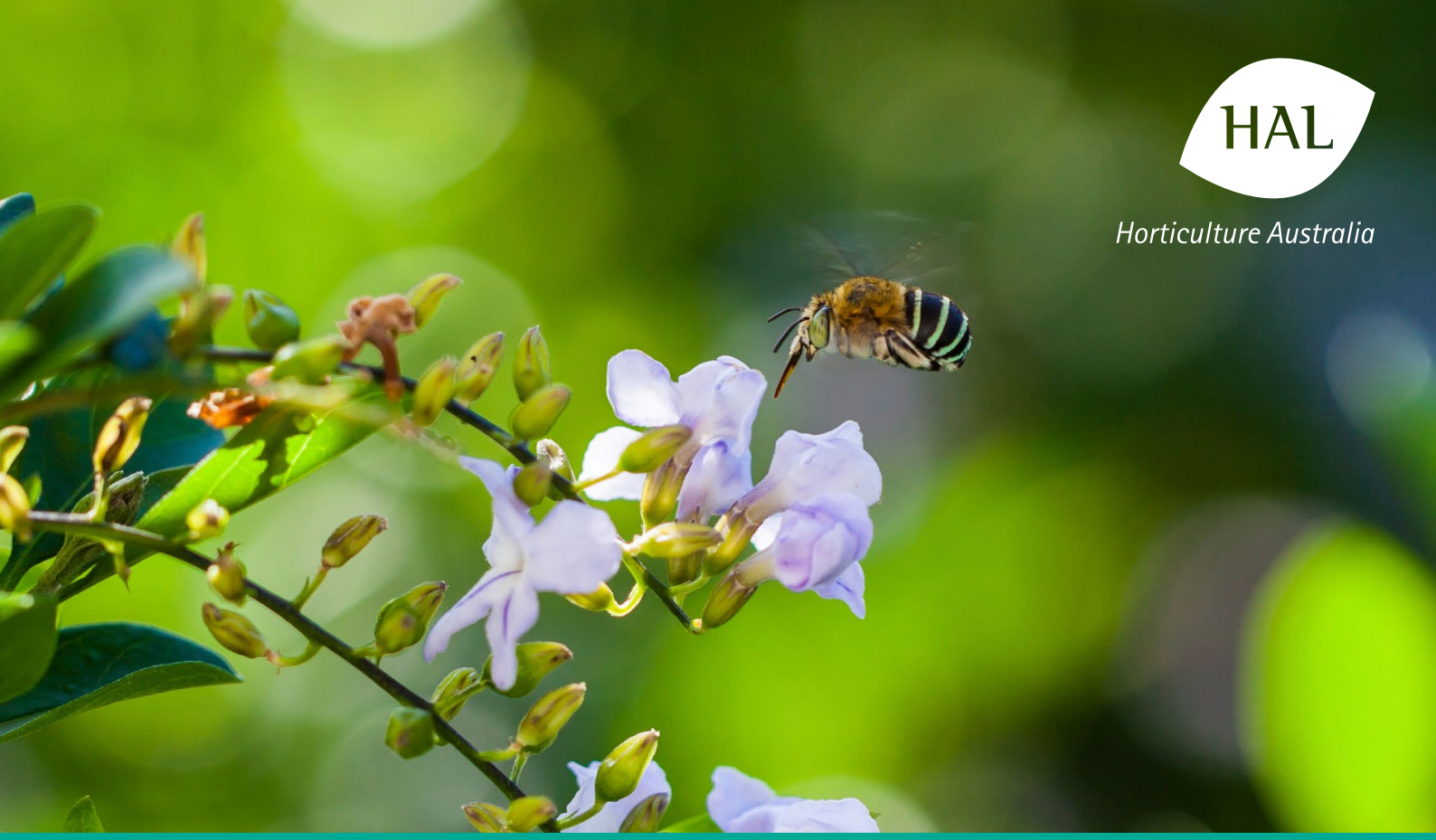


Chapter 5 Biodiversity

Objective – native vegetation, wildlife and ecosystems are appropriately maintained and managed and, where possible and practical, contribute to regional biodiversity priorities

Biodiversity is the variety of all life forms: the different plants, animals, fish, birds, insects and micro-organisms, their genes and the ecosystems of which they are a part.

Biodiversity is increasingly being recognised for its contribution to farm sustainabilityand productivity.

Biodiversity does not just apply to native organisms, but the focus of this chapter is largely on managing native biodiversity. This does not imply that biodiversity is not important within the production area.

Native biodiversity refers to the biodiversity found in a particular locality. It is restricted to the local ecosystems and their components, be they native plants, animals or micro-organisms.

Native biodiversity provides many benefits that are essential to sustaining and fulfilling human life and maintaining productive agriculture. These benefits are called 'ecosystem services' and include:

- Fungi, worms and bacteria transforming sunlight, carbon and nitrogen into fertile soil;
- Pollination from insects, including native bees, such as in the photograph above;
- Regulation of climate;
- Provision of shade and shelter from native vegetation; and
- Waste absorption and breakdown.

Further references and resources can be located at the end of this chapter.

Horticulture and biodiversity have complex interactions. If native biodiversity and ecosystems deteriorate, then the quality of the soil, water, air and ultimately productivity declines. The initial clearing of land may have negative impacts but horticultural properties, once established, become part of the local landscape. Crops may provide shelter and food for wildlife. Some wildlife may help control pests in crops, while other species may become pests themselves.

Ecosystem resilience is the capacity of an ecosystem to respond to changes and disturbances, yet retain its basic functions and structures. The resilience of ecosystems in Australia is currently being reduced by a number of threats, including climate change.

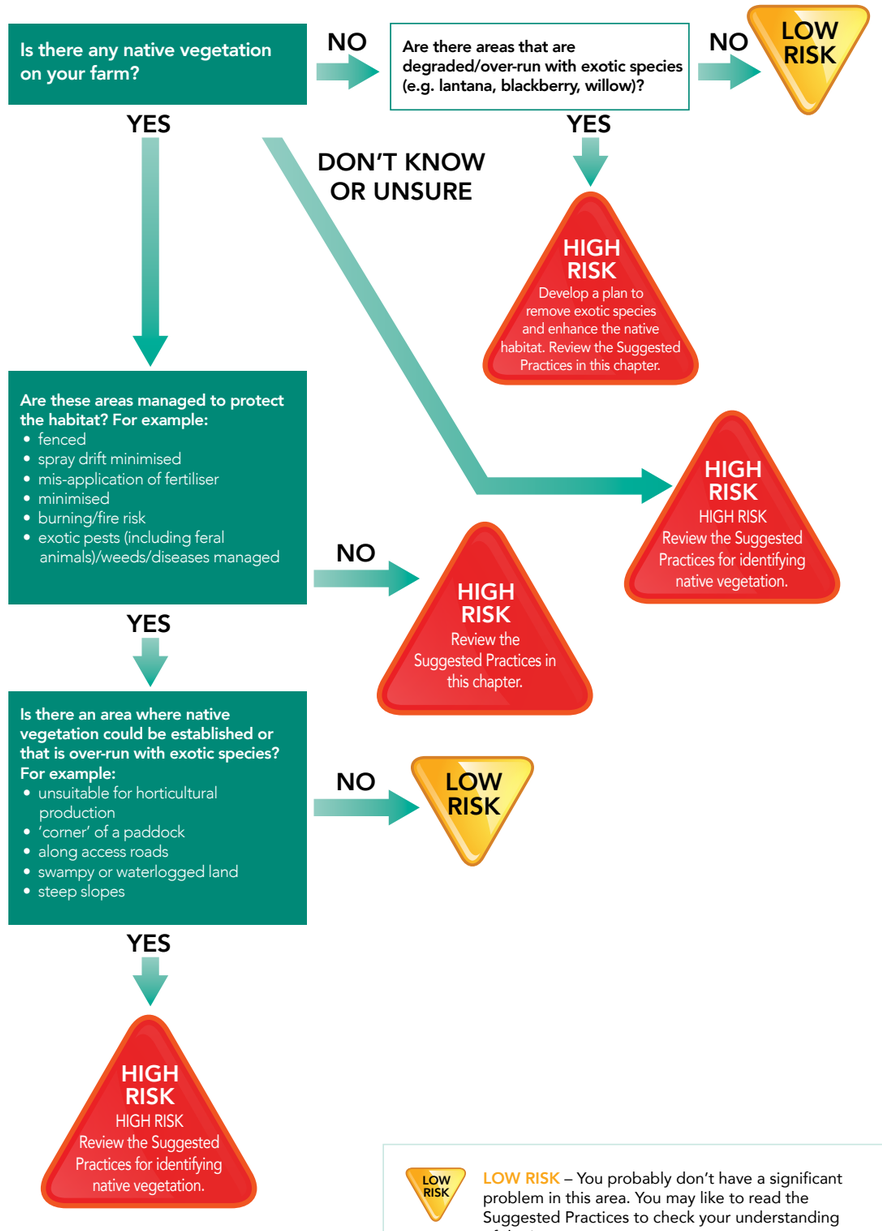
There is a need to reorientate management objectives from preserving all species in their natural habitat and current locations to ensuring space and opportunities are available for ecosystems to adapt and reorganise. This will increase the chances that they can maintain the provision of ecosystem services through a diversity of well functioning ecosystems.

To manage biodiversity on your property you need to know what native vegetation exists and, if it is of special importance, consider the impacts of farming operations on the environment and develop practical ways to manage any native vegetation as well as problem plants and animals. Management practices such as using native plants in buffer plantations or as habitat for beneficial (pest controlling) birds and invertebrates can add to efforts to conserve remnant on-farm vegetation. There may also be areas where revegetation can occur and be coordinated to contribute to regional initiatives. The careful application of pesticides is another way to protect local biodiversity from harm.

Further references and resources can be located at the end of this chapter.

5 Biodiversity

Risk assessment



LOW RISK – You probably don't have a significant problem in this area. You may like to read the Suggested Practices to check your understanding of the issue.

HIGH RISK – You need to take some action. Read the Suggested Practices for that chapter.

Further references and resources can be located at the end of this chapter.

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Review checklist

To go straight to the worksheet for this chapter click here.

Relevant legislation and regulation

Legal requirements are subject to change. Regularly check with Federal, State and Local authorities for updated requirements. See here for links.

Suggested practices

By adopting farming practices that are compatible with biodiversity protection, land managers can work towards sustainable agriculture and integrating agricultural production with biodiversity protection.

In some instances, rather than identify and assess all the native biodiversity on your property (i.e. all native animals, plants and insects etc.) it is more practical to use native vegetation as an indicator to identify if native biodiversity is present.

Identify native vegetation on your property

An initial assessment should try to identify any local native vegetation still left on the farm (exclude plantations and vegetation established for commercial purposes). This could include naturally occurring trees, shrubs, herbs and grasses, areas with understorey, or corridors connecting larger areas of natural habitat, native pasture, large old trees, wetlands, rocky outcrops, and areas of fallen timber. Dead trees should be included as important components as they provide habitat for native animals and insects. Create an inventory/file of this information.

Contact your State conservation, natural resources or sustainability department and ask them for any maps and/or lists of the native vegetation that is likely to be present and to provide advice regarding management of native plants and animals that may be on your property. Other people to help with identification include:

- Field naturalists, Greening Australia;
- Local catchment management authorities, Bushcare;
- Landcare groups;
- Regional Natural Resource Management (NRM) groups; and
- Local/State herbarium.

Universities and other research bodies are sometimes looking for farms on which to conduct studies of native plants and animals. This can be a good opportunity to learn more about the wildlife on your farm.

Attending field days in your catchment is also a good way to learn about local plant and animal species.

You may like to undertake a more complete and detailed assessment of all the species (native plants and animals) located, or likely to be present, on your property. You can ask a State biodiversity or environmental officer for advice. Biologists or ecologists are qualified to carry out this more detailed survey.

Further references and resources can be located at the end of this chapter.

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A full native biodiversity assessment could include:

- A map of the vegetation likely to be present prior to development;
- Maps of the location and type of native plants and animals species currently known to be on the farm;
- A list of local plants and animals in danger of dying out (i.e. threatened species);
- A list of current farm activities that is helping/harming native plants and animals;
- Future actions to improve biodiversity as well as maintaining farm productivity; and
- The expected improvement if these actions are followed.

The Environmental Management in Agriculture: Native Biodiversity Resource Kit provides guidance on these steps. See http://live.greeningaustralia.org.au/nativevegetation/pages/pdf/Authors%20S/12_Straker_Platt.pdf.

Consider surrounding properties

No farm works in isolation of its neighbours. Just because you haven't found any native vegetation on your property doesn't necessarily mean there is no native biodiversity, or that you can ignore the impacts your farm operations may have on surrounding properties. Look for native birds and listen for frogs – chances are both are present, indicating that suitable habitat is located in surrounding areas.

Any basic knowledge of the surrounding area, aerial photos, satellite images or maps of vegetation will give you an idea of what native vegetation is located near your property.

Assess special importance

The Government has developed lists of plants that are considered important because of their rarity, they are particularly subject to threats, or may support other significant features (e.g. as a drought refuge for native animals).

Some native vegetation stands are more important than others. This includes:

- Threatened species protected under legislation;
- Remnant vegetation (land that has never been cleared, or if previously cleared, regrowth is now mature);
- Larger areas of vegetation; and/or
- Areas serving as wildlife corridors.

More information can be found on the Australian Government Department of Environment website: http://www.environment.gov.au/topics/about-us/legislation/environment-protection-and-biodiversity-conservation-act-1999.

Contact your local government, State conservation department or the regional catchment management authority/Natural Resource Management committee for information about any important or significant vegetation that may be in your region. Financial assistance may be available to assist with management of important vegetation. Check out conservation incentives on www.environment.gov.au or contact your local catchment authority.

The following categories may have been used to describe threatened plant species:

- Extinct – no reasonable doubt that the last member of the species has died;
- Critically endangered – extremely high risk of extinction in the immediate future;
- Endangered – very high risk of extinction in the near future; and
- Vulnerable – high risk of extinction in the medium term.

Each of these categories may carry specific legislative responsibilities you are required to undertake.

Further references and resources can be located at the end of this chapter.

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Assess off-farm impacts and threats

Site development or redevelopment works need to be assessed for their potential impacts on the existing environment.

Management actions for biodiversity need to address the cause of decline or what threatens the continued existence of the native biodiversity. In many cases these threats have their origin in inappropriate land and natural resource management activities.

To assist you to assess your impacts on native biodiversity, potential management actions addressing threats should be organised according to farm activities. It is expected that each farm will be unique, therefore these actions should be considered as prompts that a land manager should use to broaden the search for solutions.

In the Environmental impacts section of these guidelines, you will note that most activities represent some form of impact both on and off-farm. However, the five key horticultural activities you may need to draw up specific actions for are:

- Spray drift;
- Fertiliser/water use and leakage;
- Topsoil loss and erosion;
- Control of pests (including native animal species); and
- Disposal of waste.

An integrated property management plan such as a Whole Farm Plan (WFP), Property Management Plan (PMP) or similar, can help you to work through the range of potentially conflicting needs and allocate resources according to priority.

Living with native birds and animals

There are many benefits to having native animals on or near agricultural land. For example, many native birds eat insect pests, pollinate plants and disperse native seed. However, occasionally problems may arise when native birds and animals eat or damage crops. Where growers are faced with 'problem' native animals, specialised advice must always be sought from your State conservation department to avoid exposing yourself to the risk of prosecution if any illegal response is adopted.

Avoid looking at symptoms of the problem, such as 'there are too many animals' – the question is why? Options for responding to problem animal management will include how to mitigate the problem and live with native animals. As standard practice, always consider non-lethal management options. These may include:

- Netting;
- Fencing;
- Sound or light based systems (sirens, gas cannons);
- Encouraging predators (e.g. hawks, although this may end up being lethal!); and/or
- Providing alternative habitat.

See http://www.wildlifefriendlyfencing.com/WFF/Friendly_Fencing.html and http://www.wildlifefriendlyfencing.com/WFF/Netting.html for examples.

If you have sought advice and trialed applicable non-lethal management options without success, as a last resort consider lethal management options (such as shooting). It is important to check whether wildlife is protected and be aware of any licensing requirements before undertaking lethal management options. These must only be implemented in a humane manner.

Consider registering your farm under the 'Land for Wildlife' program if it operates in your area. This program is delivered by different organisations in each state. See Greening Australia or Landcare Australia for relevant information.

Further references and resources can be located at the end of this chapter.

5 Biodiversity

Keep pets away from wildlife. Unrestrained cats and dogs can wreak havoc on local wildlife populations. If pets are kept in at night, this will help safeguard them as well as the wildlife. Ideally, cats should be confined to indoor areas at all times.

Look after wetlands and watercourses. The natural cycles of flood and drought are important in maintaining ecosystems and habitats. In wetland areas, floods rejuvenate the soil and create temporary habitat and breeding sites for waterbirds, tadpoles and fish. Waterbirds eat many crop damaging insects, and the common backswimmer and the nymphs of dragonflies and damselflies eat mosquito larvae. Adult dragonflies and damselflies also prey on mosquitoes and crop damaging insects such as aphids.

Well maintained waterways are also attractive and an asset to any property

Make a farm dam more wildlife friendly. A dam with a large surface area, variety of depths and gently sloping bank also provides different habitats for many vertebrate and insect species. Logs, rocks and boulders in and around the dam will provide homes many animals.

Leave river snags, submerged logs, branches and litter in place. If it looks messy, chances are it is great habitat! Snags, logs and litter provide habitat for fish, frogs and invertebrates. Half submerged logs also provide perching spots for birds and turtles. Hollow logs provide homes for many species. Logs from other areas can be used to re-snag watercourses and improve habitat values.

Controlling feral animals and invasive species

Invasive species can be both native and exotic. They can have an impact on the environment by competing with native plants and animals and potentially can cause soil degradation and water quality issues. If pests, such as feral pigs, deer and weeds, are a problem, contact your local natural resource department or council, to get advice or assistance to control them.

Exotic plants may require specific management. Problem plants can be escapees or volunteers from commercial operations, such as escaped olive trees. In the right place these plants are not a problem, but once they start encroaching on native vegetation specific action is required. The landowner must take all reasonable measures to prevent the land being infested with a declared weed and take all reasonable measures to prevent a declared weed or potential weed spreading to other land.

Get rid of weeds to reduce potential for pest harbour and give native vegetation a better chance of survival (e.g. Bridal Creeper Asparagus asparagoides – a Weed of National Significance not only causes losses by shading citrus and avocado trees and interfering with fruit picking, it is also considered the most important weed threat to biodiversity).

If you are planning to use herbicides for weed control rather than physical removal, take special care not to damage the area you are trying to improve or to contaminate waterways. Removing dense areas of weeds should coincide with revegetation or regeneration activities, otherwise further weed infestation may result. For more specific information on threats and control methods for individual weeds refer to http://www.weeds.org.au.

Environmental weeds and nursery propagation

Weeds have a significant impact on the environment because they compete with native plants and reduce habitat and food sources for wildlife. Weeds Australia publish 'Weeds of National Significance' (WoNS), which currently lists 32 weeds that, by law, must be controlled if they are present on your land. See www.weeds.org.au/WoNS.

'Noxious' weeds must also be controlled under legislation at a state or territory level. Of the 2700 species of introduced plants now established, 429 have been declared noxious or are under some form of legislative control in Australia. Weeds Australia also publish a searchable list of noxious weeds at www.weeds.org.au/noxious.htm.

Further references and resources can be located at the end of this chapter.

Identify and manage weeds on your property according to the relevant legislation. Weeds around riparian areas and watercourses are also the landowner's responsibility. General information relating to identification and control measures for weeds can be found on the Weeds Australia website www.weeds.gov.au.

Soils amendments, mulch and fill may harbor weeds, so only source these products from a trusted supplier and manage these inputs as well as possible. Inspect the places where these products are applied regularly to identify any potential weed incursions.

Role of the nursery and garden industry in reducing the spread of invasive garden plants

With the increasing focus on the impact that invasive garden species have on the environment and agriculture, the nursery and garden industry and its customers are frequently targeted for education and awareness strategies. The difficulty is that 'customers' include not only gardeners, but also a diverse range of people with differing needs, knowledge and skills.

The Nursery & Garden Industry NSW & ACT Limited's 'Grow Me Instead' programme has been very successful in highlighting the importance of industry and local government partnerships in identifying and targeting key invasive garden species on a regional scale. Through daily contact with customers and stakeholders who are making decisions and seeking advice about their gardens, the industry is in a unique position to educate the community about responsible plant choice and to promote appropriate care and maintenance to reduce the spread of invasive garden species and to better manage plants already in gardens.

Practical management of native vegetation

Once you have found out which native plants are on your property (including their significance) you will have some idea about how to prioritise your actions to protect them. These actions may include:

- Fencing off areas to exclude vehicles, people and stock. Select fence types that enable native animals to have access to natural drinking water sources and to move between habitats;
- Animals to have access to natural drinking water sources and to move between habitats;
- Leaving dead trees standing, logs, branches, twigs and rocks on the ground as homes for birds, insects and other animals;
- Not cleaning up places with native vegetation. By not tidying up understorey grasses, shrubs and fallen trees, birds and beneficial native animals will have places to hide from introduced predators or competitors or as a food source; and
- Protecting native vegetation from fertiliser. Avoid the use of fertiliser on native vegetation, ensure native vegetation is protected from accidental application such as drift. Fertilisers raise nutrient levels, encouraging invasion by exotic species and also reducing the amount of native ground cover species, including valuable perennial native grasses.

You can also ask a State biodiversity or environmental officer for advice or assistance on priorities for management.

Depending on the jurisdiction, it may be possible to enter into a voluntary conservation agreement or similar agreement with the relevant State agency to formalise protection of wildlife and significant habitat on part of your property. 'Land for Wildlife' is one such scheme and conservation incentives also exist (http://www.environment.nsw.gov.au/cpp/landforwildlife.htm). Sometimes these agreements may contribute to providing compliance against international environmental standards.

Many pest animals not only prey on native animals but they also compete for the same space, food and shelter. Control animals such as rabbits, foxes and feral animals. Check local regulations and laws about the control of pest animals before you begin any control program.

Integrated Pest Management (IPM) is an excellent management practice to maximise biodiversity on-farm. IPM strategies are designed to reduce reliance on pesticides while still managing pests. Reduced reliance on pesticides can provide an environment where a greater diversity of flora and fauna exists. This in turn can assist in building the numbers of pest predators to improve the control of pests.

Whole farm planning is a structured approach to making informed decisions for the use and management of all aspects of your property. Your State biodiversity or environmental officer, catchment management authority or natural resource management group can provide advice.

Fire management

Management of vegetation areas needs to also consider fire control and the role of fire in maintaining the diversity of plants that make up the bush. Much of Australia's flora has evolved in an environment where fires regularly occurred, and many plants require fire to assist regeneration.

Considerable care is required to manage fires and local authorities should be consulted and alerted before burning. Neighbours may also be affected by smoke and should also be consulted (see Chapter 7 – Air management).

The following points should be reviewed:

- Choose a fire regime to suit the desired outcome. If you are burning to reduce fuel loads then fires will need to be more frequent than if you were burning to promote tree regeneration;
- If you have threatened species, choose a fire regime that suits their needs;
- Time burning to suit the plants' lifecycles. These will vary depending on where you are in Australia, but generally autumn burns are best; and
- Fireproof buildings and ensure sufficient fire breaks around production areas, boundaries and other areas that must not be burnt.

If the property is affected by bushfire or a prescribed burn, the bush will recover. This can be a valuable opportunity for controlling weeds and kick-starting natural regeneration.

Consider options for increasing on-farm native vegetation

Plantings can greatly enhance a property's productivity and wildlife habitat value. Depending on their design and placement, they provide a range of services including:

- Windbreaks, or shelterbelts protecting crops, pastures, livestock and farm buildings;
- Additional habitat area — potentially boosting numbers of native animals that pollinate plants, and control insect pests;
- Corridors to help increase connectivity between patches of habitat;
- Help in reducing water tables and control salinity;
- Erosion control;
- Supply timber and fodder; and
- Improvement to water quality in wetlands, dams and watercourses.

Further references and resources can be located at the end of this chapter.

Further references and resources can be located at the end of this chapter.

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Think about planting windbreaks and shelterbelts using local native species. Shelterbelts and windbreaks may be best placed on the property boundaries and developed with consideration of establishing interconnecting wildlife corridors.

The resulting wind protection can contribute to overall farm productivity, plantings may provide habitat for beneficial native insects (i.e. contribute to Integrated Pest Management) as well as providing habitat for native species. Ideally, plantings should be at least 20 m wide to provide greater benefits, however, if space is limited, narrower shelterbelts can still provide some protection to crops and provide some habitat. Individual trees can also provide suitable habitats.

Choose some areas where it would be possible to begin a restoration project. It is a good idea to choose areas not currently used for farming, such as steep slopes, stream/dam sides, saline areas and wetlands. These areas are usually poorly utilised and don't make a major contribution to horticultural production.

Select a mix of native plants, including trees, shrubs and grasses, preferably native to your local area (known as provenance species). Plantings should copy nature and not be as regular as a crop.

Dams and waterways also significantly contribute to increasing biodiversity and providing habitat for native animals, birds, frogs, insects, fish, invertebrates and plants. Wetlands, bogs and marshy areas can be turned from unprofitable areas to rehabilitated areas of great ecological significance with fencing and revegetation.

Some local authorities and organisations will provide advice and support to landholders for revegetation activities. Flora, fauna and bush regeneration consultants are also available to assist in design of restoration projects.

Soil biodiversity

Soils contain many living organisms ranging from microscopic bacteria and fungi to burrowing animals. All play a part in maintaining natural soil processes, which are vital for maintaining the chemical and physical fertility of soil. Soil organisms rely on organic matter for food. By 'feeding' on organic matter, micro-organisms release organic nutrients in a mineral form available to plants for uptake. Increasing the organic matter content of your soil (such as by incorporating compost) can help boost the population size, diversity and activity of soil organisms. The organisms in the soil food web play a part in breaking larger pieces of litter into smaller fragments, mixing these throughout the soil profile, binding soil particles, providing channels for water access and maintaining the health of the plant. Bacteria and fungi are responsible for the rate of nutrient release to the soil and rhizosphere (the area around plant roots where the biology and chemistry of the soil are influenced by the root).

Biodiversity can be improved in production areas by strategies such as inter-cropping or alley cropping (growing two or more crops in the same area), rotations with a range of crops and cover crops, or by simply being more tolerant of weeds.

Work with others

Neighbouring land managers may have practical experience in addressing certain biodiversity issues that they can share. You can demonstrate your involvement in environmental issues and gain practical advice from fellow growers by joining local groups such as Landcare.

Contact these organisations to see if your on-farm activities can contribute to any local environmental projects and encourage your neighbours to work with you. It is a good idea to contact your regional NRM group to see how your property and activities may contribute to regional targets or strategies and to see if there is any financial assistance available to help you achieve your goals.

The Commonwealth has developed a Biodiversity Resource Guide as part of the National Environmental Management Systems (EMS) training kit and provides state-by-state contact details. To find out more, visit http://www.daff.gov.au/natural-resources/soils/ems/biodiversity.

As animals travel between farms, it is a good idea to cooperate with your neighbours and connect your native vegetation with theirs.

Further references and resources can be located at the end of this chapter.

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Monitoring and recording

Records demonstrating that you have achieved progress with your management of native vegetation, fauna and ecosystems serve not only to prove to yourself that your property is a healthy environment, but can also demonstrate your environmental stewardship 'credentials' to your neighbours, authorities, wholesalers, retail customers and consumers, which may go a long way when next you wish to expand your operations, change your focus, access new markets or even sell your property.

A vegetation assessment is a good way to understand current on-farm biodiversity and establish a benchmark for your property. When repeated over time, a reassessment can monitor and measure changes. Some guidance may be available from government environment departments and regional NRM groups. In the absence of better information, applying the general principle of trying to maintain the current condition of natural areas and taking some steps to improve them will benefit the environment and demonstrate your environmental stewardship.

Native vegetation and individual native plants have 'resilience' – the ability to regenerate after disturbance. It is the resilience of the plants, and the associated animals – from large mammals to microscopic soil bacteria – which governs the capacity of an ecosystem to recover when damaged.

Signs of strong resilience include:

- Older trees, which will shower the site with seed;
- At least some natives in the shrub layer native grasses and ground cover plants;
- Native regrowth and evidence of regeneration;
- Natural watercourses;
- Leaf litter, fallen timber, lichen and mosses; and
- Intact soil profiles and soil that has had minimal impacts from farming or urbanisation.

Signs of reduced resilience include:

- Heavy weed loads;
- Introduced pasture grasses;
- Land degradation and soil erosion;
- Salt scalding;
- Few living trees, and signs of dieback;
- High nutrient levels from fertiliser or farm effluent runoff; and
- Stormwater runoff from urban areas and roads.

Further references and resources can be located at the end of this chapter.

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A farm map and photos can be used to demonstrate revegetation of locally native species and future plans. You may find it helpful to record sightings of rare or unusual animals along with your vegetation assessment maps and documentation.

Records of training, implementation and the management of Integrated Pest Management on farm can be used to demonstrate some of the production biodiversity enhancements in your business.

A simple measure of soil biodiversity is to count the number of earthworms in a spade full of soil. More sophisticated measures of soil biodiversity can be provided by some research laboratories set up to measure parameters such as microbial and fungal biomass, microbial activity and nematode community analysis.

Strategies for control of problem native animals can be documented and kept along with any licences required.

References and further resources

For access to relevant references and further resources click here.

Further references and resources can be located at the end of this chapter.

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Biodiversity - references and further resources

(web links accurate as at 11 February 2014)

Note: A number of Horticulture Australia Limited (HAL)-funded project final reports have been identified as references within this document. This is by no means representative of all the research & development (R&D) or final reports available in this area. For full list of HAL final reports visit the HAL website www.horticulture.com.au. Alternatively, contact HAL or your peak industry body for more information on research & development outcomes specific to your industry.

AgBiodiversity - portal for information on decisions about managing biodiversity and production. http://www.agbiodiversity.com

Australian Fauna Care – comprehensive list of wildlife care groups in Australia http://www.fauna.org.au

Australian Government – Caring for Our Country – Biodiversity and natural icons http://www.nrm.gov.au/about/caring/priorities/biodiversity.html

Australian Government Department of Agriculture – Environmental Management Systems – Biodiversity Resource Guide http://www.daff.gov.au/natural-resources/soils/ems/biodiversity

Australian Government Department of Environment – Conservation of biodiversity http://www.environment.gov.au/topics/biodiversity

Australian Museum on line Australia's Biodiversity http://australianmuseum.net.au/Biodiversity

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Department of Agriculture, Fisheries and Forestry – Landcare and ecosystem services information http://www.daff.gov.au/natural-resources/landcare http://www.daff.gov.au/natural-resources/ecosystem-services

Department of Environment and Primary Industries, Victoria – Biodiversity Atlas http://www.depi.vic.gov.au/environment-and-wildlife/biodiversity/victorian-biodiversity-atlas

Department of Primary Industries, Parks, Water and Environment – Land for Wildlife http://www.dpiw.tas.gov.au/inter.nsf/WebPages/DRAR-7T8VRQ?open

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Environmental Taxation Concessions – administrative arrangements relating to taxation concessions that seek to conserve and protect the natural environment. http://www.environment.gov.au/topics/about-us/business-us/tax-concessions

Flora of Australia Online http://www.environment.gov.au/biodiversity/abrs/online-resources/flora/main/

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Greening Australia www.greeningaustralia.org.au

Grow me instead – educational initiative of the Nursery and Garden Industry Australia for addressing invasive plants http://www.growmeinstead.com.au

Identification of regional priorities – Conservation advices and Recovery Plans by NRM region http://www.environment.gov.au/cgi-bin/sprat/public/conservationadvice.pl

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