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An initiative of The Australian National University

# Ten ways to improve the natural assets on a farm



We thank the farmers, their families and partner organisations who have supported our research and extension work.

This booklet is dedicated to all the farmers who are undertaking land, water and biodiversity restoration and management on their farms, and to farmers who plan to do so.

## **Ten ways to improve the natural assets on a farm**

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Published by ANU Sustainable Farms  
Fenner School of Environment & Society,  
The Australian National University, Canberra, Australia  
Email: [sustainablefarms@anu.edu.au](mailto:sustainablefarms@anu.edu.au)  
Website: [www.sustainablefarms.org.au](http://www.sustainablefarms.org.au)

### **Booklet citation**

Sustainable Farms (2020). *Ten ways to improve the natural assets on a farm*. Fenner School of Environment & Society, Australian National University, Canberra, Australia.

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More detailed information is available in the book, *Restoring Farm Woodlands for Wildlife* (2018) by David Lindenmayer and the team at ANU, and in other publications detailed at [www.sustainablefarms.org.au](http://www.sustainablefarms.org.au).

This publication aims to provide information on best-practice management of natural assets on farms in the south-eastern wheat-sheep belt of Australia, from north east Victoria to south east Queensland. The publisher is not responsible for any actions taken on the basis of the information provided here, or for any errors or omissions.

The paper this guide is printed on is in accordance with the standards of the Forest Stewardship Council. The FSC promotes environmentally responsible, socially beneficial and economically viable management of the world's forests.

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ANU Sustainable Farms acknowledges the Traditional Custodians of the land we work on and we pay our respects to their Elders, past and present.

**Cover:** Jugiong Hill and  
the Murrumbidgee River.

(Photo: B. Vanzella.)

**Design:** [upperandlower.com](http://upperandlower.com)



National Environmental Science Programme

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This booklet is designed as an introduction to caring for on-farm natural assets such as native vegetation, paddock trees, rocky outcrops, dams and riparian areas. We hope it inspires you to see potential in the landscape that you care for.

In the following pages we outline ten ways in which you can improve natural assets on your farm, with a view to protecting the unique biodiversity of the box-gum grassy woodland ecosystem as well as enhancing farm productivity. This booklet is a starting point, and on the back cover we provide suggestions about where to go for more detailed and locally relevant information.

A Sustainable Farms Field Day focused on shelterbelts, saltbush and how saltbush can be used to maximise livestock performance and biodiversity on your farm. (Photo by D. Smith.)





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# Foreword

Sustainable Farms is an Australian National University initiative to support farmers with science. The team works with a range of partners to provide extension activities and resources, including on-farm field workshops.

For more than twenty years, our team has been working on farms from northern Victoria to south-east Queensland. The landholders we work with often ask questions like:

*"I have planted a shelterbelt which has made a huge difference for wildlife and stock, but what else can I do?"*

The answer is lots of things. Examples include improving farm dams, protecting paddock trees, establishing native plants alongside streams, and fencing around patches of native bush. Many of these actions — such as fencing around a paddock tree — don't have to be onerous or expensive.

Farmers who take action to improve the natural assets on their land tell us that, with time, they make gains in profitability, livestock weight and health, crop productivity, and job satisfaction.

When natural assets are improved, they deliver a range of co-benefits. For example, well managed shelterbelts have been shown to boost pasture production for livestock by up to 8%, wool production by up to 30%, weight gain in livestock by up to 20% and reduce lamb deaths by 10%.

Patches of native woodland and pasture are important natural assets on farms. They can provide shelter for livestock, act as a source of fodder during drought, and provide refuges for pollinators of crops such as canola. They are also key habitats for a wide range of native animals and plants.

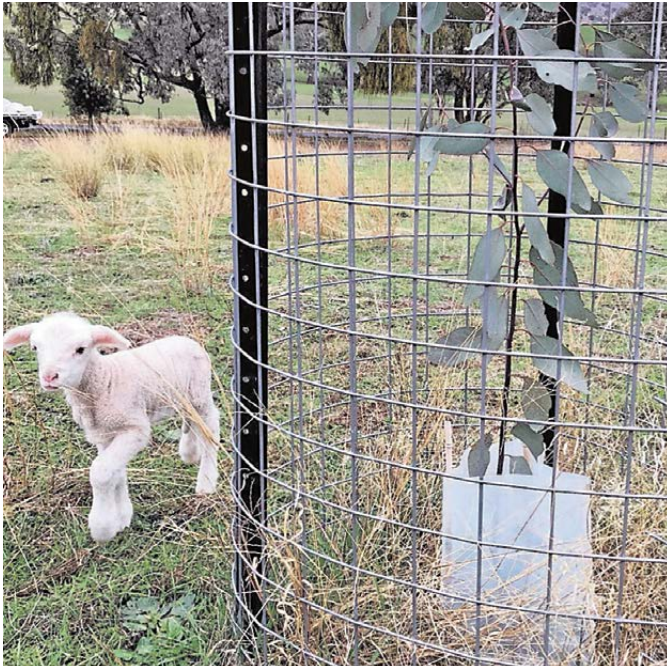
Through investing in the natural assets on their farm, landholders can have a hugely positive impact on productivity and profitability and, at the same time, enhance the survival of native plants and animals.

## **David Lindenmayer**

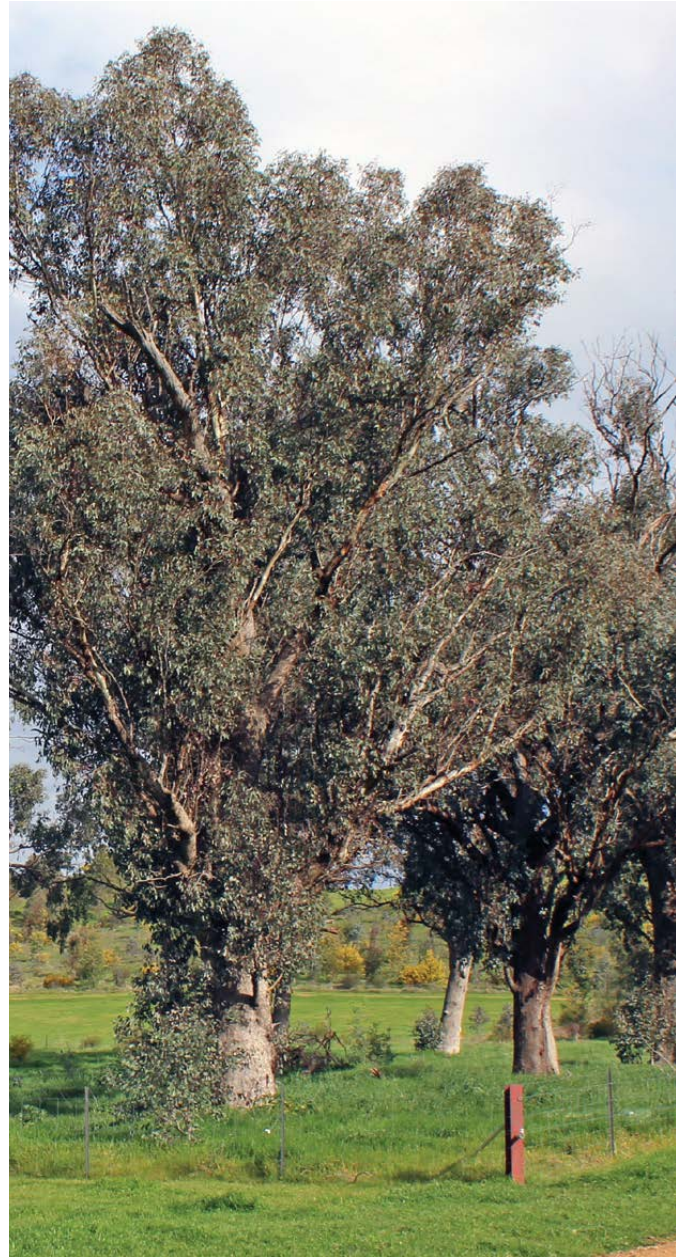
Research Director for Ecology and Lead Scientist,  
Sustainable Farms, Australian National University.



Paddock trees provide important habitat and resources for pollinators, helping increase crop yield.  
(Photo: T. Boyer.)



Fencing around individual trees can be an effective way to protect new cohorts of paddock trees.  
(Photo: T. Refshauge, courtesy of Hovells Creek Landcare Group.)



A fenced planting established around old paddock trees. Large old paddock trees often exhibit an improvement in condition when adjacent areas are replanted. (Photo: M. Crane.)

# Protecting paddock trees and growing new ones

1

Scattered paddock trees are often the only large old trees remaining on farms and their numbers are declining due to clearing, salinity, dieback, chemical drift from spraying, fire, damage by livestock, soil compaction, browsing by insects, and a lack of regeneration.

Paddock trees are important for livestock production because they provide shade in summer and protection from wind and cold in winter. They benefit adjacent crops by providing refuge for pollinators and predators of pest insects. Paddock trees also assist with water infiltration, salinity management and can improve the structure and quality of soils.

When new plantings are established around existing paddock trees, these two natural assets complement each other to provide higher quality and more complex habitat for native wildlife.

Scattered paddock trees have many ecological roles. These include acting as stepping stones to promote the movement of animals through landscapes, supplying hollows for animals to shelter and breed, providing a source of food (because they are often prolific flowerers), and providing habitat for animals such as tree-dwelling geckos and skinks that live in bark crevices. Large old paddock trees with huge canopies of leaves are also important for long-term carbon storage.

## **To protect paddock trees and enable the growth of new ones, consider the following:**

- Avoid clearing paddock trees where possible. It can take hundreds of years for a recently cleared large old tree to be replaced.
- Paddock trees tend to be in better condition when they are surrounded by plantings or areas of natural regrowth. Midstorey vegetation around paddock trees will not only help protect them, but provide added benefits for birds and beneficial insects.
- Try to identify the cause of poor condition in paddock trees and manage accordingly. For example, excessive trampling by livestock or a build up of manure around the tree's base.
- Fence an area around paddock trees to reduce soil compaction, erosion and root damage.
- Fencing with the existing tree in the corner of the fenced area enables livestock to continue to utilise the tree's shade, while helping protect the tree's roots and providing a fenced area within which to regenerate vegetation.
- Incorporating existing old paddock trees into areas of new plantings will give these plantings a 150-year head start, attracting species which require older, established trees.
- Limit prescribed burning around paddock trees. The decayed wood and hollows they contain make them vulnerable to fire.
- Planting young trees and fencing them individually until they reach maturity enables re-establishment of the spatial patterns of paddock trees on the farm, without taking areas of land out of production as can happen with larger fenced plantings.



Restored riparian area showing a variety of grasses, trees, shrubs and aquatic plants. (Photo: M. Crane.)



# Protecting rivers, creeks and wetlands

# 2

Rivers, creeks and wetlands are often the most productive and biodiverse parts of the landscape, making them good places to focus vegetation protection and restoration efforts. They can also be key sources of high quality water for your farm.

When riparian areas are well managed, water persists longer on a farm, which can boost productivity. Restoring riparian vegetation can limit erosion and improve dry matter production in adjacent paddocks, leading to greater milk production in dairy herds and a boost in farm income.

Well managed riparian vegetation is a hotspot for biodiversity. Threatened species such as the squirrel glider, regent honeyeater, Macquarie perch, southern pygmy perch and Booroolong frog are associated with healthy riparian systems. Healthy populations of native animals add value to farms in many ways, including through better pest insect control, pollination and nutrient cycling.



## To protect rivers, creeks and wetlands, consider the following:

- Fence riparian areas to limit the impacts of livestock, particularly faecal contamination and pugging, on water quality. Set fences back from the high-water mark and active erosion zones to ensure that they are not washed away during a flood, or use fence types that will tolerate flooding, such as plain wire.
- If you can, install troughs to provide livestock with water away from the watercourse. If not, fence the riparian areas and provide a hardened access point for stock.
- When riparian areas are protected from grazing, grasses, reeds and rushes usually regenerate naturally. They provide an important filtration service for runoff from adjacent paddocks and upstream, reducing the amount of sediment and chemicals entering the watercourse.
- Allow native plants to naturally regenerate, or plant trees and shrubs within fenced riparian areas. Ensure that native plants are used. Exotic plants must be avoided – they can contribute to invasive weed problems that badly damage the environment.
- Leave fallen timber in and around waterways. Snags help to form “leaky weirs” and create a chain-of-ponds, enabling water to persist in the landscape for longer during dry times. Snags also provide habitat for native animals and an underwater surface for biofilm, which provides food for invertebrates and other animals.

White-necked heron, *Ardea pacifica*.  
(Photo: A. Chapman. Creative Commons.)

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## CASE STUDY:

### Protecting rivers, creeks and wetlands



Planning on-farm biodiversity improvements. (Photo: N. Fijn.)

Paul and Rachel Graham run their 1,580 hectare farm, Bongongo, along with another property, producing beef, lamb and wool north east of Gundagai NSW.

In collaboration with the local Landcare group and with the support of government incentives, Paul and Rachel have taken on larger and more challenging rehabilitation projects over the years.

They focus on riparian and wetland restoration to improve water quality and infiltration, and limit erosion on their farms. Through the Adjungbilly Creek Conservation Project, they are continually improving habitat for the endangered Booroolong frog and Macquarie perch. Paul's brothers, who own the adjacent properties, also joined the Adjungbilly Creek Conservation Project, enabling them to connect vegetation corridors and increase the value of the habitat for native plants and animals.

Checking a well and revegetated soak. Note the variety of grasses and groundcovers. (Photo: N. Fijn.)

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“We are planting native trees and other vegetation along the creeks and fencing them off to revegetate the banks. The vegetation also acts as a shelterbelt and a filtration system.” — Paul Graham

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“We take the stock out and then it’s the grasses that hold the soil together because they’re not grazed, otherwise the bank washes away. You can see the amount of grassing-up, or re-vegetation, along the banks without the stock. The water quality in the creek is beautiful now because it has been locked off from stock.”





Local school community planting trees along the creek. (Photo: N. Fijn.)

“The idea when we’re doing these riparian restoration projects is to put the fencing further out and plant the native trees well off the bank. You want to fence 15 metres from where the bank starts with a corridor of three rows of trees. We plant the first tree about five metres off the bank; then its roots can touch the water but it’s not going to be close enough to the bank to fall over and take the bank out.

Not only are the projects good for the environment’s health, they are also good for my mental health. It’s very rewarding to see these areas establish, grow and develop, to stand back and look at the whole picture of the result from your efforts out there in front of you.

Without the government funding I wouldn’t be able to do such large projects. To me it’s a no-brainer. It makes my farm more efficient and the environment more sustainable for the long term.”

In coming years, the Grahams are planning to increase connectivity between vegetation corridors to create more shelter for livestock and extended habitat for birds.



Checking young trees planted along the creek. (Photo: N. Fijn.)



Recently improved dam showing fencing,  
hardened watering point and young plantings  
connected to existing paddock trees.

(Photo: B. Vanzella.)



A fenced and hardened watering point  
improves the water quality in the dam  
and prevents pugging and bogging.

(Photo: M. Crane.)

# Improving farm dams

# 3

Improving water quality in dams can bring significant benefits, such as greater weight gain in livestock and fewer harmful parasites. Improvements to dams can also greatly increase drought resilience of farms.

Well managed farm dams provide refuge for a range of native animals, including birds, frogs, dragonflies and other invertebrate predators that help to control pests.

Increasing biodiversity in and around the dam will help with nutrient cycling between the dam and paddocks. For example, birds feeding on frogs and tadpoles in the dam will assist in transfer of nutrients back into the surrounding pastures.

## Consider the following dam improvements:

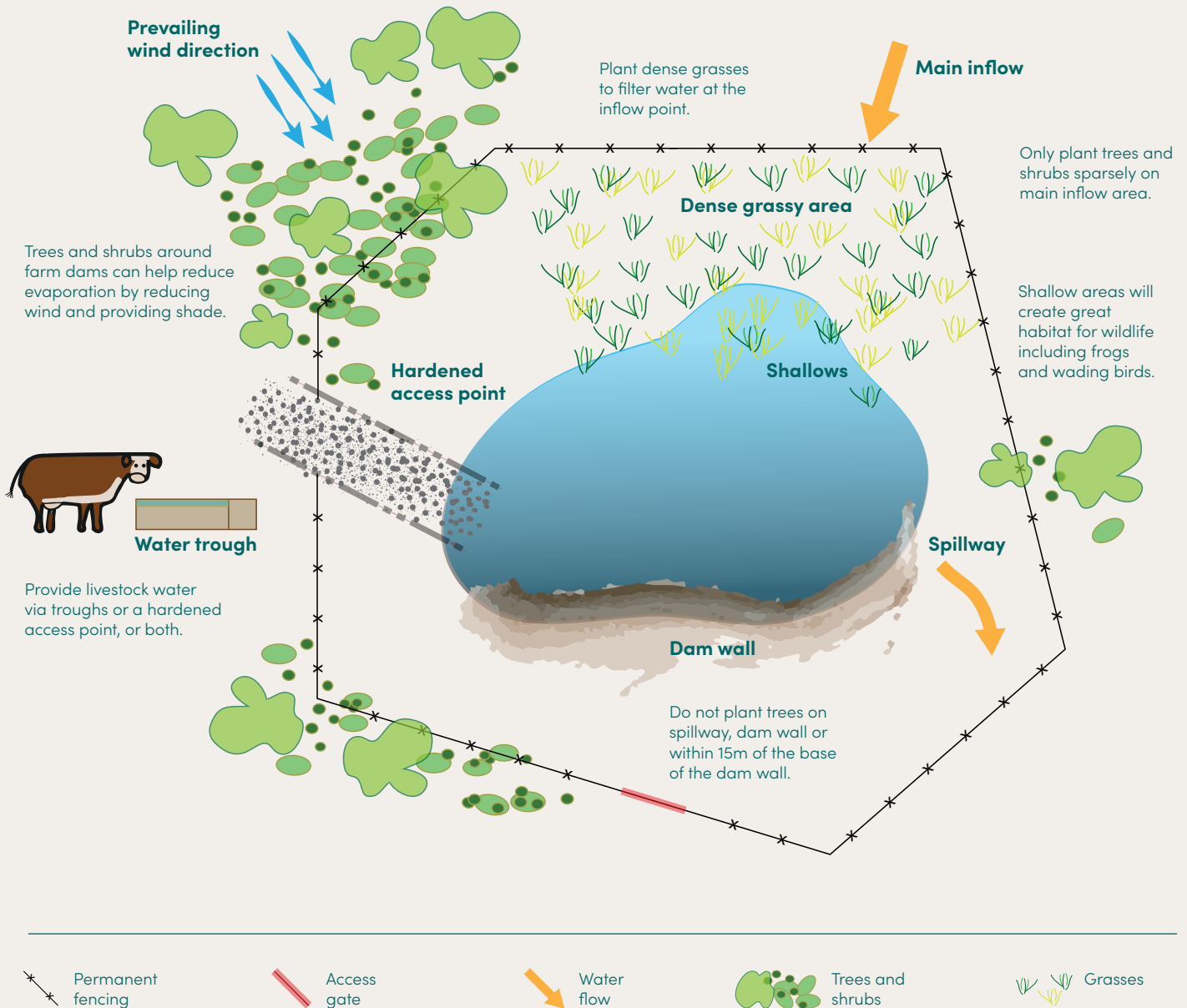
- Fence the dam to exclude or limit livestock access and reduce fouling by animal wastes. Vegetation will quickly begin to regrow on the banks of a fenced dam.
- Provide a hardened access point with crushed rock to prevent livestock pugging up the ground or becoming bogged in mud.
- Completely fenced dams can be a source of high quality water piped to troughs.
- Surround the dam with trees to create shading and shelter from wind, thereby reducing evaporation. Avoid planting on dam walls, inflow and spillway areas.
- Grow grasses and ground cover in the inflow and spillway to filter and limit sediment, animal wastes, pathogens and agricultural chemicals from entering the dam.
- The combination of fencing the dam and increasing filtration of water flowing into the dam will significantly slow the rate of siltation of the dam. This will reduce the expenses associated with mucking out a silted-up dam.

- Ideally, a dam will have varying water depths. Deeper sections ensure water remains cooler for longer and is less likely to evaporate. Shallower shelves improve the suitability for some native wildlife, including wading birds.
- Include logs within the fenced dam area, both in and out of the dam, to shelter frogs and tadpoles from the sun and predators.
- Include an island to provide important habitat for native wildlife and aquatic organisms.
- Revegetate with native water plants, such as rushes, sedges, and aquatic plants.



A newly installed hardened access point for livestock. The next step will be to fence around the remainder of the dam perimeter to exclude stock and enable revegetation. (Photo: M. Crane.)

## Plan of a farm dam showing key features



A bare, unimproved farm dam that will be vulnerable to high levels of evaporation and fouling from runoff. (Photo: B. Vanzella.)



Well vegetated dam with fenced watering point.

(Photo: H. Fitzgerald.)





Native grassland with native bluebells in foreground. (Photo: D. Smith.)

Spotted harrier, *Circus assimilis*.  
(Photo: K. Emery. Creative Commons.)



Australasian pipit, *Anthus novaeseelandiae*.  
(Photo: A. Lugg. Creative Commons.)



Stubble quail, *Coturnix pectoralis*.  
(Photo: D. Smith.)





# Protecting native pastures

# 4

High quality native grasslands may support up to 100 plant species, including many types of grasses, lilies, daisies, sedges, rushes and herbs. However, they are now very rare in Australia's south-eastern wheat-sheep belt, due primarily to clearing for improved pastures and crops, and overgrazing.

While these native grasslands are rare, mixed pastures that include native perennial grasses are more widespread. They are a key natural asset on farms, supporting both biodiversity and production. Native perennials are deep rooted, so can draw on moisture deep in the soil, stabilise soils and provide groundcover year round. In turn, they reduce soil erosion from wind and water, improve water infiltration rates, and improve soil moisture retention.

Because they are summer-active, native pastures hold more moisture and remain greener during summer than winter-active annuals, so are less susceptible to fire. If they are burnt, they recover quickly. With good management, native pastures can be hardy during drought, providing more reliable feed for livestock when feed is scarce elsewhere.

Native pastures support many native plants and animals including birds such as the stubble quail, little button-quail and Horsfield's bushlark. Reptiles associated with native pastures in some areas include the southern rainbow skink, grassland earless dragon and striped legless lizard.

## To protect native pastures, consider the following:

- Control the timing and intensity of grazing to meet ground cover targets and allow desirable species to seed, recover and persist.
- Just as for improved perennial pastures, native perennial grasses will need to be rested occasionally to allow recovery from grazing.
- Control encroaching exotic plants by strategically grazing these areas before invasive plants set seed.

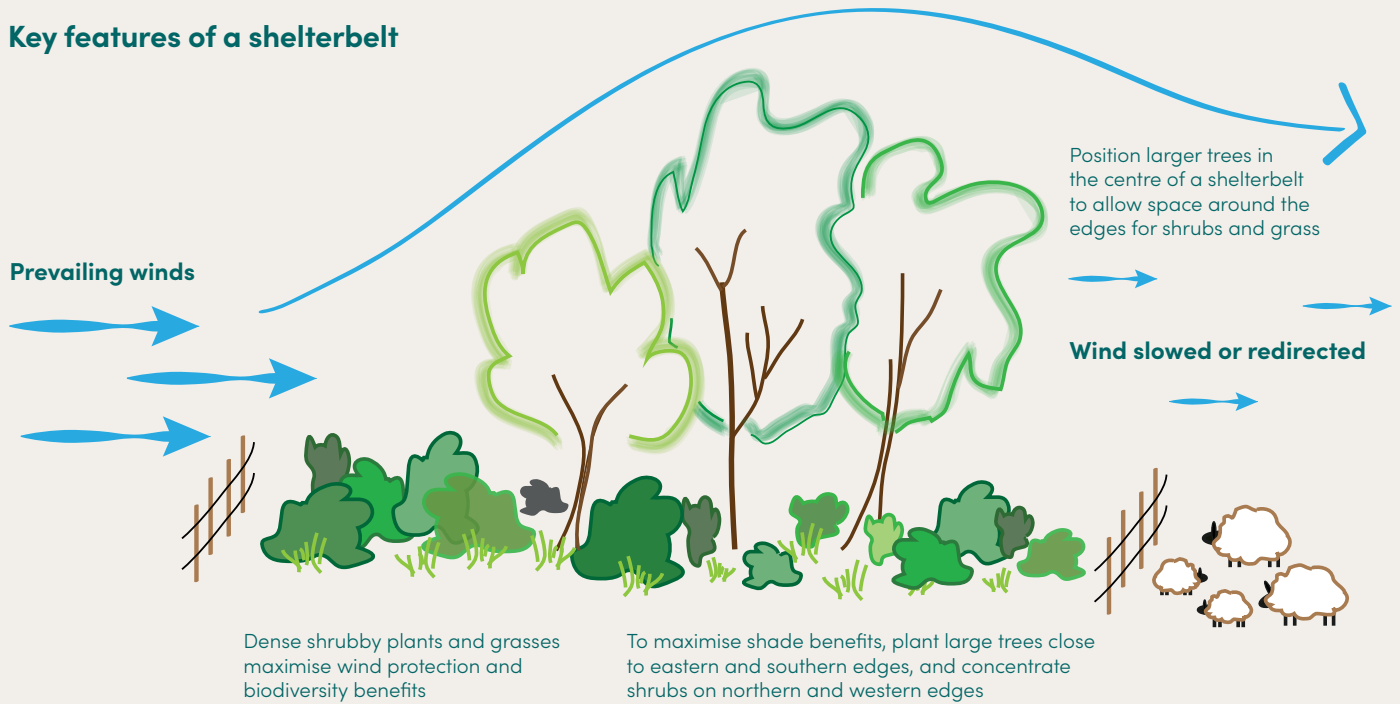
Southern rainbow skink (male),  
*Carlia tetradactyla*. (Photo: D. Michael.)

Olive legless lizard, *Delma inornata*.  
(Photo: D. Smith.)

Fat-tailed dunnart, *Sminthopsis crassicaudata*.  
(Photo: B. Dupont. Creative Commons.)



## Key features of a shelterbelt



A well placed shelterbelt helps to protect livestock from excessive heat, cold and wind and can have significant benefits for livestock production. (Photo: B. Vanzella.)

# Establishing native shelterbelts

# 5

Shelterbelts are strips of woody native vegetation established between paddocks to reduce windspeeds and provide shade and protection for livestock. Shelterbelts reduce the drying effect of wind on crops and pastures, and can also be valuable habitat for wildlife.

Shelterbelts have been shown to benefit farm productivity, including:

- boosting pasture production for livestock by up to 8%<sup>1</sup>
- growing wool production by up to 30%<sup>2</sup>
- increasing weight gain in livestock by up to 20%<sup>2</sup>
- reducing lamb deaths by 10%.<sup>3</sup>

Shelterbelts can promote soil fertility, act as a biosecurity buffer along boundary fences, help limit soil erosion and secondary salinity, and support predators that reduce populations of pests like the red-legged earth mite. The trees in shelterbelts can also store large amounts of carbon.

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“I see investing in shelterbelts as investing in the capital of the property. There is no doubt of the benefits to the livestock and birds. We have also noticed we no longer have issues with red-legged earth mite.” — Paul, a cattle farmer

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## When establishing and managing native shelterbelts, consider the following:

- Use native trees, shrubs and ground cover. Native plants are adapted to local conditions and are likely to have greater survival rates. Exotic plants tend to attract exotic bird species, some of which are agricultural pests.
- Avoid establishing shelterbelts in high quality native grasslands, which are extremely rare and harbour many threatened species.
- Incorporate existing paddock trees or other remnant vegetation to maximise the performance of your shelterbelt for production and biodiversity.
- Link shelterbelts to other planted areas or patches of remnant bush as these connected areas have greater combined value for biodiversity conservation.
- Establish an understorey – this is key to reducing windspeeds and preventing pest native birds like the noisy miner dominating.
- Plant wider shelterbelts as they provide greater wind control than narrow ones and better habitat for biodiversity.
- Maintain the fences around shelterbelts. Heavily grazed shelterbelts have significantly reduced value as bird and reptile habitat.
- Plan for future management needs – install gates in the shelterbelt fencing to allow access for maintenance and removal of rogue stock.
- Maintain pest control programs for rabbits, foxes and weeds.
- Establish nestboxes to provide nesting and denning sites for animals such as parrots and marsupial gliders. Consult guidelines for the best designs to avoid creating habitat for unwanted pests like the common starling and the black rat.

1. Future Farmers Network, 2014. Focus on carbon farming makes economic sense: Young carbon farmers case study. Sefton and Associates, Tamworth, NSW.

2. Lynch J. and Donnelly J., 1980. Changes in pasture and animal production resulting from the use of windbreaks. Australian Journal of Agricultural Research 31(5):967-79.

3. Squires V. The value of trees as shelter for livestock, crops and pastures: a review. In Van Der Sommen, F.J., Boardman, R. and Squires, V.R. (eds), 1983. Tree in the rural environment: towards a greenprint for South Australia. Roseworthy Agricultural College, Roseworthy, SA.

## CASE STUDY:

### The value of shelterbelts

Bimbi and Kim Turner live on a 412 hectare sheep grazing property near Yass.

They have planted shelterbelts to reduce livestock exposure across the farm, as well as enhanced their farm dams. Riparian and gully erosion has been controlled through livestock management and revegetation, with passive regeneration of vegetation in specific areas. Their property is part of a grazing study designed to investigate the effects of different grazing regimes on farm biodiversity.

“Particularly in paddocks where we’ve got lovely trees, you put stock in to lamb and you have a much higher percentage surviving because it’s sheltered. If your lambing rates increase over five or ten years, then that’s a significant result. You have much better protection of your pastures because you don’t lose topsoil, you don’t lose your seed. There’s a lot more bird life. Aesthetically, it looks better too.

When I ride along, I can see there’s not the bareness in the landscape. Because we’ve got the tree lines in, it’s got a warmth about it — certainly the paddocks are warmer in winter. You can see the difference in the pasture because it’s protected. It doesn’t burn off, or dry out as quickly, because the hot winds can’t get to the grass as much and blow the soil away from it.”

Bimbi now has the opportunity to pass on her love of the land to her grandchildren, who enjoy the sheep and horses as well as watching wedge-tailed eagles in their nest.

“With the grandkids, we take the binoculars out and find birds and lizards. We don’t put any pressure on the kids but they are keen on nature, which is lovely, to show them the freedom you can have. It’s a tough life, but it’s lovely.”



Bimbi Turner among scattered canopy trees during a dry winter. (Photo: N. Fijn.)



Trees thriving in a shelterbelt, protected by fencing and gates from overgrazing. (Photo: N. Fijn.)

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“I love the fact that we can hand on these ideas about nature. I do think if people take on anything in agriculture, it doesn't matter what, that if they've got the land imprinted on them from a young age, then they have more of a passion for it.” — Bimbi Turner

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Shelterbelts provide rich habitat for a variety of beneficial native plants and animals. (Photo: N. Fijn.)



Connecting natural assets such as shelterbelts, paddock trees and riparian areas creates cumulative benefits for productivity and biodiversity. Vegetation corridors enable animals such as yellow-footed antechinus to move through the landscape. (Photo: Sustainable Farms.)

# Connecting assets for multiple benefits

# 6

Improving and linking vegetation and other natural assets across the landscape is an effective way to improve the ecosystem services on your property. There are important cumulative benefits for productivity and biodiversity when natural assets – such as shelterbelts, paddock trees, rocky outcrops and riparian areas – are connected.

Identify natural corridors that already exist in the surrounding landscape – such as creeklines or remnant vegetation along roadsides – and consider how you can link the natural assets on your farm to these existing corridors. For example, you may be able to link an isolated patch of remnant vegetation on your farm with established trees along the roadside by planting some midstorey shrubs. Providing links between vegetation patches enables species to access varying habitat types and move to other areas of your property. In turn, this encourages greater species richness and builds resilience to drought or disturbance.

Old paddock trees provide habitat for groups of animals, such as yellow-footed antechinus and grey-crowned babbler. Establishing new plantings around old paddock trees usually improves the health of the old trees and gives your planting a 150-year head-start, creating richer habitat for a range of native wildlife. Plantings can also unlock the potential of the old, isolated trees by enabling more animals to access and take advantage of the habitat these trees provide.

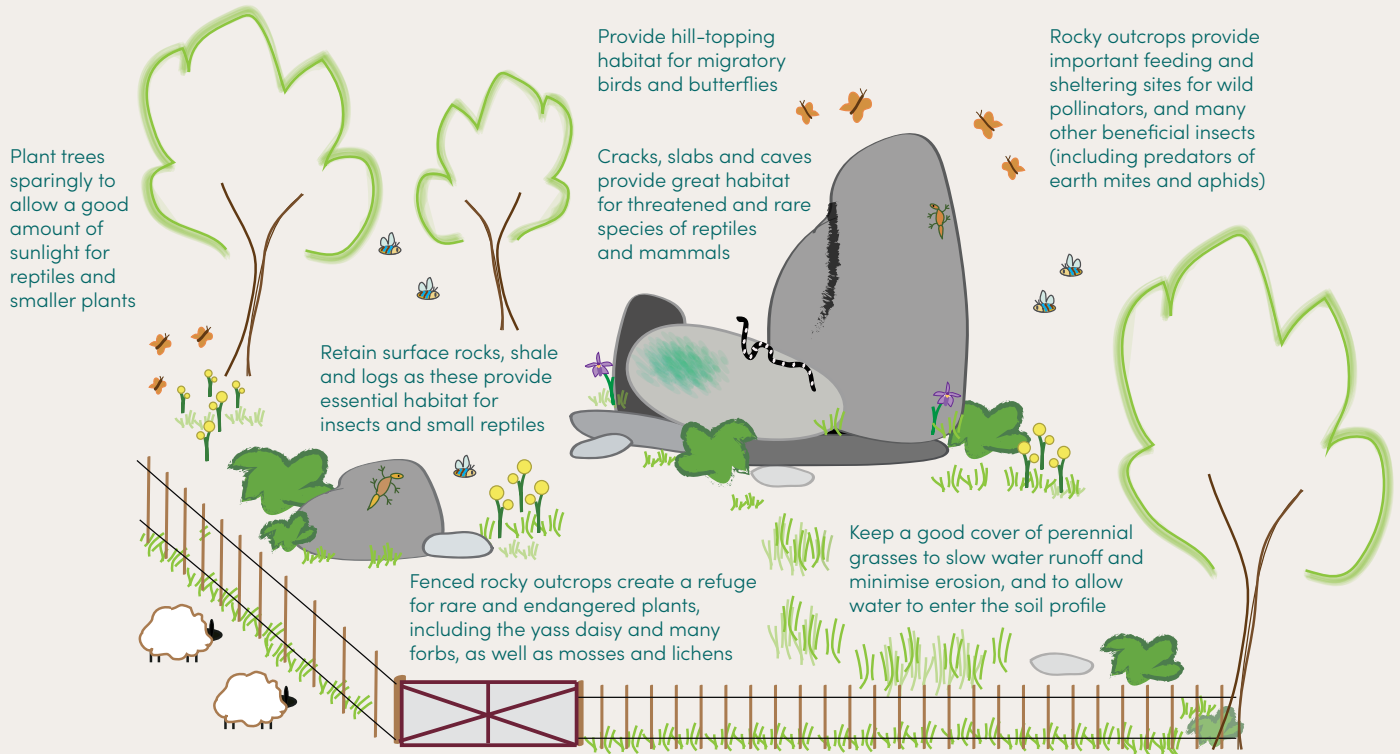
Travelling Stock Reserves are also very important for conservation and wildlife movement, as they often contain large old trees as well as native grasses and ground covers. Creating habitat corridors by planting areas between old paddock trees and linking to Travelling Stock Reserves where possible means that rare species can move through the landscape. It may be an option to collaborate with neighbours to create connectivity between natural assets, particularly where existing assets are limited on your property.

Improving habitat and other on-farm natural assets generates huge benefits, including slowing run off, increasing infiltration into the soil profile, filtering sedimentation, controlling erosion, cycling soil nutrients, creating habitat for crop pollinators and controlling pest insects.

## **To connect natural assets and create multiple benefits, consider the following:**

- Link natural assets to each other wherever possible as these connected areas have greater combined value for production and biodiversity conservation.
- Reinforce the health of existing vegetation corridors, such as by planting adjacent to roadsides and paper roads, or enhancing riparian strips.
- Plant trees and shrubs in blocks and clusters. Even well-placed single trees can provide connectivity between areas of habitat.
- Our research shows that plantings that are large and wide, connected to other vegetation or located in gullies attract many more bird species. Plantings that tick more than one of these boxes have even greater habitat value.
- Where possible, retain or plant shrubs and grasses, and keep logs, rocks, groundcovers and mistletoe – these all benefit particular animals and assist some species to move through the landscape.
- Continue planting trees and other vegetation over time – plantings of different ages support different species.
- Our research shows that old growth woodland, regrowth woodland and tree plantings are distinctly different habitats and attract different species of birds. Young trees greatly expand the type of birds on a farm, which may include rare bird species such as the black-chinned honeyeater, *Melithreptus gularis*, and the hooded robin, *Melanodryus cucullata*.

## Key features of a protected rocky outcrop



Thick-tailed geckos, *Underwoodisaurus milii*, live in rocky outcrops and feed on insects and small vertebrates. (Photo: D. Michael.)

Woolly ragwort, *Senecio garlandii*, a threatened species of native daisy, growing on the sheltered slopes of a rocky outcrop. (Photo: D. Michael.)

A pair of fringed heath-blue butterflies. (Photo: M. Jefferies.)





# Protecting rocky outcrops

# 7

Rocky outcrops come in all shapes and sizes, ranging from huge granite boulders strewn across hilltops, to small collections of scattered rocks on the ground.

Even the most unassuming outcrops can provide habitat for a rich variety of native animals and plants, including threatened and specialised rock-dwelling plants and animals. The cracks and crevices among rocky outcrops also protect vulnerable plants from grazing by livestock or other herbivores, meaning that many plants that were formerly widespread now find refuge among the rocks.

Fencing rocky outcrops to prevent livestock grazing generally has minimal cost in terms of pasture production, but many positives. When protected from grazing and revegetated, rocky outcrops can boost farm biodiversity, productivity and profitability.

Healthy rocky outcrops can help filter and slow runoff, leading to increased soil moisture. Even when livestock are excluded from the outcrop by fencing, they still benefit from the shade and shelter around its edges.

Larger outcrops can be opened up to stock access as a last resort when short term emergency shelter is required, such as during very bad weather after shearing.

Protected rocky outcrops can be critical habitat for many different native plants and animals that provide ecosystem services such as crop pollination, water filtration, erosion control and insect pest control.

Two ANU ecologists found over 70 individual reptiles of 8 different species in just a few hours in this rocky outcrop near Cowra, NSW. (Photo: D. Smith.)

## To protect rocky outcrops consider the following:

- A good first step is to map your outcrops, assess the soil condition and vegetation, and develop an understanding of the opportunities that protecting certain outcrops could create. Large outcrops support greater biodiversity than small patches, but even outcrops of less than one hectare provide valuable habitat.
- Establish fences to control grazing pressure.
- Plant native plants, which will benefit native bees, birds and butterflies as well as restock the soil seed bank.
- Prevent bushrock collection.
- Ensure the trees planted around outcrops are widely spaced to prevent excessive shading that impairs basking sites for reptiles, and inhibits the growth of smaller plants such as grasses, shrubs and forbs.
- Limit hazard reduction burning as it can badly damage the condition and integrity of rock features and rocky habitats.
- Control feral animals, but be careful with the timing of rabbit control measures like ripping warrens. This is to avoid negative impacts on other species that use the warrens such as the carpet python.
- Control invasive, exotic plants. Rocky outcrops can provide important habitat for many rare and threatened native plants.



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## CASE STUDY:

### Protecting rocky outcrops

Sue and Chris Cain run two properties with a total area of 1,011 ha, producing beef cattle, fat lambs, wheat and other crops, near Gerogery in NSW.

Over twenty years ago, Sue and Chris fenced off a large rocky outcrop and it hasn't been grazed by livestock since. This has allowed the wildflowers, native shrubs and grasses to flourish.

In 2006, a large wildfire burnt through one of their properties, including the rocky outcrop. While the fire affected many of the trees and shrubs, the vegetation has regenerated well.

Before Sue and Chris fenced off the rocky outcrop and made other improvements, they would watch heavy rains rush off their land, down the creek and away from their farm.

"A lot of creeks were eroded. With the fencing and revegetation, planting and landscape connections, the water flow and erosion have slowed down – the whole landscape seems to function better.

Lots of springs come out of the rocky outcrop and it's not good to have it overgrazed. Water is a very valuable thing and cattle drink a lot of it.

Some of the most noticeable changes in the rocky outcrop have been the growth of the native grasses and other plants and the increased bird life and reptiles. We have many different birds now and peregrine falcons and wedge-tailed eagles are now nesting up there."



The rocky outcrop in 2008, following the large fire of 2006. (Photo: D. Michael)



The vegetation regenerated well in the years following the fire. (Photo: D. Michael)



Revegetating the rocky outcrop has made a real difference to the property's aesthetic value. (Photo: D. Michael.)

Early on, Sue and Chris questioned whether the fenced rocky outcrop would become a haven for pests and weeds, and they did experience some problems with foxes and feral cats, but managed to control the numbers with baiting and shooting. 2018 was the first time they had a problem with high numbers of kangaroos.

The Cains have also fenced off the creeks and gullies that run from the rocky outcrop and planted thousands of trees on the property.

"We were delighted to find carpet pythons basking and sheltering in the rocky outcrop. They aren't venomous and their numbers have fallen since the 1950s. It's wonderful to see the biodiversity on the farm and all the benefits it brings.

We enjoy having the outcrop there. It's a great place to go walking and when the children were young we used to go camping up there. It's very picturesque and beautiful."

Eastern bearded dragon, *Pogona barbata*, on a rocky outcrop. (Photo: D. Michael.)



Native pelargonium, *Pelargonium australe*, growing in a rocky outcrop. (Photo: D. Michael.)

"I think it's made a real difference to our property, both in its attractiveness and value, the way it looks with the treed rocky outcrop connecting to our revegetated creeks and gullies. I think it's increased the productivity of the farm with better pasture pest insect control, water and fertiliser retention and reduced the loss of soil and nutrients."





Patches of remnant woodland can provide shelter for livestock, fodder during drought and key habitat for native animals and plants. (Photo: N. Fijn.)

# Protecting patches of remnant vegetation



Patches of remnant woodland are important natural assets on farms. They can provide shelter for livestock, havens for predatory insects that help control pest species, and refuges for pollinators of crops such as canola. They are also key habitats for a wide range of native animals and plants.


Remnant woodland patches are often the most biodiverse places on a farm. They have generally experienced less disturbance, enabling native plants such as forbs, grasses and shrubs to persist. Remnant patches will often contain trees of mixed ages, and habitat features such as fallen logs, dead trees and tree hollows. The combination of these features make remnant woodland patches vital for biodiversity, particularly for rare and threatened plant and animal species.



Old trees can provide habitat for rare animals, such as these grey-crowned babblers, *Pomatostomus temporalis*. (Photo: D. Smith.)

## To protect existing patches of vegetation, consider the following:

- Limit grazing pressure, particularly by fencing to control livestock access, but also by controlling exotic herbivores such as rabbits and overabundant native animals such as kangaroos.
- Let natural regeneration of overstorey and understorey plants occur.
- Resist the temptation to clean up fallen timber. Logs and fallen timber provide habitat for a range of native animals.
- If fallen timber needs to be removed for safety or access considerations, move it to patches of bush or new plantings where it can add value as habitat and for erosion control.
- Leave mistletoe — it is a valuable food source for native animals and usually does not have significant adverse effects on host trees.
- Keep large dead trees as they provide nesting and denning sites for many native animals, including sugar gliders, squirrel gliders, feathertail gliders, laughing kookaburras and superb parrots. Suitable nesting hollows can take more than a century to develop in most species of eucalypts.
- Given the likelihood that marsupial gliders will utilise vegetation patches, consider using electric fencing or replacing barbed wire with plain wire on the top strand of fences in key glideways. Alternatively, cover the top barbed strand with polypipe. This will reduce the chance of gliders and other animals becoming tangled and dying.
- Avoid clearing or burning dead trees or fallen timber. While fire is a natural part of woodlands ecology, even cool fires can destroy important habitats that take hundreds of years to develop. Note that while dead trees and fallen timber will burn, they are “heavy fuels” which are slow to ignite and are not a major factor in high fire risk.



Planting native vegetation on farms can assist with erosion control and the restoration of riparian areas, provide shade and shelter for livestock, and boost ecosystem services such as pest insect control and pollination.

(Photo by M. Crane.)

# Establishing new plantings

# 9

Establishing patches of native vegetation on farms can have many benefits including providing shelter for livestock, limiting erosion and enhancing the condition of riparian areas. Planting native vegetation increases habitat for native wildlife and provides other benefits such as natural pest control and pollination.

Look for multiple benefits when planning new plantings, including benefits for biodiversity, for the productivity of your livestock or crops, and for the aesthetic value of your property. Maximising the value of natural capital projects, such as habitat for wildlife, also maximises the ecosystem services that these natural assets provide.



Using a new planting to link existing trees, including dead trees, improves habitat potential. (Photo: N. Fijn.)

## When establishing plantings, consider the following:

- Make plantings as large as possible. Bigger is generally better; large plantings support more bird species than small plantings. That said, small plantings are not without value. Even planting a single tree can be important.
- Establish plantings close to other plantings or large patches of native vegetation and connect when possible. A greater variety of birds are found in plantings located close to other plantings.
- Establish plantings around paddock trees to increase the habitat value of both the paddock tree and of the planting.
- Plant in gullies and around watercourses as these habitats support more species of birds than plantings on slopes or ridges. This can have the added benefit of contributing to riparian restoration, which has livestock production benefits.
- Incorporate permanent water into plantings to attract wetland birds such as rails, ducks, herons and migratory waders.
- Include shrubs in plantings. This encourages small birds and can help to control the hyper-aggressive noisy miner, a native honeyeater species that excludes other bird species.
- Plant a variety of native species that flower at different times of the year to help create resources for pollinators such as bees and hoverflies. The proximity of pollinator habitat and resources has significant local effects on crop pollination, which will increase crop yield.
- Keep new plantings of native vegetation 30–40 metres away from houses and other infrastructure to minimise fire risk. Check with your local Rural Fire Services or Country Fire Authority for specific advice on the size and management of buffer zones.



Identify existing natural and built assets.

(Photo: N. Fijn.)



# Making a plan for managing natural assets

# 10

Planning is essential to identifying and utilising opportunities for natural asset improvements on your farm. Having a thorough understanding of the existing natural assets – such as creeklines, shelterbelts, remnant vegetation and rocky outcrops – is an important starting point for developing a plan to improve these assets and create new ones. It's also important to know if there are endangered species on your property or in adjacent areas, as your natural asset management choices may vary accordingly in order to provide habitat or resources for a particular species.

As well as providing habitat for wildlife, natural assets provide shelter, clean water and ecosystem services, all of which add value to farm production. It's important to keep these benefits front of mind when planning your approach to natural asset management.

On the following pages, we provide an imagined farm plan with a range of potential improvements.

## When making a plan, consider the following:

- What do you want to achieve by improving natural assets? Is your aim to improve the water quality in farm dams, or to repair a heavily eroded creekline? Is it to improve lambing success by providing better shelter? Do you want to create a green, cool wetland environment to visit on hot summer days? Do you hope to increase bird diversity? Or do you want to help protect a particular species, such as squirrel gliders or superb parrots? Once you are clear about what you want to achieve, it is then possible to identify which assets to prioritise for improvement.
- Calculate the costs. Investigate potential funding sources through Local Land Services, Landcare, Catchment Management Authorities, or other sources. Talk to these agencies about what you're planning, so that they can let you know if funding becomes available for the work you hope to undertake.

- Take into account landscape features in the areas surrounding the farm, such as roadside reserves or remnant timber on neighbouring properties, to maximise the effectiveness of your plan.
- Can you work with your neighbours to manage natural assets across a larger area of the landscape?

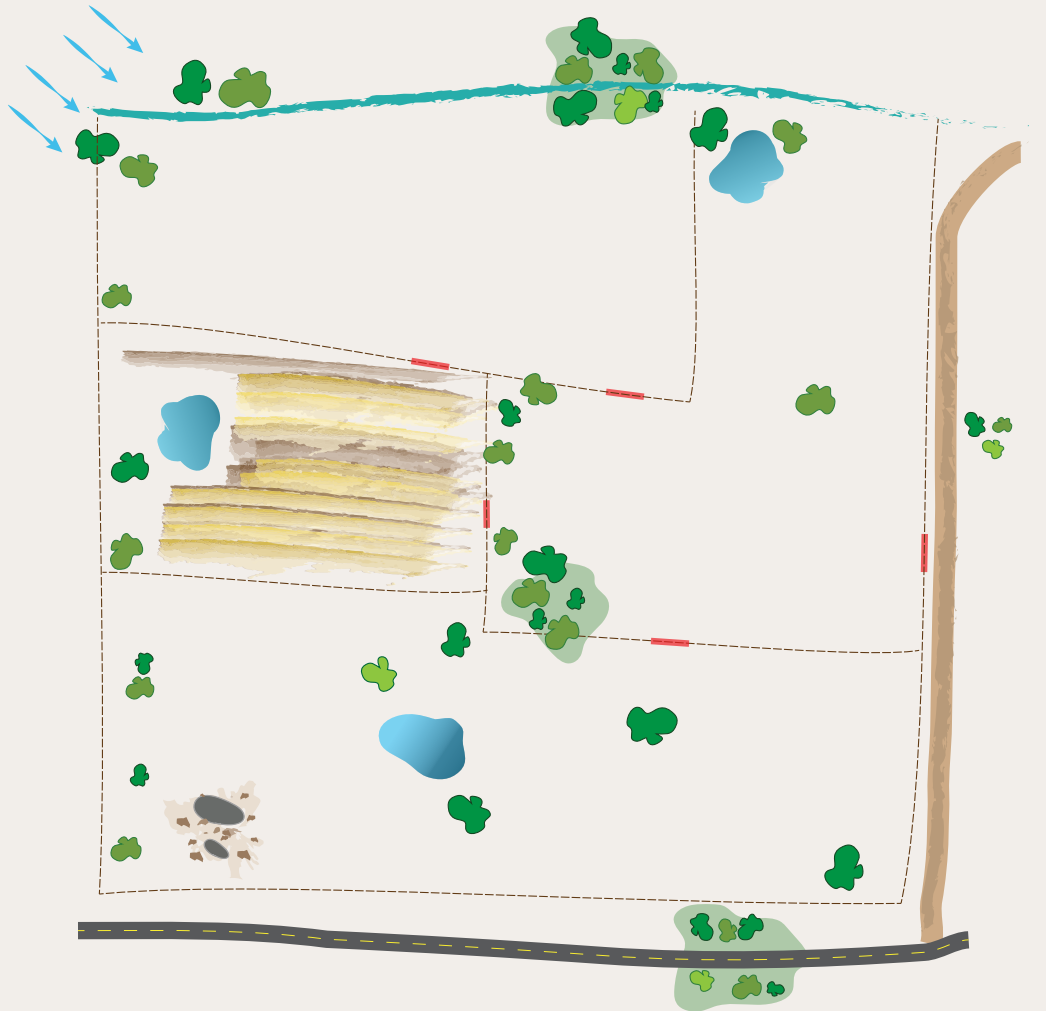
Even if you can't undertake all of your intended natural asset improvements immediately, having a clear plan for what you'd like to achieve means you can seize funding opportunities when they arise, or respond to unforeseen events like fire, flood or drought which can create unexpected windows for natural asset improvement.

Talk to your neighbours, Landcare or government agencies about your plan. Many people are improving the natural assets on their farms. They can be well placed to discuss what worked, what didn't work, and why.



Start planning with an aerial photo or satellite imagery. (Photo: N. Fijn.)

## An example of a basic farm plan mapping existing natural and built assets



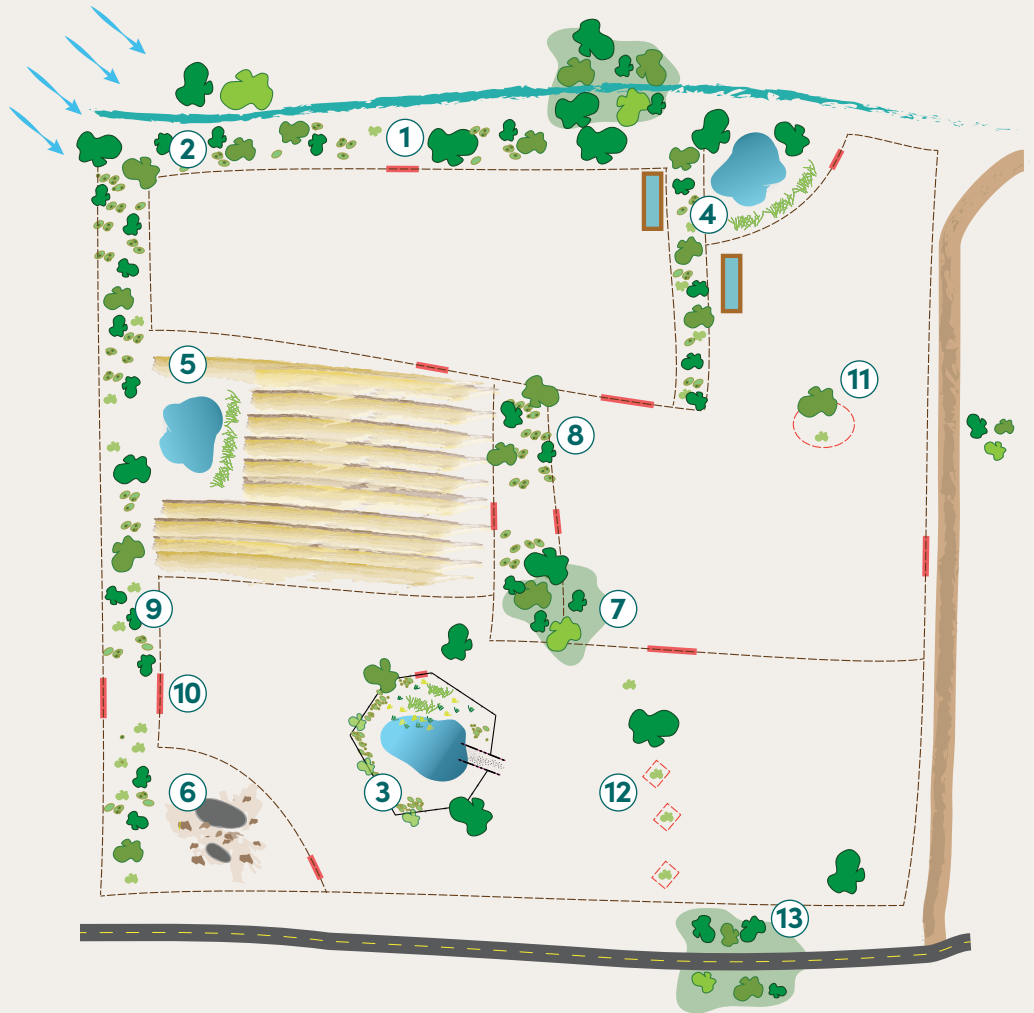
### A bird's eye view of your property

The first step in making a plan is developing a big-picture view of your farm within the landscape.

Start with an aerial photo or satellite image of your property (for example using Google Earth or SIX Maps). Mark existing natural assets, including creeks, shelterbelts, native vegetation, rocky outcrops and paddock trees,

and note their condition. Mark areas known to flood or erode, and mark built assets such as fences, dams, roads and buildings. Consider the prevailing wind direction and areas that are exposed or sheltered on the property. Identify natural assets that adjoin your property, such as existing vegetation patches or corridors.

## Example farm plan showing a range of improvements



Our example farm plan now shows a range of improvements to natural assets, which are identified and explained on the following pages. While this example shows extensive improvements to natural assets, undertaking a much smaller subset of improvements will still have significant value for biodiversity and production.



## Actions to improve natural assets on the example farm

### Riparian areas and the creek

- 1 Fence the creek and riparian areas to exclude livestock, as this will reduce erosion and fouling of the water.
- 2 Plant locally native trees and shrubs, but do so sparsely to allow sunlight in for grasses and groundcovers to grow. These will help filter animal wastes and pollutants (such as herbicides) out of water entering the creek system.

The newly fenced and planted area will, in time, shelter adjoining paddocks from the prevailing winds.

**Note:** Seek advice before removing exotic plant species that are stabilising creek banks, as removal may create an erosion problem.



### Dams

If you have multiple dams but limited resources, choosing which dam to fence and revegetate first will depend on what you hope to achieve.

- 3 An exposed dam in an open area will benefit from the reduced evaporation rates and increased filtration that comes from fencing and revegetation. Improving this dam will create better drought resilience.

Installing a hardened access point when fencing a dam allows livestock access to water without pugging of the dam bank. Options for hardened access points include laying crushed rock onto the access point, or using gravel on geofabric as a longer-term solution.

- 4 A dam that's close to an existing fence, or a fence that you plan to build for another purpose such as to protect a creekline or new plantings, provides an easy opportunity for livestock exclusion fencing.

Field staff from Sustainable Farms discuss riparian restoration with a farmer.

(Photo: Sustainable Farms.)

An alternative to installing a hardened access point on a fenced dam is to exclude livestock entirely and instead pump to a reticulated pipe and trough system. This provides the opportunity to more closely monitor stock access to water, as well as providing maximum protection from silting and pugging for the dam, a valuable asset that is worth protecting.

Installing a trough as well as a hardened access point that can be opened or closed as needed provides the best of both worlds.

- 5 When livestock are excluded from a dam, some natural revegetation will likely occur. However, planting in and around the dam will speed up the process. Tree plantings should be set well back from the dam edge to avoid root disturbance and ensure groundcovers have enough sunlight to grow. Avoid large plantings on the inflow area, where it's best to encourage native grasses, rushes, sedges and reeds that will filter runoff before it enters the dam.

*For more detailed information on improving farm dams and for a dam planting guide, please contact Sustainable Farms using the details at the back of this booklet.*

## Rocky outcrops

- 6** This rocky outcrop could be fenced separately, or it could be incorporated into fencing for a new shelterbelt. Plant a few trees and shrubs on the southern side of the rocky outcrop, ensuring plenty of northern sunlight for basking reptiles and to allow the reestablishment of grasses and groundcovers around the outcrop. Reestablishing vegetation around the rocky outcrop will minimise the potential for erosion following heavy rain. Rocky outcrops are generally located on poorer soils, so these areas are ideal for reintroducing native forbs and shrubs, which will in turn create prime habitat for many animals.



A fenced shelterbelt provides habitat for birds and insects that feed on insect pasture pests.

(Photo: D. Michael.)

## Shelterbelts and remnant vegetation

- 7** Existing remnant vegetation can be fenced to exclude livestock, which will allow young trees, shrubs and ground covers to emerge if a viable seedbank persists in the soil. A midstorey of shrubs is particularly important habitat for small birds and will reduce the negative impacts of noisy miners and invasive predators. If this regeneration does not occur naturally, new plantings may be required.
- 8** Planting a new shelterbelt that incorporates this remnant vegetation will give the planting a “150-year head start” as a habitat resource for birds, mammals and reptiles, due to the mix of old and young trees. Our research shows that different species favour different aged trees.

- 9** Planting a shelterbelt along this fenceline will provide good shelter from prevailing winds, which should maximise stock weight gains, improve lamb survival, and protect pastures, crops and soils from drying out and blowing away.

Many crops show increased yield when there are a greater number and diversity of insect pollinators in the landscape. This shelterbelt, adjacent to the cropping paddock, provides an excellent opportunity to increase resources for pollinators. To do this, plant a range of flowering natives that will provide flowers for pollinating insects throughout the year.

*For more information on planting for pollinators, please contact Sustainable Farms using the details at the back of this booklet.*

- 10** Ensure that all shelterbelts have gates for management access and weed control, and gaps between plantings large enough to allow vehicles to access adjoining paddocks, particularly for firefighting and other emergencies. Ideally, this principle applies to boundary fences as well, in consultation with neighbours.

## Actions to improve natural assets on the example farm

### Paddock trees

**11** Paddock trees provide essential shade for livestock, but can become stressed and die if left unprotected from livestock or machinery. Fencing around this paddock tree with the tree in the upwind corner will enable stock to continue to access the shade provided, while protecting the tree's roots and providing a protected area to replant.

**12** Planting new young paddock trees is an alternative way of creating a succession plan for recruitment of new shelter trees. Install tree guards to protect the young trees from grazing animals.

Paddock trees are particularly vulnerable to the impact of drought. To assist with future drought resilience, consider planting species that are local to the area but suitable for drier soils, such as yellow box and grey box. Take note of which tree species have done well in past droughts, and plant more of these.

Limiting livestock access to a dam can improve the water quality, generating greater weight gain in livestock and fewer harmful parasites. (Photo: M. Crane.)

### Connectivity

**13** The remnant vegetation on the roadside and the scattered trees in the adjacent paddock provide a good opportunity to develop a habitat corridor through the property to the creek. This is enhanced by planting the shelterbelt at (8).

The corridor will encourage movement of animals such as squirrel gliders, so take care with fencing in this area. Avoid barbed wire if possible. If working with an existing barbed wire fence, strategically cover the top strands through the corridor with polypipe to prevent gliders, bats and other wildlife from getting caught on the barbs.

### Fire risk management

- Pasture and crop management can help minimise fire risk. Native, summer-active perennials tend to be less flammable than winter-active annuals. Avoiding large fuel loads of dry annuals or crop stubble, particularly close to infrastructure, will assist with reducing fire risk.
- Studies show that planting additional trees on a property does not generally increase fire risk. Fire moves much faster across pasture or crops than through woody vegetation.
- Shelterbelts and other areas of native vegetation should be 30-40m away from houses and other buildings – this “buffer zone” is the single most important factor in avoiding building loss during fire.



- Ensuring vehicles have easy access through shelterbelts is extremely important for fire management. A gate into your shelterbelt is essential for year-round management, but it is also vital to ensure gaps between trees wide enough to allow vehicular access at other points, in case you need to cut the fence and get through quickly in an emergency.
- Trees with loose, stringy or ribbon bark provide important resources for wildlife, but are best planted in sheltered areas, such as within a shelterbelt or downwind from infrastructure such as houses. Plant trees with tightly compacted bark that are less likely to produce embers, such as box gums, in more exposed areas.

A superb fairy wren, *Malurus cyaneus*, a charismatic bird that often occupies young plantings. (Photo: B. Green.)

### Improved natural assets

Our example farm now has good wind protection, excellent shelter from sun and adverse weather for livestock, improved water quality in the creek and dams, increased resources to support pollinators, a protected rocky outcrop, vital areas of habitat for wildlife, and a vegetation corridor to allow wildlife to move throughout the property.

Some of these improvements will have immediate short-term benefits, such as improvements to water quality from fencing the dams, while other benefits will accumulate over time as new plantings grow and establish.





“In dry times and in times when you question your management, it’s always nice to walk up through your tree lines and see that things are surviving, the cycle and the ecosystem keeps on going around, and that we’re really only a rain away from making the whole farm do that. So it’s quite uplifting doing these projects.” — Paul Graham, Bongongo, NSW



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Sustainable Farms has a comprehensive program of research to better understand the benefits of investing in natural assets for farms, farmers and profits. If you would like to know more about Sustainable Farms, contribute to the research, download additional resources, or host or attend a field day, please visit our website, subscribe to our newsletter, or contact us:

### **SustainableFarms.org.au**

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For specific, local advice on natural asset management, and to seek financial and practical support to improve natural assets on your farm, please contact the following organisations:

Local Land Services in NSW:

**[lls.nsw.gov.au](https://lls.nsw.gov.au)**

Catchment Management Authorities in Victoria:

**[viccatchments.com.au/about-us/our-cma-regions](https://viccatchments.com.au/about-us/our-cma-regions)**

Your local Landcare group:

**[landcareaustralia.org.au](https://landcareaustralia.org.au)**