Local Land Services

Bird-friendly Farms

A guide for rural landholders to protect birds and their habitats on farms in rural landscapes of NSW.







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Front and back cover: Farm dam (Rhonda Vile)

Back cover: Little eagle (Dean Ingwersen), Scarlet robin (Mitchell Roberts), Superb Parrot (Andrew Silcocks)

This page: Little Wattlebird (Lyndel Wilson)

Page 3: Azure Kingfisher (Matthew Piper, DPE)

Page 4: Farm Dam (Rhonda Vile)

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Contents



Section 1: Introduction: Why support a bird-friendly farm? 5

- Birds on Australian farms 6
- Farm benefits from birds 7
- Habitats on farms 8
- What is habitat quality? 10
- How much bushland is enough for birds? 12
- Threatened birds in the landscape 14
- Bird diversity and diet or habitat needs 16

Section 2: Habitat features on rural properties 17

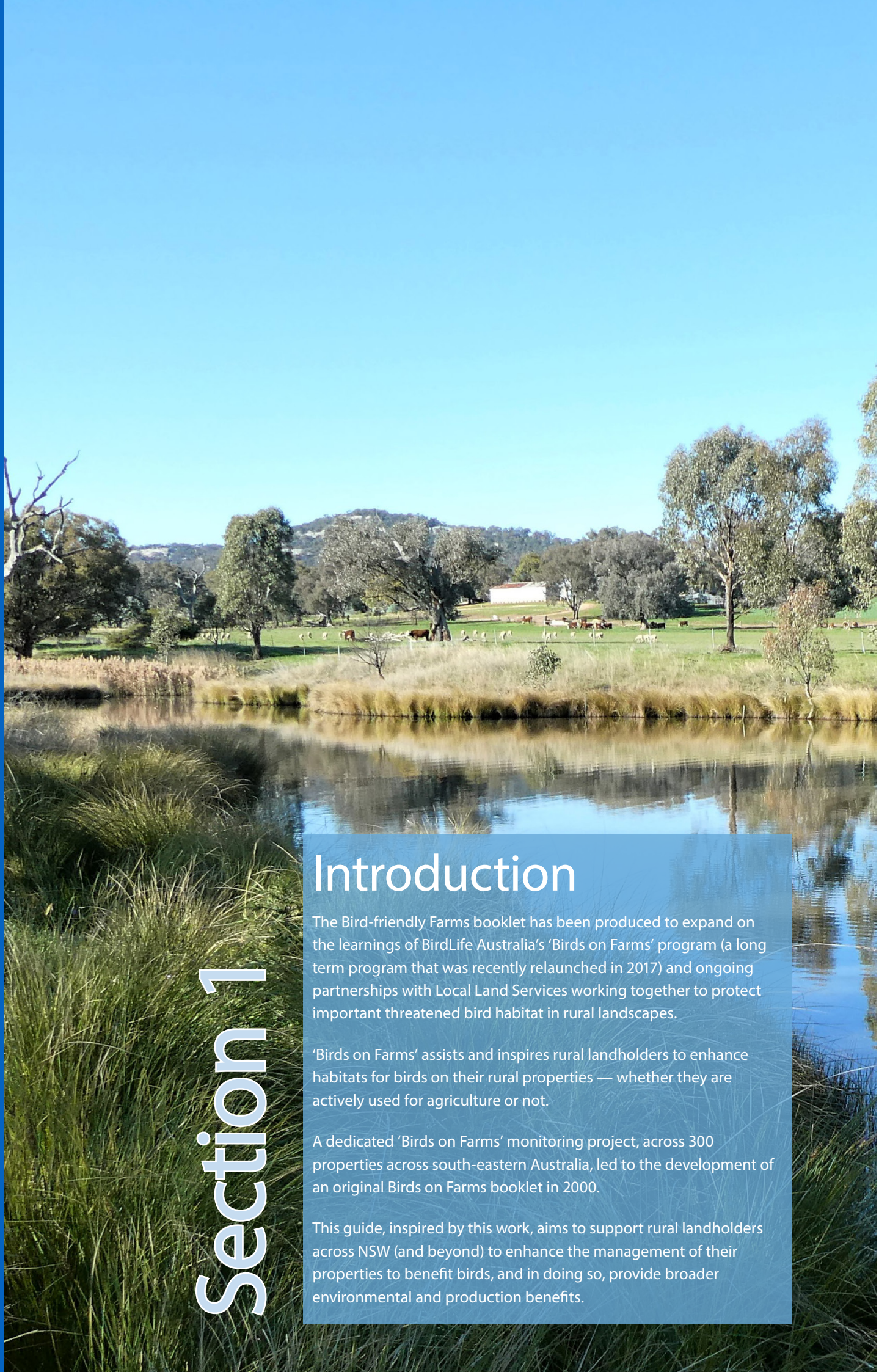
- Remnant vegetation and creating habitat linkages 18
- Value of paddock trees 26
- Restoring the shrub layer 28
- Helping hollow dependent birds 30
- Natural features: coarse woody debris 34
- Native mistletoe 36
- Improving waterways and dam health 39
- Farm gardens as habitat and safe havens 43

Section 3: Managing threats & pressures for birds & their habitats 45

- Predators and ferals 46
- Managing for Noisy Miners 48
- Fire regimes and risks 50
- Management of livestock and grazing 52
- Wildlife-friendly fencing 53
- Use of chemical pesticides 55
- Weed threats 57

Section 4: Getting started - making your farm bird-friendly 58

- Get to know the birds on your property 59
- Establish your own monitoring program 60
- Bird networks & groups 63
- Planning for birds on your property 63
- Resourcing on-ground restoration and management 64
- Conservation covenants 65
- Time to get started! Make your farm bird-friendly 66
- Further reading and references 67



Section 1

Introduction

The Bird-friendly Farms booklet has been produced to expand on the learnings of BirdLife Australia's 'Birds on Farms' program (a long term program that was recently relaunched in 2017) and ongoing partnerships with Local Land Services working together to protect important threatened bird habitat in rural landscapes.

'Birds on Farms' assists and inspires rural landholders to enhance habitats for birds on their rural properties — whether they are actively used for agriculture or not.

A dedicated 'Birds on Farms' monitoring project, across 300 properties across south-eastern Australia, led to the development of an original Birds on Farms booklet in 2000.

This guide, inspired by this work, aims to support rural landholders across NSW (and beyond) to enhance the management of their properties to benefit birds, and in doing so, provide broader environmental and production benefits.

Why support a bird-friendly farm?

Rural properties, whether used for farming or not, make up a significant expanse of the landscape. They are vital in providing habitat for biodiversity, which includes hundreds of different birds across Australia, as refuges and safe havens for many of our most threatened birds.

The combination of private and public conservation and management of lands, and protection of natural habitats and features, that provide a broad landscape benefit for a large suite of species.

The more landholders that are motivated and well supported to provide land stewardship, the more healthy, and diverse populations of birds will be able to not just survive, but thrive.

In doing so, the benefits for protecting birds are much greater than the enjoyment they can bring. Sustaining bird habitats benefit ecosystem services such as pollination, pest management, nutrient cycling and carbon sequestration, local ecotourism and social connections, to name a few!



Superb Fairy Wren (Rhonda Vile), Paddock trees as nesting sites on a farm (Skye McPherson)



Birds on Australian farms

Australian farms are home to a diverse array of birds, playing a vital role in the ecological balance of agricultural landscapes.

The vast majority of the 700+ birds that breed in Australia — or visit it regularly — occur on rural properties, at least to some extent.

As birds are well researched and easily observed, they respond to environmental change and they are often referred to as an "indicator" species representing trends that gauge broader environmental issues.

In productive south-eastern and south-western lands of Australia, more than 75% of the land area is under private ownership. While much of this land is used for agriculture (such as annual and perennial crops, stock grazing, agroforestry or vineyards), these areas also support residential housing, recreation, mineral extraction and conservation lands.

Australian farms provide a mosaic of habitats that support a diverse range of birdlife, making them not only productive agricultural spaces but also important sanctuaries for some of our most threatened species, including woodlands (where many are so fragmented, such as once widespread critically endangered White Box- Yellow Box- Blakelys Red Gum Woodlands where only 10% now remains (DCCEEW, 2023)), and woodland birds that rely on them.

A significant challenge is the historic loss of their natural habitats through clearing, a process which is ongoing in some locations, and loss of suitable nesting sites, feeding areas and protective vegetation.

There is also a range of other threats - common to both public and private land - that include feral predators, aggressive competitors and inappropriate chemical use and fire management.

The impacts of climate change, including shifts in rainfall patterns and extreme weather events, put additional strain on Australian birds.

Farmers, land managers and conservation scientists can work together to ensure that sustainable practices on private rural land incorporate habitat preservation, a reduction in threats, and measures to lessen the effects of climate change, to enable Australian birds to thrive.



Critically endangered Regent Honeyeater, a woodland bird once was found across eastern-Australia in abundance, but now has declined to numbers as low as 350 in 2023. (Mick Roderick)



Intact forest remnants on farms provide valuable refuge for a number of bird species (Ryan Kilgower)



Farm dams are an important refuge for mobile species, and many waterbirds. Healthy dams with native vegetation buffers not only provide clean water for stock, but also become a habitat zone for birds on farms. (Rhonda Vile)

Farm benefits from birds

Managing bird habitats on farms can be a win-win providing numerous benefits for the environment that also benefits agriculture and productivity:

- **Natures pest controllers** controlling pests such as insects, rodents, and rabbits, that can damage crops and other productive farmland. By supporting birds through appropriately managing their habitats, farms can reduce the need for chemicals to control pests.
- **Powerful pollinators** contributing to the reproductive success of flowering crops, timber and fruit trees. By enhancing habitats that attract and support birds, you can improve crop yields and increase their overall productivity and profitability.
- **Vegetation corridors can improve farm health and profitability** by reducing wind speed, evapotranspiration and soil loss in the adjacent paddocks, where they are established or maintained for wildlife habitat and movements.
- **Shade and shelter for livestock** is provided by remnants of native vegetation, revegetation areas and scattered trees, and can be particularly valuable during extreme weather conditions.
- **Soil erosion is reduced** by retained trees and shrubs, grasses and forbs that that hold soils in heavy rain or from wind or drought
- **Soil nutrients are enhanced** as some plants, favoured by birds, such as wattles fix nitrogen, improving the soils as they grow (Brockwell et al 2005), as well as fallen branches and logs that can create new soils naturally as matter breaks down.
- **Water quality is improved** by vegetation that provides valuable water infiltration, and reduce runoff, leading to healthier waterways, water quality, water availability and soil condition.
- **Properties are more valued**, where they retain a portion of their land vegetated with trees and other native vegetation. These properties consistently sell for higher prices than similar-sized properties without these features.



The Wedge-tailed Eagle is the perfect apex predator, while they feed on carrion or roadkill, they also will prey on small kangaroos, wallaby, rabbit, and occaisionally snakes, lizards, large birds, possum, fox and feral cats. (Andrew Silcocks)



Honeyeaters are important pollinators of native flowering plants, including timber species (BirdLife Australia)



Shrubs and small trees make perfect habitat as they attract small insects, the Brown Treecreeper forages in shrubby understorey, groundcover and up tree trunks and fallen logs in search of insects (Andrew Silcocks)

Habitats on farms

Australian rural lands encompass a variety of habitats, which supports a rich diversity of birds. Some of these habitats contain features that were present before European settlement, and those that are partly or wholly modified, with each providing some suitable habitat for a range of birds and other fauna.

Here is a selection of the main broad habitat types on Australian farms, and a snapshot of some of ways they are used by birds:

Open grasslands, with scattered paddock trees

A widespread habitat in most agricultural districts, native or pasture grasslands are present on farms as paddocks used for grazing by livestock. The open grassy areas can provide feeding sites for ground-dwelling birds like Australian Pipits and quail, while others may perch or nest in the scattered trees nearby and then forage in or over the grassy areas for insects or seed (e.g. Australian Magpies, Galahs, ibis, kestrels, falcons, finches or parrots).



Red-browed Finch, feeds on grass-seed in an open pasture. (David Silcocks)

Woodlands, forests and other remnant vegetation

Remnant patches or strips of vegetation that remain after surrounding areas have been cleared. As a result, many of these vegetation types are now threatened- such as box gum grassy woodlands along eastern Australia. These remnant woodlands, forests or other remnant habitats (in good condition) are made up of a mixture of trees, shrubs, grasslands and forbs, and may contain woody debris.

Depending on their size and condition, the remnant vegetation patches usually support a range of birds which play a number of ecological roles in the environment.

If these remnants are small or have been modified -particularly when lacking understorey - theymay become dominated by aggressive species, such as Noisy Miners, or be exposed to weed invasion, impacting on the habitat availability for several species.



Superb Fairy Wren (female) sheltered in understorey wattle (Lyndel Wilson)



Dusky Woodswallow, common to woodlands and dry forest habitats, feeds it's young with insects (David Silcocks)

What is habitat quality?

We can describe habitat quality as — **intact, modified, heavily modified** and **non-native.**

Intact There are many examples of important remnant habitats on both private and public land that can be considered intact — that is, where it is mostly undisturbed by humans, and represents the original vegetation or features, structures and ecological processes. For example, a 20 hectare area of forest might be considered 'intact' if it contains the local native endemic trees of a variety of species and ages (including older hollow-bearing trees), a good cover of shrubs of different species, native mistletoes and vines, and a range of ground-layer features, including native grasses, forbs, mosses, logs, leaf litter, and few weeds. Intact habitats provide the conditions for local endemic plants and animals to thrive.

Modified A modified habitat is superficially similar to an intact habitat, but one or more key features are missing or depleted. For example, a modified forest might include areas with mature trees but the shrub layer is no longer present or dominated by non-native species, or the ground-layer is dominated by exotic grasses. Another example is a forest where the trees are dominated by young or medium-aged trees that lack hollows.

Highly modified A highly modified habitat is where most — but not all — of its ecological features are missing or significantly depleted. For example, a patch of scattered old trees in a paddock with no shrubs and a ground layer dominated by non-native grasses, or an area that was once forest, but the trees have been cleared, leaving only a shrub layer or native ground vegetation.

Non-native Non-native habitats lack any features that would have been present historically. Examples include cropland, orchards, fertilised or heavily grazed paddocks and urban parks and gardens. These areas are still used by birds — sometimes in large numbers — but the species that utilise this habitat are quite different than what would have if the habitat was in a condition closer to the original intact one.

Meaningful conservation management can occur at all levels, and it is possible to restore areas from a lower to a higher habitat ranking, but it is not a process that happens quickly. To maximise positive outcomes for birds, it is more ideal to restore or rehabilitate lower quality non-native or highly modified habitats to be more representative of intact ones. However, even maintaining a modified or highly modified habitat is better than allowing it to degrade further, and eventually be dominated by non-native habitats.

But, for conservation management, protecting and maintaining an area of intact habitat usually takes much less effort, time and cost than it takes to improve the condition of modified or highly modified habitat, or to attempt to recreate it from scratch.



Farm containing a high proportion of intact bushland and habitat features (Rhonda Vile)



Newly planted native shelterbelt (Mikla Lewis, LLS)

Windbreaks and shelterbelts

These linear plantings of shrubs and trees — typically along the borders of grassy paddocks or cropland — are often established to benefit livestock or crops. They are also important stepping stones for birds, allowing them to move safely across the landscape, or as habitat in their own right.

Shelterbelts planted with native trees and shrubs are preferred — as they can provide both an agricultural and conservation role.

Riparian zones

Located along rivers, creeks and other waterways, these fertile areas support a range of birdlife, including waterbirds and bushbirds.

Waterways with healthy intact riparian vegetation make a large contribution to bird diversity on a property, and facilitate movement and dispersal across the landscape, and can also act as a drought refuge.



Sacred Kingfisher perches ready to catch a fish from the river below (Andrew Silcocks)



The endangered Australasian Bittern nesting on the edge of a farm dam (Birdlife Australia)

Wetlands and dams

Natural and artificial waterbodies are used by waterbirds and occasionally shorebirds, largely depending on their size and condition. Terrestrial birds are also attracted to them as a source of drinking water, but they also spend more time around them when there are surrounding trees, shrubs and other features.

Dams or wetlands lined with vegetation will have improved water quality that benefits stock, but also provides suitable habitat for aquatic plants and insects, frogs, lizards, that in turn support a diversity of birdlife, including at times, threatened species.

Orchards and vineyards

These cultivated areas can provide food and nesting opportunities for birds like honeyeaters and insect-eating species. Birds can sometimes be a source of conflict when they damage or eat excessive amounts of fruit.

Annual crops

Crops provide some shelter for ground-dwelling birds seasonally, and the invertebrates around the crops are a source of food. Sometimes, some of the crop itself is eaten by birds and is an important supplementary food source. On the other hand several birds such as eagles, hawks, owls, butcherbirds and magpies are attracted to rodents in crops, and become important pest controllers.

Agroforestry

These tree plantations have a simplified structure (compared to a native forest or woodland), usually lacking shrubs, a diversity of trees, older trees and a ground layer.

However, a few birds from nearby forests or woodlands may use these areas, particular for foraging on insects or nectar.

Gardens and backyards

These smaller-scale habitats created around their farmhouse and homestead areas often have among the highest diversity and abundance of birds on a farm, often containing species that are seldom encountered elsewhere on the property.

Gardens are often fertile, providing a reliable source of insects and nectar at most times of the year, as well as a source of water, and dense shrubs and trees for shelter and nesting.

Farm infrastructure

Across a typical rural property, there are sheds, fences, machinery, powerline poles, posts and other similar structures.

While they are not of the highest value for birds, they are regularly used as perching and roosting sites, and occasionally for foraging (such as taking insects or spiders from cracks or crevices) and as nesting sites (e.g. in an old wooden fencepost or the roof of farm shed).



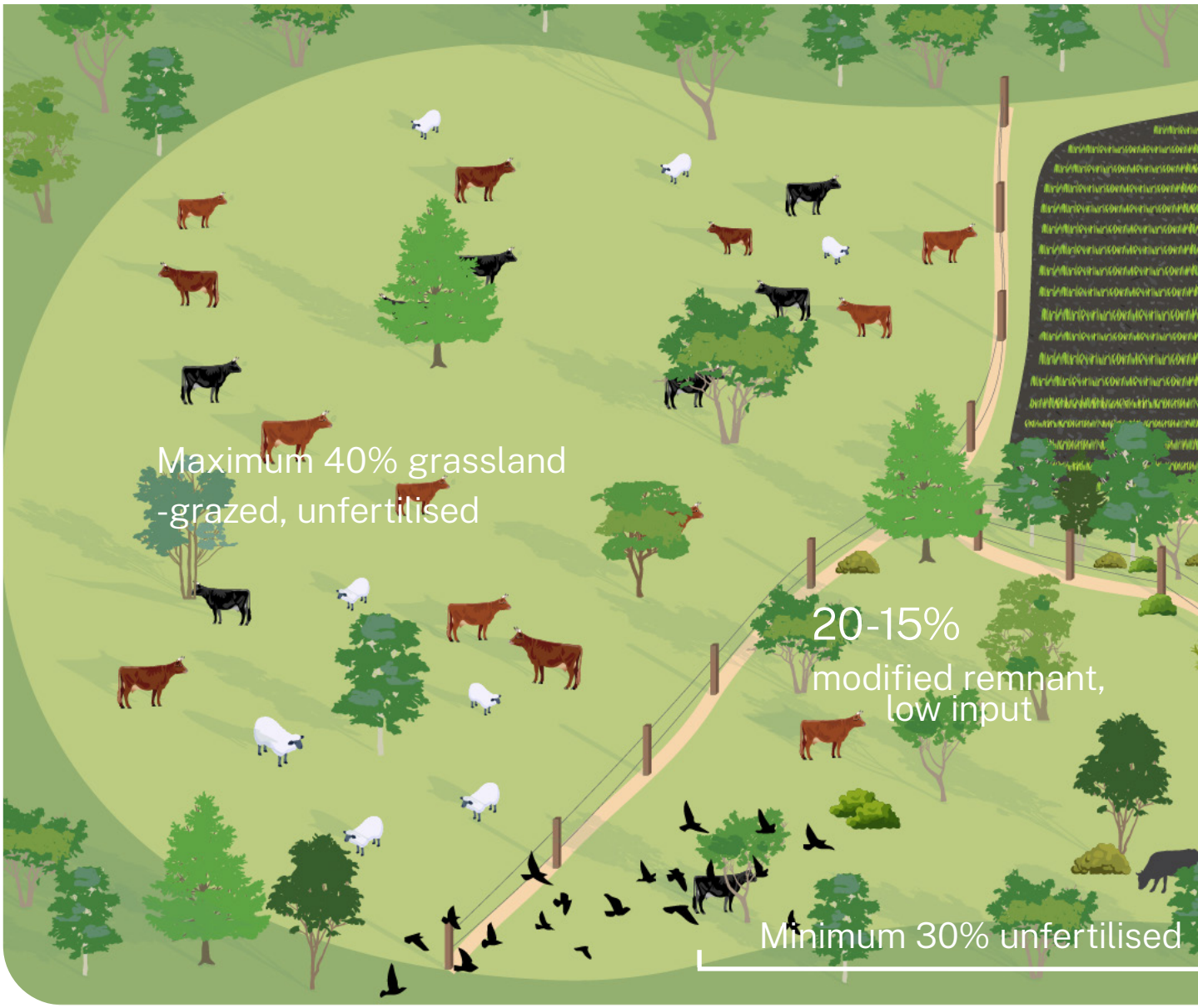
Nankeen Kestrel (Andrew Silcocks)

How much bushland is enough for birds?

The short answer is that any increase in native vegetation is likely to result in a greater number of specialised birds. That is, birds that have specialist habitat needs or diets such as pollinators, insect eaters, carnivores or seed dispersers. However, at least for woodland birds, **10-15% of the land with vegetation cover** seems to be a tipping point – below this, the diversity and abundance of woodland birds drops away dramatically.

This is supported by studies in south-eastern Australian by Deakin University in the early 2000s where they found that the diversity of woodland birds dramatically declines when the proportion of a region (10km by 10km) covered by trees drops below 10-15%. And on the other hand, bird diversity in a region will continue to rise when the tree cover exceeds this, but the rate of increase in bird diversity is slower(Radford et al 2009).

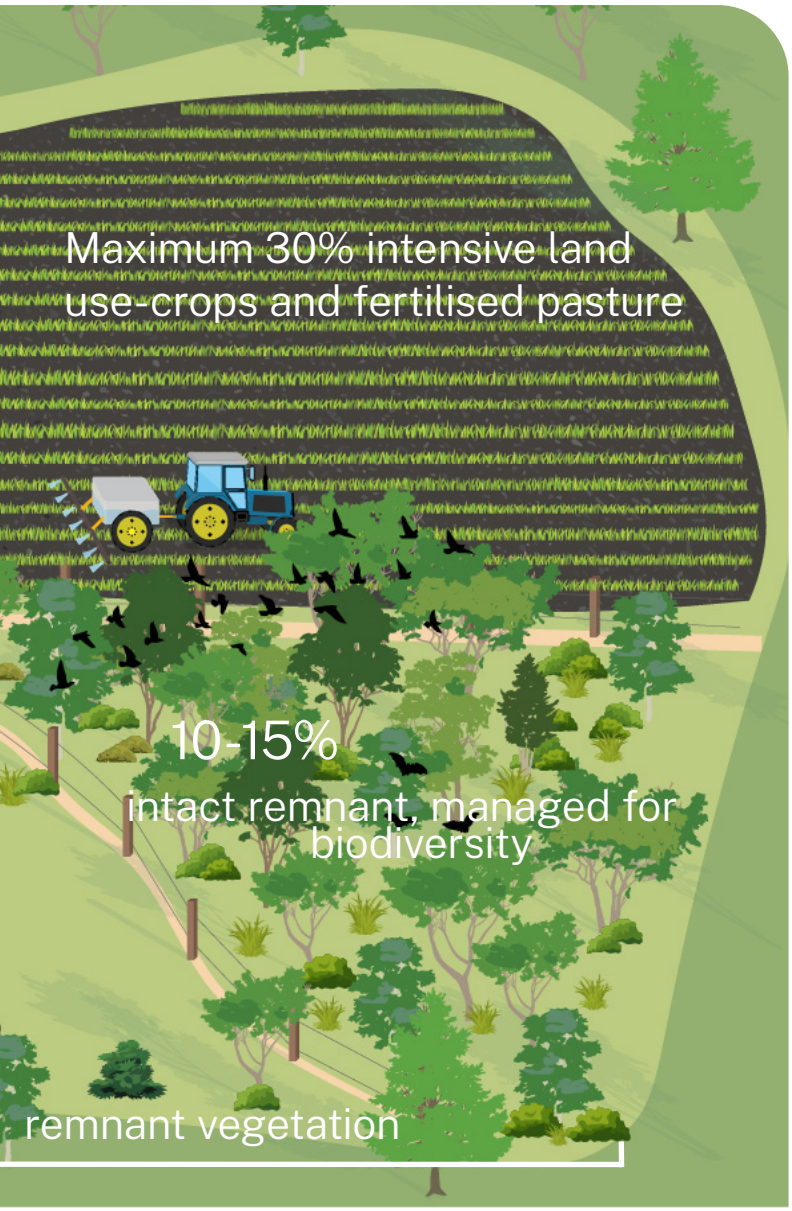
A similar conclusion of 'increased woodland bird diversity with increased vegetation cover, but with diminishing returns' was also reached by Australian National University researchers – who found that this also applies at both the site and property scale, as well as at the regional scale (Cunningham et al 2014). The same study also identifed that the proportion of the overall tree cover that occurred along waterways was particularly important for increasing bird diversity.



At the Conference of the Parties (COP15) to the United Nations Convention on Biological Diversity held in Montreal in late 2022, Australia was one of more than 100 countries that were signatory to the target to protect or conserve at least 30% of the planet's land and ocean by 2030 (the "30 by 30" target.). This global target aims to aims to halt the accelerating loss of species, and protect vital ecosystems that are the source of economic security. Approximately 22% of Australia's land mass is currently protected in the national reserve system.

Based on the original BirdLife Australia Birds on Farms project it is recommended that "Local native vegetation should cover at least 30 per of the total farm area", indicating that one third of this 30% extent (that is, 10% of the total property area) should be managed primarily for wildlife. In addition, it's recommended to also "exclude high-impact land uses from at least 30 per cent of the farm area".

Based on a study near Gunnedah in northern NSW (Walpole 1999), the pasture output per farm reached its maximum when the proportion of tree cover across the property was at 34%. Current studies underway indicate that the sale value of a rural property is maximised when the area covered by trees is between 20% to 40%, indicating a win-win again for farmers to provide for and protect bushland and wildlife habitat on farms.



Graphic 1: Proportion of farm managed for biodiversity

Supporting the findings from Birds on Farms, this graphic-adapted from a study by Australian National University on maximising the retention of native biodiversity in Australian agricultural landscapes (McIntyre, 2013), is where the 10:20:40:30 rule was first identified.

Striking the balance between the proportion of intense agricultural land use , the rule identifies the proportion of the retention of remnant vegetation and native plants and animals that can provide for healthy landscapes.

If a farm retains 30% of unfertilised remnant vegetation (intact~10-15% and modified~15-20%), this can guarantee connected habitats for native plants and animals, and enable movement and breeding opportunities.

Given the extent of clearing or intensive land use in some areas (such as wheatbelts and sheep grazing), there is a long road to recovery.

However, there are benefits to actively restoring this balance, as the same study showed that applying this rule and applying practices, such as low input farming pasture management, can also be more profitable, especially in dry years, and correlations for farmers adopting these practices having increased health and well-being (a triple win!).

Threatened birds in the landscape

In NSW there is currently 1043 threatened species listed under the Biodiversity Conservation Act (1996) (the Act). Of the 452 bird species, 140 (31%) are threatened, and 7 localised bird populations (such as Emu popuations of North Coast NSW) are listed as endangered (NSW State of the Environment Report, 2021). Under the Act, listing status for species are categorised as:

- presumed extinct;
- critically endangered;
- endangered; &
- vulnerable.

Past and current landscape clearing, urban sprawl, and development, mining, agricultural pressures, increasing pressures from pest and predators, increased pressures of drought, busfires, storms and biosecurity through climate change places enormous pressures on species already in decline.

Across eastern Australia woodlands have suffered extensive clearing due to agriculture, and some critically endangered woodland remnants have less than 10% remaining (DCCEEW, 2023).

To say that individual landholders have a role to play in conservation is an understatement. While National Parks and reserved lands provide important refuges and biodiversity conservation zones across Australia, by far the largest land manager is private landholder and farmers.

In the next 100 years, it's estimated that- without significant effort- a whopping 59% of our current listed threatened species could go extinct. The extinction crisis is happening now.

Some species are well known, the critically endangered Swift Parrot, Regent Honeyeater, where as others are disappearing faster than conservation can keep up, such as the mallee bird, the cryptic Mukkarthippi Grasswren, and others have been further exacerbated and impacted by bushfires increasing intensity and range, such as the Eastern Bristlebird, the Glossy Black-Cockatoo and species such as the Black-throated Finch and Red Goshawk are predicted to have completely disappeared from their former NSW range, and now is only found in northern ranges (Qld/NT) with significant pressure from mining and agriculture.

Protecting and enhancing habitat on private land has a significant role to play in the future of these threatened birds. The more habitat and safe havens landholders can provide, the better the chance they have to sustain numbers and, hopefully, thrive.



The Black-throated Finch drinks from a water trough on a farm. Once found in NSW, the species is now only known to occur in Queensland, and in declining numbers (Tony Grice)



Glossy Black-cockatoo, specialist forager relying on she-oak has suffered decline, with loss of habitat to clearing and fires (Bob Walpole)



Mukarrthippi Grasswren, a subspecies of the Striated Grasswren, is found in a small population on the NSW, SA and Victorian border is fast declining in the mallee habitat it once thrived in (Birdlife Australia)

Case Study: Birds of prey in decline

The Northern Tablelands Local Land Services **Birds of Prey Project** is helping to create bird-friendly farms on the Northern Tablelands of NSW. The project has been growing over several years and aims to increase understanding and awareness of birds of prey, and to reduce the long-term population declines of key species.

Focal species are the **Little Eagle *(Hieraatus morphnoides)***, the **White-bellied Sea Eagle *(Haliaeetus leucogaster)*** and the **Square-tailed Kite *(Lophoictinia isura)***(pictured). These species occur on the Northern Tablelands and are listed as vulnerable under the NSW Biodiversity Conservation Act (2016).

The project is collaborative and has been shaped by various stakeholders including Northern Tablelands Local Land Services, Southern New England Landcare, the University of New England, local Aboriginal groups, landholders, wildlife carer organisations, and birdwatching enthusiasts. These groups are working together to build a community invested in enhancing regional knowledge of each species, and to highlight and reduce threats to the birds such as habitat loss, secondary poisoning, and persecution.

The project includes monitoring, research and community education and engagement. The monitoring component of the project aims to increase understanding of the population trends of key species via monitoring the nesting or breeding outcome of nests across the region.

An ecological consultant, researchers, landholders and volunteers are working together to conduct ongoing monitoring of these raptors. Citizen science is actively encouraged, and the community is engaged via social media. The idea of landholders as custodians of 'their' birds is championed, with the aim of increased engagement with environmental issues more broadly.

The research component is to build the understanding of the complex ecological relationships that exist between key species and other woodland birds, and both informs and supports the strategic direction of the project. Community education and engagement activities have been successful in building a network of motivated citizen scientists, and further inform the direction of the project via consultation and feedback.

Watch the Birds of Prey project video: https://www.youtube.com/watch?v=FfEDlvVR8LM



Square-tailed Kite (Andrew Silcocks)

Bird diversity and dietary or habitat needs

To better understand the diversity of birds and their individual habitat needs in the landscape, or to inform habitat planning on a property, there is a need to understand the range of birds, their role in an ecosystem, foraging and dietary needs and breeding requirements.

Below is a list of the range of bird types, and some common species that you may observe in a rural landscape, particularly in a woodland and forest habitat and in or around water bodies. Defined by their nesting or dietary needs, it provides a valuable understanding of the unique requirements to sustain bird diversity:

- Aerial insect-eaters: swallows, martins, woodswallows, Grey Fantail, swifts and needletails
- Bark foraging/gleaning: treecreepers, Varied Sittella, Crested Shrike-tit
- Birds of prey: eagles, falcons, sparrowhawks, kites, buzzard, owls, kingfishers
- Foliage gleaners: thornbills, pardalotes, some honeyeaters, Swift Parrot
- Fruit-eaters: rosellas, parrots, Silvereyes, Common Blackbird (introduced), bowerbird
- Ground-nesting: Bush Stone-curlew, pipits, Speckled Warbler, Rainbow Bee-eater; sometimes pardalotes and Sacred Kingfishers, Malleefowl
- Grassland birds: pipit, quail, kites, kestrel, falcons, Brown Songlark
- Ground-foraging: button-quail, Yellow-rumped Thornbill, pouncing robins, choughs
- Hollow-nesting: owls, parrots and cockatoos, pardalotes, ducks, treecreepers, kingfishers
- Insect-eaters: fairy-wrens, fantails, thornbills, robins, scrubwrens, starlings, Rainbow Bee-eater, treecreepers, Tawny Frogmouth. Many other birds, such as honeyeaters, will also feed on insects.
- Nectar-feeders: honeyeaters, spinebills, wattlebirds, lorikeets, Swift Parrot, Noisy Miner, Regent Honeyeater
- Shrub-specialists: robins, whistlers, thornbills, wrens, Grey Shrike-thrush, some honeyeaters, babblers
- Seed-eaters: parrots, cockatoos, rosellas, finches
- Waterbirds: ducks, waterhens, egrets, herons, ibis, crakes, rails, Australian Reed-warbler



Top: Insect-eater White-naped Honeyeater foraging for spiders (Andrew Silcocks), Nectar-feeder Musk Lorikeet feeding on mistletoe flowers, (Mick Roderick). Bottom: Ground-nesting Bush-stone Curlew and bark-foraging/gleaning Brown Treecreeper, (Rhonda Vile)

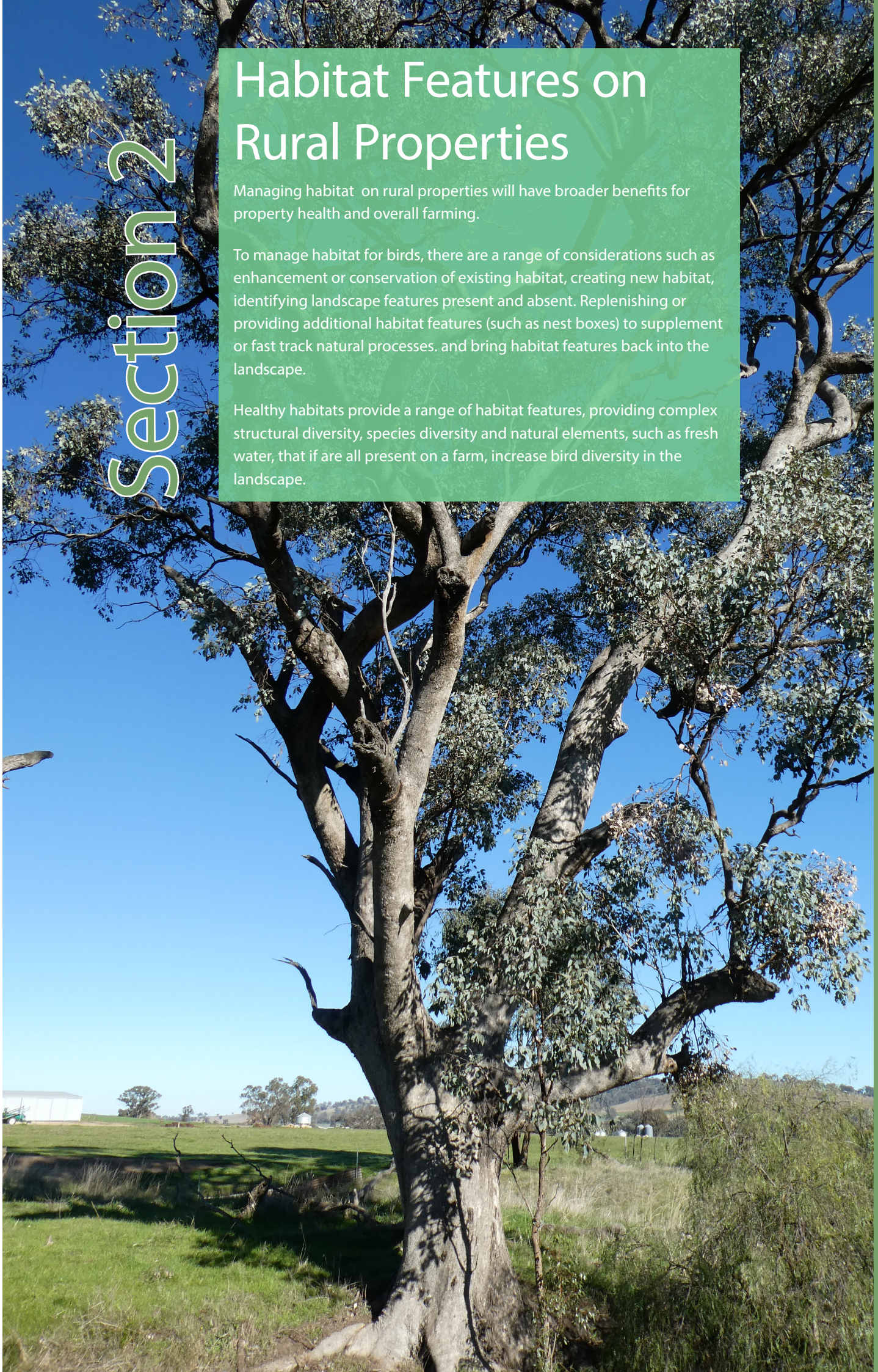
Section 2

Habitat Features on Rural Properties

Managing habitat on rural properties will have broader benefits for property health and overall farming.

To manage habitat for birds, there are a range of considerations such as enhancement or conservation of existing habitat, creating new habitat, identifying landscape features present and absent. Replenishing or providing additional habitat features (such as nest boxes) to supplement or fast track natural processes. and bring habitat features back into the landscape.

Healthy habitats provide a range of habitat features, providing complex structural diversity, species diversity and natural elements, such as fresh water, that if are all present on a farm, increase bird diversity in the landscape.



Remnant vegetation and creating habitat linkages

Protecting areas of existing intact or modified remnant vegetation is crucial, because once any naturally occuring habitat is gone, so is the wildlife they support.

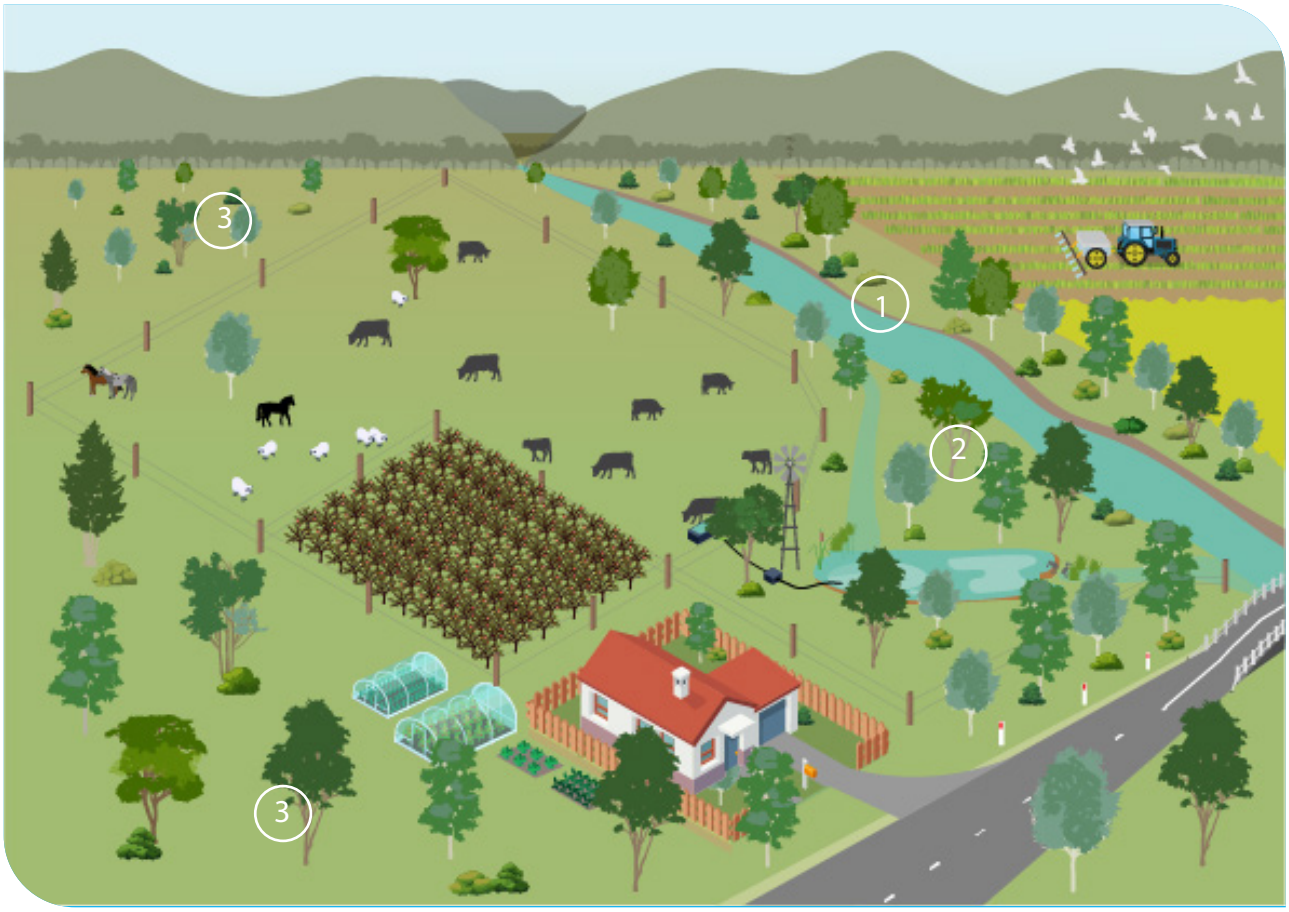
Remnant vegetation can come in many forms such as a single large area of bushland or woodland, one or more smaller patches, a narrow strip of large old gum trees along a waterway or a roadside, or large old trees scattered throughout the paddocks.

It is almost impossible to restore it to its original state, and only with significant costs - financial, labour, time and effort, and of course the environmental cost to overall landscape health and the ecosystem services (such as birds inhabiting vegetation being pollinators, insect or pest managers) they provide.

The areas of remnant vegetation on your property should form the foundation on which habitat expansion and linkages are built. Increasing the size of the remnant and improving its connectivity to other areas of native vegetation will provide more habitat for existing populations of birds and provide safe corridors across the landscape, and in doing so prevents "bottlenecks" or isolation or inbreeding of species with small populations.

To achieve the best conservation 'outcome' (based on a combination of effort needed, financial outlay and benefits to the birds), consider these three priorities, starting with the highest first:

1. **Protect existing intact remnant native vegetation (highest priority)**
2. **Protect and enhance the condition** of existing modified native vegetation **(second)**
3. **Enhance or create new native vegetaton linkages between existing remnant vegetation** (e.g. natural regeneration along waterways or between remnants, enhanced plantings around paddock trees or existing fragmented small remnant patches). **(third)**



Graphic 2: identifying habitat refuge and linkage zones on your property. 1. Riparian zones are important fauna corridors, and enhancing these can protect from erosion runnoff or spray drift, and improve water quality. **2. Farm dams** also provide dual benefits such as clean water for stock and wildlife, and **3. Remnant paddock trees can be enhanced** to support wildlife refuge and areas for safe movement across the landscape.





Remnant vegetation with woody debris (Greening Australia), Scarlet Robin (Chris Tzaros)

Does size matter?

Yes! Larger patches of remnant vegetation support more species of birds than smaller areas of remnant vegetation. A 'Birds on Farms' study (Barrett 2000), found that the variety of birds present was significantly lower in survey plots that were situated in habitat patches less than 10 hectares.

Larger patches create a buffer from surrounding agricultural activities — and they also allow internal refuges from competitive species (such as territorial Noisy Miner birds), and in general have a smaller 'edge-effect' and, as less likely to be over-run by weeds that will establish in more open, disturbed or higher nutrient areas.

Natural regeneration first

Natural regeneration is where native plants grow back naturally or 'regenerate' through regrowth, seed germination or from propagules from existing mature plants in the existing woodland or forest remnant.

In landscapes that have suitable growing conditions and a viable seedbank (where mature plants have dropped seed, and it is held in the soil/ground layer, ready to germinate given the right conditions) or a productive stand of native vegetation, landholders can support native vegetation to re-establish at a *much cheaper* cost than revegetation.

Sometimes natural regeneration requires an environmental trigger to kickstart the germination, such as a major rainfall or flood event, or a bushfire, or other disturbance or exposure to sunlight that triggers seedling growth.

But a landholder may decide to change their land management practices and adopt 'facilitated' natural regeneration to intentionally encourage new growth and expand existing remnant vegetation.

Cost effective and easy methods that are commonly used to facilitate natural regeneration are to restrict grazing (using temporary or more permanent fencing) or by resting paddocks or rotational grazing methods, slashing or mowing, the removal or containment of competitive weeds or undertaking a planned 'ecological' or low intensity burn.

It should always be the first option to naturally regenerate the land if there is potential to do so, than it is to replace or create new areas of native vegetation through revegetation methods.

Case Study:
Woodland bird recovery in eastern Australia

Many woodland birds are declining in response to the loss of habitat. Across south-eastern Australia (Tasmania to southern Queensland) only 20% of temperate woodlands remain and a coordinated response is needed to conserve and restore this key habitat.

The vision of the BirdLife Australia led 'Temperate Woodland Birds Conservation Action Plan' (CAP) is to provide a landscape and habitat scaled approach to protect, recover and stabilise viable populations of 51 species of temperate woodland birds in decline across south-eastern Australia, by implementing a suite of targeted management interventions which conserve habitat and minimise or mitigate threats.

A dedicated Woodland Bird CAP working group, represented by 17 state and federal government, NRM, not for profit, community and research institutes provide strategic input, coordinates local and regional initiatives,exchanges knowledge, and identify research and data deficiencies and seek solutions across woodland CAP bioregions, from Tasmania through to southern Queensland. Benefits of a landscape scale Woodland Birds - Conservation Action Plan are that it:

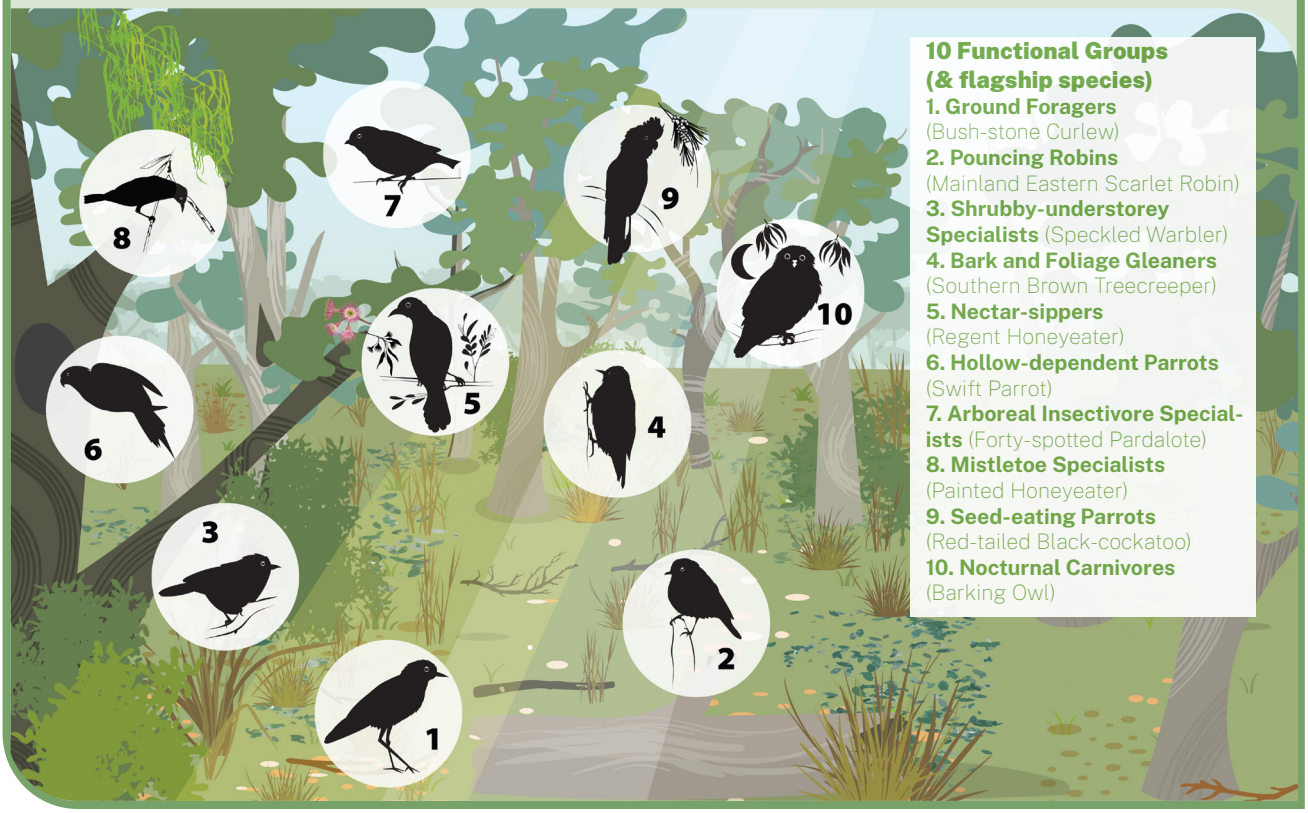
- Provides a holistic approach to conservation
- Identifies 10 consistent management actions
- Combines individual species conservation advice and recovery plan objectives, to benefit multiple species
- Led by BirdLife Australia, but implemented and championed through multiple stakeholders and partners
- Can inform property scale, local, regional, state or national actions
- Can be implemented by community, landholders, NRM regional and state agencies

Multiple woodland bird conservation projects are being currently delivered through the CAP across eastern- Australia, aligned to the CAP priorities and key actions.

The plan can be implemented at a property scale, and management actions that benefit the 10 functional bird groups, and their flagship species (see graphic). Each of these functional groups provide important ecological functions in the landscape, and broad environmental benefits.

The main premise of the plan is that if you are providing actions that benefit one flagship species, these benefits are amplified for others- and provide overall woodland bird conservation outcomes. Educational booklets for each of the 10 functional groups are available to landholders, identifying landholder or community group scaled actions that contribute to woodland bird recovery.

More information: www.birdlife.org.au



When to revegetate

When the potential to naturally regenerate the land is limited, in the case of highly modified or non-native landscapes without potential for natural regrowth, revegetation may be required. This is more costly, and labour intensive - but is an important restoration method where natural regeneration is not an option.

Most revegetation projects conducted in Australia hand plant tube-stock of species of locally endemic plants. Tube-stock is ideal if you need to be able to control the spacing between plants, for example, when you are establishing a windbreak, or when you need to fill in gaps in previous revegetation sites.

Increasingly, direct seeding can be used instead because it can be more cost-effective.

Direct seeding involves using specialised machinery to sow seeds of endemic plants into prepared soil. The results of direct seeding are less consistent, because the seeds are exposed to unregulated, natural conditions and only the strongest seedlings will survive.

Revegetation is often an appropriate restoration approach, when you want to:

- **Create new areas of vegetation,** through supplementary planting in areas previously cleared or modified, to create linkages between two or more remnants or refabrication planting, to create new areas of vegetation or habitat (windbreaks, river corridors, around dams or small patches). Or if there is a need to reintroduce absent vegetation layers such as understorey shrubs, or to increase the diversity of species of canopy or mid-storey trees that are no longer present (such as from timber harvesting practices).
- **Encourage wildlife or provide habitat,** in particular for birds! Landholders may specifically want to expand or create dedicated habitat zones on their property, target threatened species or local species and provide suitable plantings that provides food, shelter or breeding sites.
- **Increase overall health and function on a property,** such as additional shade and shelter, windbreaks, or to encourage pollinators, prevent soil erosion and stablise banks or improve water quality around waterways or dams.
- **For carbon sequestration - directly capture carbon through the planting of trees.** This may have a financial offset benefit. In the longer term this can combat climate change and contribute to natural carbon, air and water cycles (storing carbon, capturing carbon dioxide, creating rainfall and releasing oxygen), and reducing evaporation of waterbodies (dams, rivers, creeks) and retain moisture in the property (through roots and transpiration from leaves).





Natural regeneration of dry forest in NSW for the Regent Honeyeater (Karina Glover, Local Land Services)
Regent Honeyeater prefers habitats of dry, woodland or coastal forests (Mick Roderick)

Revegetation principles

Considerations in revegetation include species selection, soil preparation, protecting the plants, planning, timing, planting your seedlings or seed and maintenance. Here are a few principles to consider in revegetation design and planning:

1. **Consider the entire property** when developing a habitat and restoration plan, ask yourself the following questions:
   - *What is the long-term vision for the property?*
   - *Is revegetation the highest priority? That is, would the time and effort be better spent protecting and increasing the condition of areas of existing vegetation? Or is there potential to encourage natural regeneration?*
   - *How many years will the revegetation activities take to achieve?*
   - *Can the vision be broken down into smaller projects that will be more achievable and affordable in the short term?*
   - *Where should I revegetate? How can I link vegetation on the property to existing vegetation nearby?*
   - *Are there existing habitat values that may be damaged by a revegetation project (e.g. native grassland)?*
   - *How can I design the revegetation to attract target species of birds and avoid favouring competitor species?*
2. **Choose local native endemic species**. These are adapted to the soils and climate, and have a long history of providing suitable habitat for local wildlife. Most regions have produced native plant guides that can assist with the selection of suitable plants, and from local nurseries and other experts can be sought to assist plant selection or sourcing local seed for growing on.
3. **Manage feral herbivores** such as rabbits, hares, deer, wild pigs and goats will reduce the success of revegetation projects. Baiting, fencing or using tree guards will protect and increase the survival of the tube-stock. Fences or tree guards will also reduce the impact of native herbivores, such as kangaroos and wallabies. Excluding livestock from revegetation areas — particularly during the early years of establishment — will also increase plant survival and health.

Long term value of revegetation

If revegetation is the best option, the benefits of undertaking habitat management and restoration on your property won't be observable in the short term, but will make a difference over time.

A Birds on Farms study by BirdLife Australia (Herman, 2021) shows that stands of revegetation which is more than 20 years old supports significantly more ground-nesting birds, honeyeaters, birds that forage for insects on bark and fallen woody debris (such as treecreepers, Varied Sittella, Crested Shrike-tit) and birds that peck insects and other food from the leaves (foliage gleaners).

This aligns with other studies that have found that the variety of birds is greater in plantings that were older, with a more complex structure.

As well as providing more opportunities for foraging and nesting, increased habitat complexity deters competitive species such as the Noisy Miner or Lorikeet and can result in an increase in the numbers of small birds present.



Monitoring for birds on a conservation property (Rhonda Vile)



Graphic 3: Enhancing vegetation linkages through natural regeneration or revegetation.

A. Identify areas that can be protected to form existing linkages between larger remnants of habitat. These often can include roadside vegetation, trees along waterways or scattered paddock trees.

B. Enhance existing linkages between larger remnants of habitat. This may involve improving its condition (such as adding shrubs, infill of gaps, or adding coarse woody debris), or increasing the vegetation width and new linkages creating stepping stones.

Habitat linkages

Remnant areas of native vegetation are patchily situated across the landscape, separated by pastures, crops, orchards, plantations, urban areas and other modified habitats. Roads, railways and other linear infrastructure also criss-cross the landscape.

The loss of the expanse of native vegetation into a number of smaller, isolated patches is known as 'fragmentation'. Fragmentation affects each bird species differently. For instance, species that seldom move far from the shelter of dense shrubs in the understorey such as bristlebirds, Speckled Warblers, scrubwrens and heathwrens — generally avoid crossing gaps in the vegetation. If they disappear from an isolated patch of native vegetation, the reluctance to cross large open areas makes it unlikely that they will be able to recolonise the area naturally. Birds that have greater mobility, such as the migratory Swift Parrot and nomadic Musk Lorikeet, are able to cross large areas of unsuitable habitat, but still use more energy to traverse larger areas that could be devoted instead to breeding or other activities. No matter the ability of a species to disperse, all birds face an increased risk of predation when they cross an open landscape without any shelter.

Enhancing a property so that vegetation is more connected, allows for birds and other wildlife to move more easily between areas of their preferred habitats. These connections are variously described as habitat linkages, wildlife movement corridors or pathways.

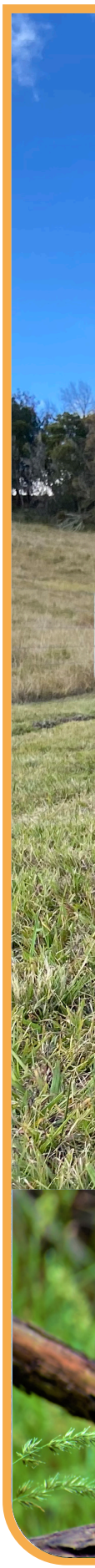
For some birds, there needs to be an almost continuous connection of suitable habitat between areas; and the habitat link could involve a stepping-stone approach — a series of one or more small, isolated patches of vegetation that break down the large crossing between two areas of suitable habitat into a series of smaller 'jumps', and could be as small as an isolated paddock tree or a farm dam.

As a minimum measure of success, habitat linkages should allow some birds to move safely between remnant vegetation, and enable breeding and genetic exchange or in the longer term repopulation.

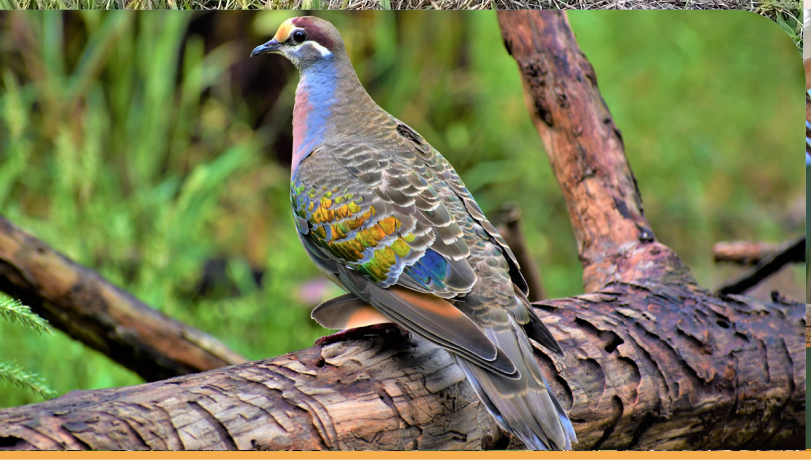
Ideal outcomes are that habitat linkates are utilised by many birds of many different species, and the linkage itself provides suitable habitat. A well-designed linkage should take the width, plant composition and length of the linkage into consideration to provide a successful route for crossing, based on the specific needs of the various target species. However, as a general rule, a corridor at least 30 metres wide should meet the needs of most birds as a habitat linkage.

When creating an entirely new habitat linkage or the protection and enhancement of existing linkages, here are some tips to increase the abundance and variety of birds which will be able to use it.

- Any linkage you can create between areas of remnant habitat is better than none. Even a small stepping-stone is beneficial.
- Travelling the shortest distance between the two remnant areas is preferable, but topography, land-use and costs also need to be considered.
- Establishing a new vegetation corridor along an existing fence line will reduce the cost of the fencing.
- A wider corridor is better, ideally a minimum width of 30 metres.
- Multiple linkages are better than a single linkage.
- Create a diverse habitat structure within the linkage will increase the likelihood that it will be used by a variety of different birds.
- Incorporate existing remnant habitat into the linkage, including paddock trees, small areas of remnant habitat and existing revegetation areas.
- Protect revegetation from stock with fencing. Once the plants are tall enough, periodic livestock grazing to reduce biomass and control weeds may be appropriate.
- Ongoing control of invertebrate pests (such as rabbits or hares) and feral predators within the linkage may be required, as it is for the entire property.









Why birds need habitat linkages

Connectivity has a positive influence on the variety of birds, with more well connected patches of habitat supporting a greater number of bird species.

The ability to move through a landscape to access various resources, such as food, shelter and suitable mates, is crucial for the survival of individual birds and the long-term viability of their populations.

- For birds with poor mobility, habitat linkages provide safe pathways from predators, such as fox, pigs or cats, to recolonise areas of native vegetation that they had previously disappeared from.
- For small birds, connected habitat provides safe refuge from natural predators, such as raptors
- Isolated populations of birds have a reduced long-term survival because of inbreeding and other genetic effects.
- For birds with growing populations, habitat linkages allow them to disperse and expand into new areas, to find mates and form breeding pairs to continue growth of the populatio (without inbreeding) .
- Habitat linkages allow birds and other wildlife to adapt to a changing climate by enabling them to shift their distribution to areas with a more suitable climate.

Photo: Narrow revegetation corridor, Local Land Services care of J. Coffey (Hunter Local Land Services), Left: Common Brush Bronzewing, prefers sheltered sites; and Right: Willie Wagtail nest with two fledglings in tree corridor (Ryan Kilgower)

Value of paddock trees

Paddock trees provide an important cultural and historical reminder of the extensive woodlands and forests that once covered the Australian landscape. With the fragmentation of past forests and woodlands into smaller and smaller remnant areas, there can be no smaller example than a single remaining tree — and once gone, the remnant patch is no more. Paddock trees are typically among the oldest living structures in agricultural landscapes — and in some areas, are still a common feature.



Paddock trees provide valuable habitat for many birds due to their great age and size. It generally takes more than 100 years before a tree will start developing a hollow, and even longer before this hollow will be large enough to be used by some species of parrots and cockatoos to breed in. Most paddock trees are very old and often have one or more hollows which are suitable for hollow-nesting species, such as the threatened Superb Parrot.



Large trees also tend to produce more flowers, which attracts large numbers of nectar-feeding birds, as well as insect-eating species that feed on the insects that are attracted by the flowers.

Paddock trees are important stepping-stones that birds can use to move across the landscape, often the only vegetation structure in an otherwise cleared landscape. Scattered paddock trees allow birds to move from one to the next until they reach a larger area of suitable habitat. The trees provide mobile birds with shelter from predators and the weather, somewhere to rest and an opportunity to feed.

Old dead trees left standing in a paddock do not provide as many food resources for birds as living trees, but they often have hollows that can be used for nesting by birds, bats and other hollow-dependent wildlife; provide perches for birds of prey across the otherwise open landscape. Cracks and crevices in them also often have insects and other invertebrates, which may be eaten by a range of birds, such as babblers and treecreepers.

Alarmingly, paddock trees are in decline. In some areas, more than 2% of paddock trees die or get cleared every year(Freudenberger and Ozolins 2000) . As most of these trees pre-date European colonisation, it is unavoidable that some naturally die of old age. However, because of their location, isolated in an exposed paddock, they are also more prone to dieback, wind and storm damage, being struck by lightning and infested by mistletoe than similar trees that are surrounded by an area of native vegetation.

Protecting existing or enhancing paddock trees on your property can include:

- incorporating paddock trees into revegetation areas, including replenishing lost understorey and creating diversity in new tree species
- replanting new paddock trees across an existing cleared area
- fencing off paddock trees, temporarily, periodically or permanently, to provide relief from grazing pressure, reduce compaction, allow regeneration and sustain tree health.
- maintaining a buffer around cropping areas, to avoid root damage from cultivation or soil disturbance
- avoiding or minimising chemical spray drift near a paddock tree



What is tree 'dieback'?

Dieback is term describing the long, drawn-out decline of a tree's health.

Paddock trees are particularly prone to dieback. It starts with the ongoing loss of leaf cover, progressing from the tips of twigs and tops of the trees, spreading down the tree's limbs as the tree is subjected to constant or repeated stress. Mistletoe often becomes more prevalent. In more favourable times, the tree may attempt to stop the damage growing new leaves, but without suitable changes to management, this dieback usually results in the death of the tree.

There are usually a number of contributors to the dieback of paddock trees:

- **Paddock trees support fewer herbivores and insectivores** that can control mistletoe and pest insects than trees in remnant bushland.
- **Livestock, kangaroos and feral herbivores often prefer to camp underneath paddock trees** for protection against the direct sun, wind and other inclement weather.

This can lead to:

- **Soil compaction**, tree root damage and changes to the soil chemistry (e.g. an increase in nutrients from manure)
- **Grazing or damage** of nearby tree seedlings
- **Ringbarking** by stock, as they eat the bark low on the trunk, or removing it by regularly rubbing against it.

Other farm practices that can increase the occurrence or rate of dieback include damage to the tree's roots during cultivation, and spray drift from insecticides and herbicides.

The chemicals used in the surrounding paddocks directly damage the health of the trees and indirectly make them more vulnerable to attack by fungus, pest insects or mistletoe. Severe drought, heatwaves and a generally changing climate also makes the trees more vulnerable to these threats.

Photo: Top, Black Kite use a senescing tree as a perch (Lyndel Wilson), Left: Paddock tree (Rhonda Vile)

Restoring the shrub layer

The shrub layer — also referred to as the midstorey — is usually missing in most agricultural landscapes, but it can be the most important vegetation layer for native wildlife, including birds, marsupials and insects. Many specialised birds — particularly small to-medium sized birds — only occur in areas of native vegetation that have a healthy shrub layer.

Shrubs provide nesting and roosting sites that are less detectable and accessible to predators, and also offer protection from predators and aggressive competitors, and provide a refuge from harsh weather. Shrubs are also a valuable food source, producing fruits and seeds that form a significant part of the diet for many birds. They attract and support many insects and other invertebrates - a vital food source for many birds, especially during the breeding season.

While not all habitats must have a shrub layer (e.g. open grassy woodlands), most woodlands, mallee and forests range from a scattered to denser shrub layers, depending on the plant community type.

The lack of shrub layer in agricultural settings may be the result of various historical and contemporary practices, such as:

- Clearing for grazing or cropping land
- Overgrazing or trampling of mature shrubs and seedlings by herbivores (including stock)
- Clearing to reduce fire risk or remove shelter for pests such as foxes and rabbits
- A revegetation or agroforestry project that focuses on replanting trees (but not shrub or groundcover)
- Inappropriate burning regimes, drought or heatwaves



Rose Robin, like many pouncing robins, insects are their main diet, and they rely on small shrubs for camouflage, nesting and fooraging (Andrew Silcocks)



Small birds such as the Stirated Thornbill spend most of their time in understorey and shrubs searching for insects (Brian Rosenberg)



The Grey-crowned Babbler a shrubby understorey specialist is searching for insects in these wattle seed pods (Andrew Silcocks)

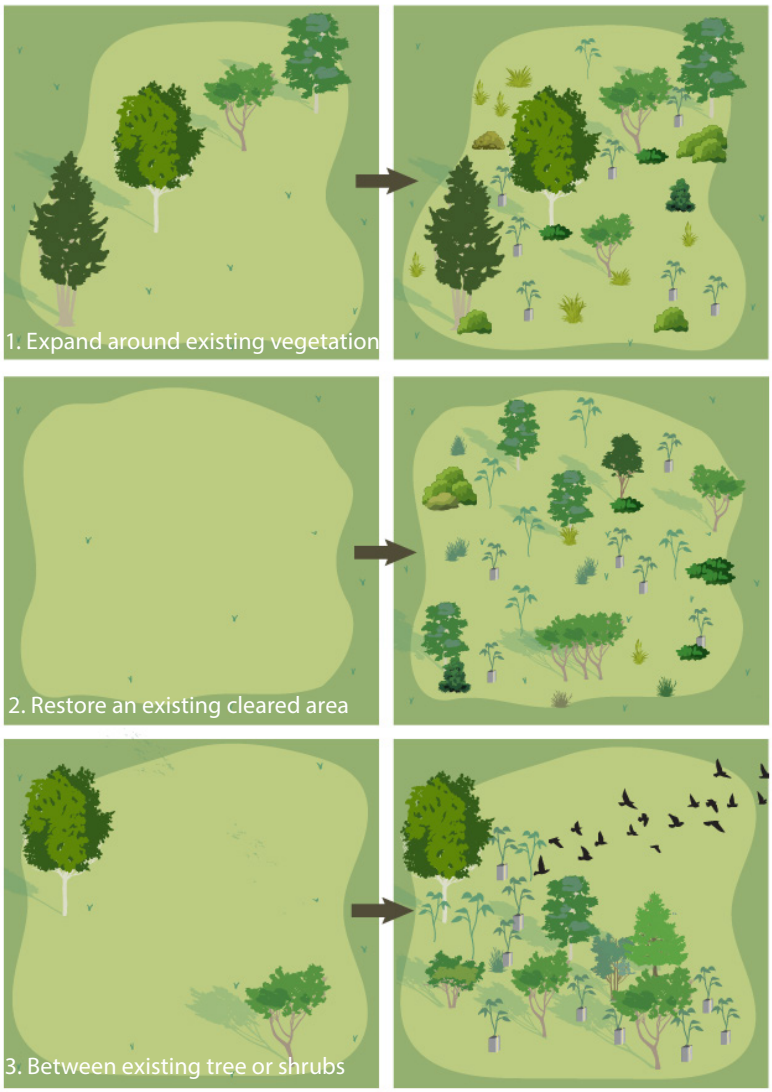
Bringing back shrubs

There are several ways a shrub layer can be restored. Depending on the condition of the property and its potential for natural recovery, sometimes the simplest way can be the most effective. Preventing access of livestock or ceasing mowing or slashing can allow native shrubs to regrow through natural regeneration. In these cases, there is also great potential for weed growth, so regular monitoring and management of emerging weeds is required.

If there are no viable seeds left in the soil for natural regeneration to take place, revegetation with a diversity of local native endemic shrubs may be required.

If undertaking assisted revegetation of the shrub layer, consider planting the shrubs in clumps or clusters, rather than evenly spaced, across you're the whole revegetation area. Make sure to plant a variety of shrubs that flower and fruit at different times of the year to provide food resources across the seasons.

Spiky and prickly shrubs provide small birds with protection from predators, and also against larger, more aggressive birds (although are less popular with farmers who are raising sheep and other woolly livestock).

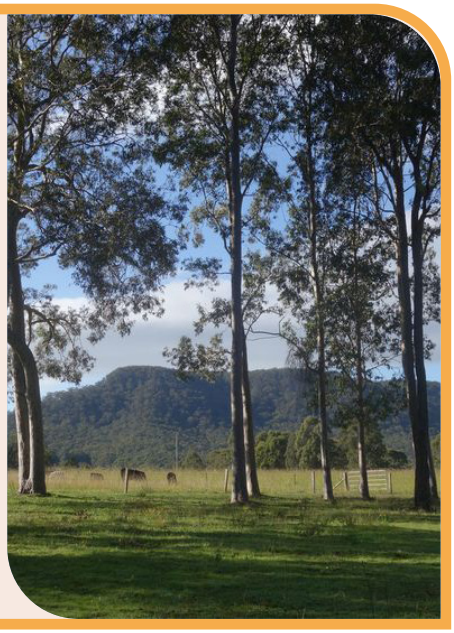


Graphic 4: Restoring the shrub layer through regeneration or infill with native seedlings can be achieved in a number of ways.

Proof! Shrub layers matter.

Restoration and revegetation projects can make a big difference for the bird community. From a large number of properties that were involved in BirdLife Australia's Birds on Farms, monitoring was conducted in both the late 1990s and more recently between 2017–21, where it was found that almost all groups of birds significantly increased over time. Out of this study it was found that the diversity of birds of the shrub layer increased twenty-fold!

More than 50% of the sites that were surveyed in both periods were revegetation or restoration sites conducted by the landholder as part of their land management and property improvement - including restoration of the shrubby understorey layers. This confirms the positive influence of habitat restoration in the increase in the variety of birds present over time.



A typical scene - lack of understorey in a pastoral setting showing little habitat value under the tree canopy. (Local Land Services)

Helping hollow dependent birds

Natural tree hollows are best

A tree hollow is a semi-enclosed cavity which has formed naturally in the trunk or branch of a tree over several decades. Hollows are found in old trees, both living and dead.

Hollows are formed when the tree suffers damage that exposes the heartwood (the dense inner part of the wood). Damage to tree limbs can be caused by fire, storms that snap off branches, lightning, insects or birds. Bacteria and fungi lose no time moving in to begin the decaying process, which can ultimately lead to the formation of a tree hollow.

Most often, it is older trees that will form hollows, and it often takes more than a hundred years before a hollow begins to form. Not every tree will form a hollow — it depends on the species, age and growing environment of the tree —and not every hollow will be suitable for birds.

Australia has many species of birds that use hollows for breeding (see Table 1). Many of these species only breed in hollows, while others occasionally use hollows for breeding, but can use other structures, such as nests they build themselves. Some of these birds also use hollows as roosting sites outside of the breeding season.

Tree hollows offer insulation, stability, protection from the weather and a relatively safe space for nesting, as the hollows are usually in a place that cannot be easily accessed by ground-based predators. Additionally, hollows are sometimes re-used by the same pair of birds over many years and even by multiple generations of birds, creating a connection between past and future populations.

You can actively assist and encourage native nesting birds if you:

- **Identify and protect trees**, and prioritise them for protection;
- **Retain a suitable buffer** around hollow-bearing trees (and consider fencing and increasing understorey around isolated trees);
- **Retain as many mature trees as possible**, and support regeneration of new seedlings or plant trees for the next generation of hollow forming trees; and,
- **Retain dead or dying trees, especially if they have hollows.** You can often trim back outer limbs and retain the trunk without compromising safety.



Critically endangered Swift Parrot relies on 100 year old hollows to breed in Tasmania each spring, following their winter migration to the mainland (Dejan Stojanovic,



The Striated Pardalote searching for a hollow to nest in (Andrew Silcocks)



Old trees with large hollows are suitable for a variety of birds, frogs, reptiles and marsupials (Rhonda Vile)

Photos on opposite page: Australian Owlet Nightjar, nocturnal species, uses hollows to rest in during the day, and form it's nests in (John Barkla) Pair of Red-rumped parrot investigate hollow (Lyndel Wilson)

Each hollow-dependent species has specific needs regarding the type of hollow that is suitable for breeding or roosting (or both), and some are more selective than others. Hollows can vary in several ways, such as the size of the entrance, the depth of the hollow, whether the hollow is in living or dead wood, its height above the ground, its aspect in regard to prevailing weather conditions and whether it is in a branch or the trunk of the tree.

Because some species prefer to nest or roost in dead trees, even dead isolated paddock trees are important habitat and should be protected. Isolated paddock trees with hollows are preferred by some species because there is usually less pressure from ground and tree based predators.

Some of our threatened birds, such as the Superb Parrot, Swift Parrot (which only breeds in Tasmania, but forages on the mainland over winter) and Brown Treecreeper, depend on hollows for nesting. As hollows are increasingly a limited resource in the landscape, it impacts on their ability to breed, and has an ongoing impact to the population each breeding season.

In addition to past and current land clearing, there are other factors which reducing the number of tree hollows that are available for birds to use. Hollows are usually located in large, old trees, which are more vulnerable to lightning strikes and fires. Hollows provide fire with access to dead internal wood, which burns more readily than live wood. Old hollow trees in urban areas and their outskirts are often disproportionately cut down or lopped due to their perceived safety risk from falling branches or collapse, especially in urban or peri-urban areas that often provide valuable refuges.

Competition with feral hollow-nesting species such as European Honeybees, Common Starlings and Common (or Indian) Mynas further limits the number of hollows available for native birds. Similarly, changes to land use since European colonisation has disproportionately favoured some native hollow-dependent birds — such as Sulphur-crested Cockatoos, corellas and Rainbow Lorikeets — thereby reducing the number of hollows available for less common hollow-dependent species.

Table 1. *A selection of birds across south-eastern Australia that rely on hollows for breeding or shelter*

Bird Group	Hollow Type
Some ducks (e.g. Pacific Black Duck, Australian Wood Duck)	Large hollows-such as large old paddock trees, large standing trees.
Owls	Large hollows
Parrots, cockatoos, lorikeets	Small-large sized hollows
Kookaburras and other kingfishers	Medium sized hollows, old termite nests
Australian Owlet-nightjar	Small-medium sized hollows
Treecreepers	Small-medium sized hollows
Pardalotes	Small sized hollows





Left: Owlet nightjar Right: Powerful owl adult and chicks. (Andrew Silcocks). Both species rely on hollows for roosting during the day or as nesting sites to raise their young, owls generally require large hollows.

Nest boxes

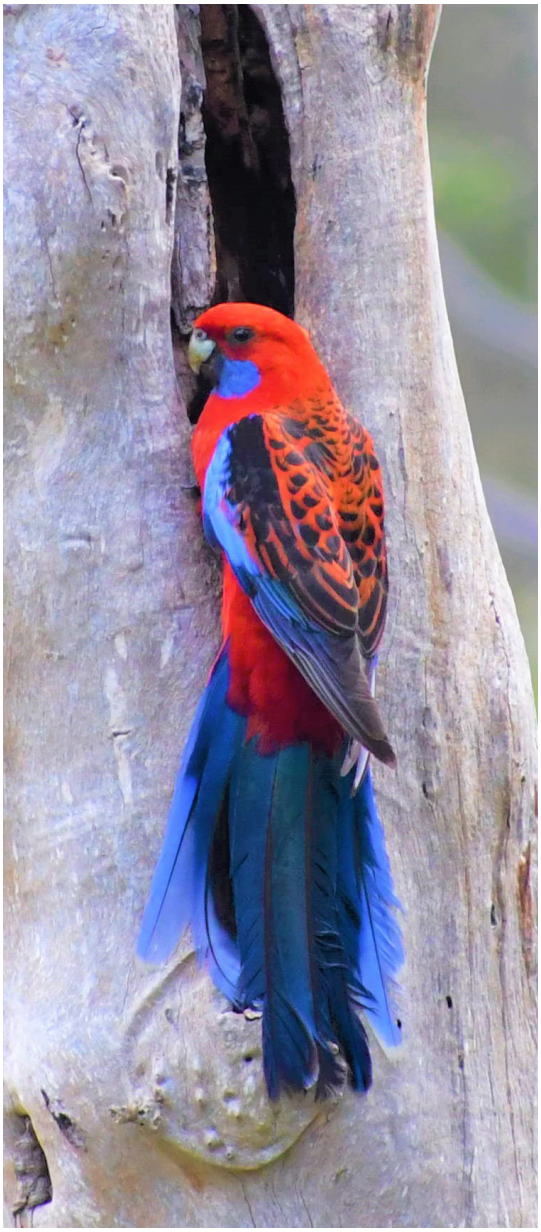
While installing nest boxes or other supplementary hollows can be thought of as an easy way to provide additional nesting opportunities for hollow-dependent birds, all too often they have unintended negative consequences. The boxes may alter the balance of the bird community in the local area, favouring already common native species (e.g. Rainbow Lorikeet), or allowing introduced pest species, such as the Common Starling and Common Myna, to breed and build up their numbers, or used by potential nest predators such as the Common Brushtail Possum.

Maintaining existing natural hollows should always be a priority on your property. However, if your woodland or revegetation area has few or no natural hollows, then installing nest boxes or other artificial hollows could be considered. It is crucial to follow guidelines and recommendations regarding the design of your nest boxes, as well as where you place them, and maintain them to ensure they are effective and safe for the targeted birds.

Some of the things to consider include:

- **Target species** Identify the birds that may benefit from nest boxes in the specific location — with a preference for native species that are threatened or declining. If only common birds are likely to benefit from the nest box then your time and resources may be better directed elsewhere.
- **Box design and placement** Use appropriate nest box designs that mimic natural hollows and meet the requirements of the desired birds. Consider factors such as the dimensions of the box, the size of the entrance hole, ventilation, drainage and predator protection features.

  NestBoxTales.com is a great resource with multiple designs and handy tips! Correct installation and positioning of nest boxes is also crucial, including the right height, orientation and protection from prevailing weather and direct sunlight. Using the correct type of wood is also important so it will not deteriorate in the outdoor conditions, but also be aware of the potential impact of paint, stain and other chemical treatments on the health of wildlife using the boxes, as many birds chew on the box openings to increase their width. The thickness of the wood is also an important consideration, in terms of insulation.
- **Monitoring and maintenance** Establish a monitoring and maintenance plan for any nest boxes you install. Check the boxes regularly to monitor for nesting activity, inspect for any damage and give them a clean them between breeding seasons. Keep records of nesting success, occupancy rates and any changes you might have observed. Have a plan in place to exclude or remove non-native birds and feral bees. All of this information is valuable for the ongoing management and understanding the effectiveness of nest boxes in supporting populations of birds.



A nest box should only be provided if there is no natural hollows available, to ensure the natural balance is in check, and not benefitting one species over another. The crimson rosella, is a common user of nest boxes, this one is investigating a long hollow in a tree (BirdLife Australia)

Types of artificial hollows

- **Standard-style wooden nest boxes.** You can make these yourself from widely available instructions, or purchase them from specialist suppliers. In your planning, consider incorporating some form of insulation into your design to avoid exposing the inhabitants to extremes of heat and cold. (Note: ornamental boxes that are often available from commercial nurseries or farmers' markets are almost never used by Australian birds.)
- **Nest boxes made from non-wooden materials.** To target the needs of specific species, there are some boxes now being created that incorporate materials such as PVC pipes or 3D printed. Many of these are being trialled, showing promising results.
- **Re-purposed hollow logs or branches.** If you are considering increasing hollows on your property, do not remove existing hollow branches from trees or logs on the ground specifically for the purpose of creating an artificial hollow. Only use woody material that is otherwise earmarked for destruction (e.g. from a firewood pile).
- **Chain-sawed or artificially carved cavities added to a living or dead tree.** This new technique creates artificial hollows in trees using chainsaws or tree hollowing tools. The benefits of these new techniques are still being researched and need to be considered in consultation with a qualified arborist. This is to ensure that personal safety and the health of the trees are not compromised.



Many new methods are being tested to supplement hollows, this one being a man made hollow created to mimic a natural hollow. (Rhonda Vile)



A typical parrot box, with a resident Crimson Rosella. There are many box designs that can be used to target different species.(Darrilyn Goldsmiths)





Natural predators of eggs and chicks include lizards, snakes, Currawongs, Kookaburra, Ravens, possums and some gliders. Lace Monitor (Rhonda Vile), Grey Currawong (Rhonda Vile)

Natural features: coarse woody debris

Coarse woody debris refers to the dead and decaying wood that is found on the floor of forests and woodlands, and even at the base of scattered or isolated paddock trees.

Coarse woody debris = fallen branches, logs and decomposing tree stumps.

Coarse woody debris forms naturally, such as from branches or whole trees that have fallen from a tree due to age or strong wind or artificially, such as a stump remaining from past tree cutting or branches that were cut down for safety reasons or as part of a fire break.

In the past, landholders were often encouraged to 'clean up' their woody debris for aesthetic reasons, fire risk, increasing the area of land available for agriculture or as a potential harbour for pest animals such as foxes and rabbits. It is often used as firewood and is often seen piled in a paddock for burning

However, coarse woody debris is an important component of a healthy forest or woodland, and a significant contributor to the diversity of birds and other wildlife that live there. It is also a valuable aspect of the ecosystem and can also be beneficial for agricultural production.

The woody material decomposes and releases essential nutrients into the soil. This contributes to the generation of new soil matter and increases soil fertility and health. It also acts as a natural sponge, absorbing and storing moisture and slowing down water runoff, helping to regulate water flow and assisting water infiltration into the soil, as well as preventing erosion, and promoting soil stability.

Coarse woody debris also provides shelter, nesting sites and foraging opportunities for many species, including insects, fungi, small mammals, reptiles and birds, all of which play important roles in decomposition, nutrient cycling and other ecological interactions.



The Flame Robin is searching for insects in and around fallen timber and tree stumps (Rhonda Vile)



Large fallen logs in an open woodland provides valuable shelter, insects and over time, new soil in the landscape (Rhonda Vile)



Substantial leaf litter, small branches and bark cover the woodland floor, and fungi, insects that break down the debris form a vital food source for local woodland birds (Lyndel Wilson)

What about fire risk?

As a fire passes through an area, larger woody debris such fallen branches and logs are slower to ignite than fine material such as dry grass, fallen leaves, twigs, bark and sticks.

In general, fine material burns quickly, and is more likely to carry flames into the upper canopy and is blown further by the wind to create spot fires beyond the fire front. Once ignited, the coarse woody material is less likely to be transported elsewhere, and less likely to create flames that reach up into the canopy. However, they may continue to smoulder for days or weeks after the fire front has passed.

Large logs, especially those with hollows, often provide critical refuges for wildlife as the fire front passes, as well as providing shelter (and sometimes food resources) for birds and other wildlife in the blackened understorey after a fire.

Burnt forest with regenerating understorey (Ryan Kilgower)



In Australia, experimental studies have shown that coarse woody debris has a positive effect on the diversity of birds in woodlands. Ground-nesting birds are more prevalent when coarse woody debris is abundant, and decaying stumps are used for nesting by some hollow-dependent birds, including the threatened Brown Treecreeper and Turquoise Parrot.

Many Australian birds also use coarse woody debris to forage in, as the decaying wood attracts a diverse array of insects and invertebrates that feed upon it. These birds peck and probe at the decomposing wood, extracting wood-boring grubs and beetles to eat. Coarse woody debris can also act as a natural perch for birds, providing vantage points to search for food, and as elevated visible spots for territorial displays and communication.

Some tips and hints for managing the coarse woody debris on your property:

- **Retain coarse woody debris** within the remnant native vegetation on your property, where it has accumulated naturally.

- **Relocate woody debris to areas where it's sparse or absent** Where logs and fallen branches occur in a part of the property that is in the way (i.e. roads or crops), consider using machinery to move it to another part of the property where it is sparse or absent. This could include an area that has been recently revegetated and where the trees are too young to be dropping branches of their own.

- **Spread the debris around, and try to not damage native understorey** As a general rule, it is better to spread the transported woody debris around rather than creating a pile of logs that can harbour pest animals.

- **Obtain firewood from sustainable sources**, such as from non-native trees such as pines, or accredited timber sources rather than removing coarse woody debris from woodland habitats.

Native mistletoe

Importance of mistletoe

Mistletoe is a semi-parasitic plant that grows on host trees and shrubs, drawing its water and nutrients from the host plant, but producing its own energy through photosynthesis.

There are up to 100 species of mistletoes that occur in Australia, all of which are native. Research over the last 20 years has shown that the vast majority of host trees (particularly in remnant bushland) remain in a healthy condition despite having one or a few clumps of mistletoe attached. It is not in the best interest of a mistletoe to kill its host tree — it needs the tree to stay alive for its own survival.

This should minimise landholder concerns that mistletoes are causing tree decline or death on their properties and the belief that, as a 'parasite', the mistletoe must be an exotic pest that needs to be removed.

It actually serves a vital function in forests and woodlands and is considered by many ecologists to be a 'keystone' species (a species that has a extremely large positive effect on its natural environment relative to its abundance, and removing it would have dire consequences).

A key feature of mistletoe plants is their long flowering and fruiting seasons. Due to mistletoes tapping their roots into their host, they can continue to flower and produce fruit even during dry times, making them a dependable resource when little else is available.

This is vitally important for many birds, including the critically endangered Regent Honeyeater and vulnerable Painted Honeyeater.

In fact, a Birdlife Australia Birds on Farms study found that where a landscape contains more than 10 trees hosting mistletoe, there was a 36% increase in the diversity of birds present, including small woodland birds, ground foragers, foliage gleaners, honeyeaters (a two-fold increase) and understorey or ground foraging birds.

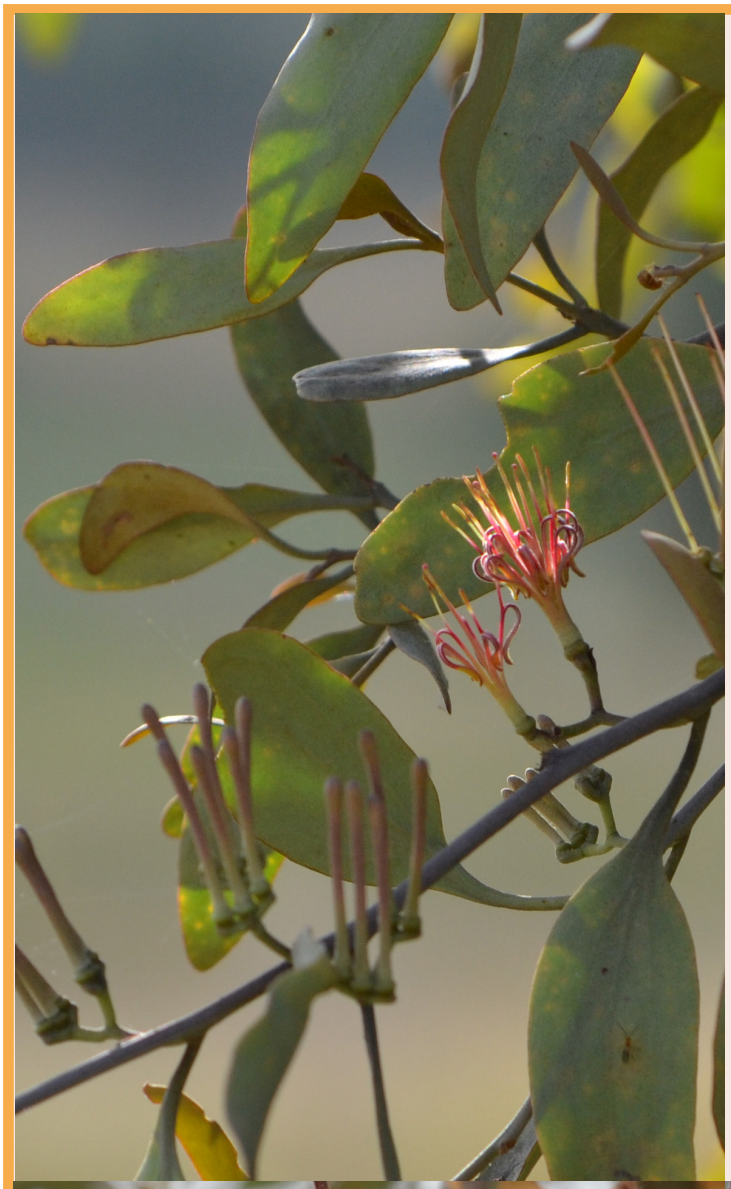
Mistletoes also benefit their host plant. Their leaves generally contain higher levels of water content, and nitrogen, phosphorus, potassium and a range of other elements than those of their host and, unlike regular plants that withdraw nutrients from leaves before dropping them, mistletoe leaves are dropped 'intact'.

This means mistletoe leaf litter is moist and nutrient-rich, creating a valuable layer of mulch beneath each clump. As well as improving the soil structure, this mulch also provides habitat for a range of insects and spiders, which, in turn, are food for birds and mammals. Fires play an essential role in maintaining forest health, including preventing mistletoes from getting out of hand. Mistletoes have no fire resistance and are usually killed by the flames.

In healthy, well-functioning ecosystems, mistletoes are seldom seen in heavy infestations because of this natural control by fire, as well as from predation by native species that feed on the foliage (e.g., possums, gliders and insects).



Naturally occuring mistletoe in a woodland setting (Chris Tzaros)



Mistletoebirds, our native super-spreader

Mistletoes mainly rely on birds such as the **Mistletoebird (*Dicaeum hirundinaceum*)** to eat their fruit and then excrete the seeds onto a suitable host branch. Mistletoebirds have a speedy digestive system — it lacks the muscular gizzard (food-grinding organ) of other birds, instead having a simple digestive system through which the berries pass quickly, digesting the fleshy outer parts and excreting the sticky seeds onto branches.

Germination is also swift; within days, the mistletoe seed sends out a small tendril to 'drill' a hole into the host's outer bark, allowing it to access the host's reserves of nutrients and water. The seed can then germinate quickly into a new plant. In this way, the Mistletoebird ensures a constant supply of its main food.

Thanks to this super-spreader, mistletoes in the landscape also provide important habitat and food source for a range of woodland birds, including the critically endangered Regent Honeyeater, and vulnerable Painted Honeyeater, both rely on mistletoe - a sugar-rich nectar, but also as a structure to build their nest in as it provides protection, and is a very handy food source right at the nest site.

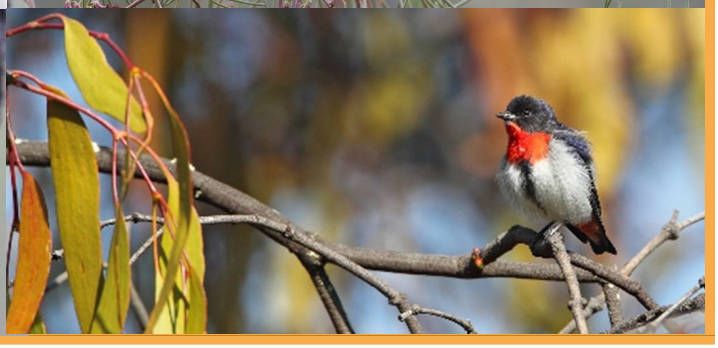
The loss of mistletoe in the landscape has a significant impact on these species, and restoring it, especially in their breeding habitats, is a critical step to their recovery.

Clockwise from top left: Grey Mistletoe in flower (Lyndel Wilson), Regent Honeyeater in Needle-leaf Mistletoe (Peter Goonan)), Mistletoebird on branch (Chris Tzaros), Painted Honeyeater (Mick Roderick), Mistletoebird feeding on mistletoe fruit (Chris Tzaros)









Benefits of mistletoe

Native mistletoe is a beneficial plant in an agricultural setting, despite it's misconceptions of being otherwise.

Some of the key benefiits are:

- It provides animals with food, shelter and (following leaf drop) nutrient rich leaf litter
- It boosts local wildlife population numbers in agricultural landscapes, especially insect eating birds (natures natural pest controller)
- 33 Australian bird species have been recorded feeding on mistletoe fruit, and 41 species on mistletoe flowers
- 245 bird species have been recorded nesting in the core of mistletoe clumps
- Mistletoes very succulent leaves provide valuable nutrients to a wide variety of insects such as beetles, spiders, caterpillars, moths and butterflies
- The leaves are a favourite food for possums and gliders
- Mistletoes have high-water content, making them weighty- resulting in host trees dropping branches (which is beneficial for forming new hollows)
- Dense mistletoe can provide shelter and shade as a cool respite during the day for many animal species, including for stock.



Sticky ripe mistletoe fruit, and mistletoe seedling (BirdLife Australia)

Grow your own mistletoe!

Mistletoe is a super-plant for birds and other native wildlife, and its presence on a property should be encouraged in most circumstances. To protect the health and longevity of host trees that support mistletoe, implement proper tree management practices, such as avoiding excessive pruning or damaging the branches on which the mistletoe is growing.

If mistletoe has disappeared or declined in an area, its return can be fast-tracked by planting seeds by hand. From the preliminary trials, the general steps to follow to achieve good results are:

1. **Collect some ripe fruit** from a local low-hanging clump of mistletoe, ideally with the stem still attached to the fruit.
   Try to pick and plant on the same day if possible or store the fruit (with the stem attached) in small quantities in a container in the fridge. Adding a piece of absorbent paper is also a good idea to prevent moisture and mould affecting the fruit.
2. **Select a suitable host tree.** Avoid very young trees, and always choose a healthy specimen. Then, simply pop out the seed, coated with its sticky surrounds (known as viscin), and wipe it onto the underside of a small branch (choose one that is about as thick as a pencil).
3. **It is important not to place the seeds too far along a branch**, otherwise the mistletoe clump is liable to break off as it grows.
4. Avoid planting the seeds in junctions of branches and avoid planting on epicormic branches (an 'epicormic' branch is one that is growing from a previously dormant bud on the limb or trunk of a tree).
5. **Plant in the outer canopy** of the host tree or shrub to allow enough light to reach the mistletoe seed, and avoid the hot, westerly side of the tree.
6. **Consider bark shed** timing if planting into a host species that sheds its bark annually, and if possible, plant after bark shed has occurred.
7. **Mark individual seed locations** (e.g., with flagging tape, or a spot of paint) or on a photo of the host tree so you can monitor your germination success.
8. **Wait... patiently!** About 90% of mistletoe seeds germinate, but only about 10% may survive to maturity.

Improving waterways, wetlands and dam health

Why waterways are important for birds

Waterways are very important for wildlife for a number of reasons.

The water in rivers and creeks is a vital water source for birds and other wildlife. It sustains 'riparian' vegetation – the semi-aquatic plants and fringing trees and shrubs that grow along the waterway, providing a cool refuge site. The water also supports fish, frogs and much other aquatic wildlife, which, in turn, attracts waterbirds (such as ducks, egrets and herons) and predators like kingfishers and birds of prey such as sea-eagles.

Riparian vegetation acts as a buffer and reduces erosion of stream banks, filters the flow of nutrients and sediment into waterways keeping the water clean, and regulates micro-climates around the waterway (e.g. providing shade) and contributes organic leaf litter to the wetland.

Trees in riparian vegetation are often larger than in the surrounding landscape, such as River Red-gums or large River She-oak, and they often support a greater proportion of hollows.

When viewed in aerial photographs, a characteristic feature of many Australian agricultural landscapes is a winding waterway — often one of the few areas regularly retaining a tree cover among grassy paddocks.

Using the extent of tree cover in riparian areas as an indicator of landscape productivity, recent Australian studies by Deakin University researchers and others have concluded:

- **Generally, riparian areas support a greater abundance and diversity** of woodland birds than adjoining non-riparian vegetation.
- **The diversity of woodland birds is significantly higher when there is remnant riparian woodland present** compared to localities where the remnant tree cover only occur in non-riparian areas.
- **Agricultural areas that contained a greater extent of riparian woodlands lost significantly fewer birds** — this was evident during the Millenium Drought in terms of the variety and abundance — compared to landscapes with little or no agricultural riparian woodland.

As such, riparian areas provide a refuge for woodland birds, and overall enhance their ability to withstand climate extremes.

Riparian areas — especially in agricultural landscapes — tend to be long, narrow strips of habitat across otherwise treeless areas — and provide connectivity across the landscape for a wider diversity of birds and other mobile wildlife, buffering against local population extinctions or declines, allowing wildlife to move and potentially provide new genetic diversity.



Shelter, shade, access to fresh water and food - a healthy waterway with riparian vegetation (Local Land Services)

Assess waterway health

Many waterways and riparian areas have been modified or highly degraded, which reduces their value for woodland birds and other wildlife.

In some landscapes, the presence of tree cover along a waterway is often one of the few remaining areas of native vegetation in an agricultural landscape.

When assessing the health of riparian vegetation for native birds on your property, please consider:

- Waterways retaining native riparian vegetation are significantly more valuable than those where the native vegetation cover is reduced or absent
- A continuous strip of riparian vegetation along waterways is more valuable for native fauna. If there are gaps in the vegetation - small gaps are preferable to large ones.
- Riparian vegetation buffered by other native vegetation, such as forest or woodland, is of higher value than riparian vegetation adjoining open pasture or farmlands.
- In largely treeless agricultural landscapes, wide strips of riparian vegetation are more valuable than narrow ones.
- Riparian vegetation with intact structural layers, including old growth — shrubs, ground vegetation and coarse woody debris, is more valuable than vegetation where the structural layers are either missing or depleted.
- Riparian strips of vegetation with either no access or controlled access to livestock tend to be healthier than ones with unrestricted access (e.g. grazing/browsing and pugging is reduced and water quality is improved).
- Revegetation undertaken beside waterways will provide a greater benefit towards retaining and increasing overall bird diversity (compared to revegetation in non-riparian areas.)



Manage waterways and wetlands for birds

The following actions for managing waterways or natural wetlands on your property will benefit native birds, and will also contribute to overall health of your farm:

- Retain all existing native riparian vegetation
- Retain dead trees, coarse woody debris and rocky areas.
- Using stock-proof fences, implement stock exclusion or restricted access to the waterways within your property.
- Retain woody debris, snags, rocks and other ground-level features
- Undertake revegetation along the riparian zone or wetland fringe to supplement existing vegetation or where layers are absent
- Increase the width of existing riparian vegetation strips through natural regeneration or revegetation
- Increase the level of connectivity to nearby non-riparian woodland habitats.
- Remove woody or aquatic weeds in a staged and environmentally considered way (and if using chemicals, refer to chemicals approved for use in and around waterways.
- Seek advice from a specialist to learn the best approach to control existing erosion issues, including seeking appropriate permits.

Assistance grants from government agencies, water authorities, catchment management authorities, Landcare, etc., are periodically available to landholders that may assist any restoration or repair efforts.



Above: An old River Red Gum provides valuable shelter, nesting hollows and shade (Rhonda Vile)
Left: Azure Kingfisher perches on the river edge, (Matthew Piper, NSW State Government)

Healthy farm dams for birds

It's estimated there are at least 1.7 million small to – medium-sized dams on farms across Australia. They provide water for livestock, irrigation for crops and orchards and domestic water supply. Many dams are no longer in active agricultural use and are either left unattended or are converted for conservation and/or recreation purposes. Collectively, all of these dams create a massive opportunity to manage them to benefit both birds and the broader health of the farms.

While natural wetlands and wetland systems should be conserved on private lands, man-made dams can also provide similar valuable habitat and access to fresh water.

Dams are hotspots for both waterbirds and terrestrial birds — particularly for those farms where access to the dam by livestock is restricted or removed and where native vegetation and other habitat features within and surrounding the dam are encouraged.

Dams offer a reliable source of water, especially during dry periods, providing birds with essential hydration and bathing opportunities.

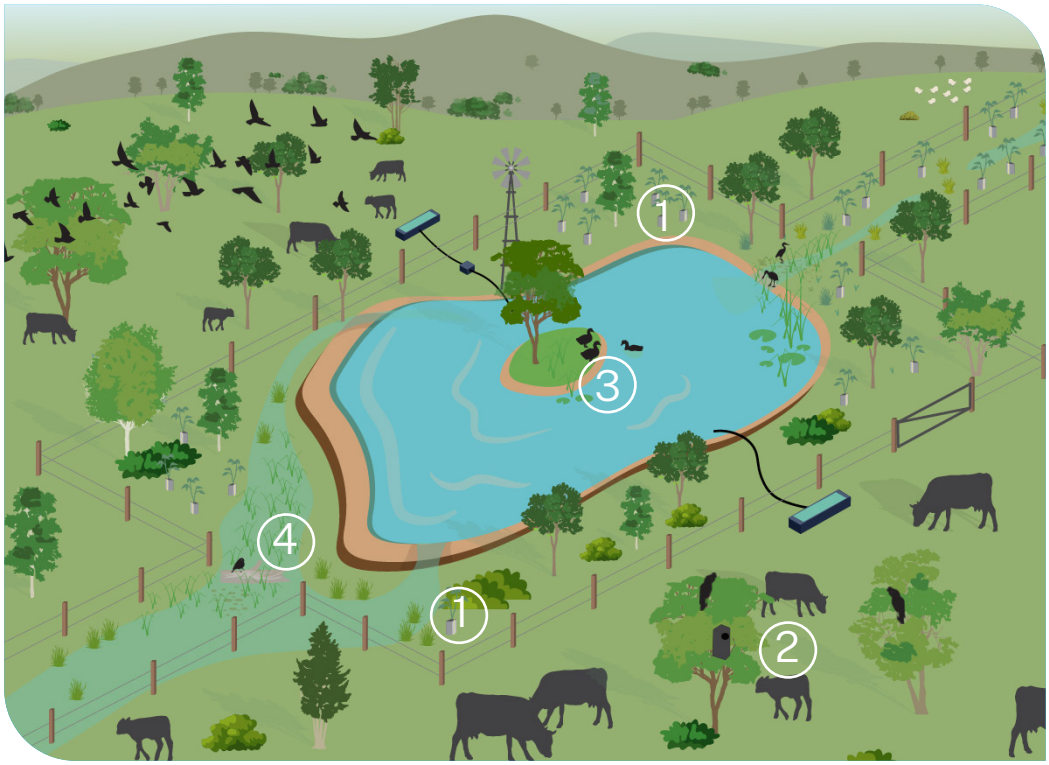
Dams can act as safe refuges within agricultural landscapes, particularly during droughts and in perennially drier regions. They attract waterbirds such as ducks, waterhens, herons and ibis. In turn, many of these species then help farmers by controlling pest insects in the surrounding paddocks and crops.

When dams are managed to promote grassy margins, areas of shallow water and aquatic vegetation, the result is the creation of nesting sites, sources of food and shelter for wading birds, including rare and cryptic species such as crakes, rails and snipe.

Aquatic vegetation can become re-established naturally with the removal of livestock through the installation of fencing or grazing management, but may need assistance with some active planting and ground modification (e.g. to create shallow areas, and sloped banks with a shallower gradient).

You can modify and add features to the dam such as:

1. **Replanting around the dam wall with shrubs and grasses** (avoid trees, so as to not impact the integrity of the dam wall)
2. **Install nest boxes** on nearby mature trees
3. **Install floating platforms or create islands** for breeding/roosting for waterbirds
4. **Add sustainable sources of coarse woody debris** (logs or fallen branches)



Graphic 5: Create a healthy dam as a safe haven and habitat refuge, and cleaner drinking water for livestock in a farm setting. **1. Replanting, 2. Nest boxes, 3. Floating platforms or island refuges, 4. Logs or branches.**

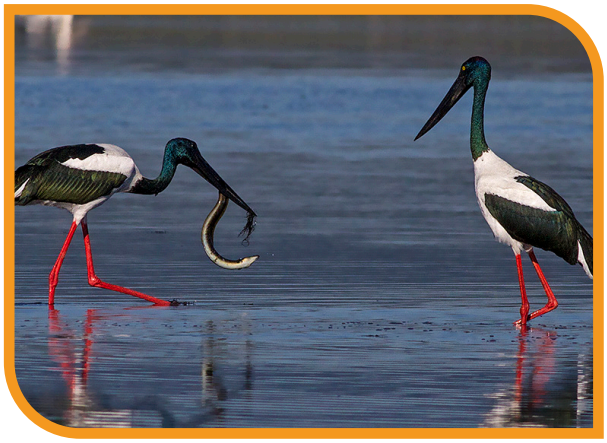
(Graphic adapted from the ANU Sustainable Farms program.)

Promoting terrestrial and aquatic vegetation within and surrounding a farm dam also provides natural filtration of sediments and pollutants, slows runoff and associated erosion during heavy rainfall, and increase the overall water quality within the dam.

Where terrestrial habitat features are established around the dams (e.g. trees, shrubs, grasses, logs and rocks), terrestrial birds will occur in a significantly greater abundance and diversity than in equivalent nearby areas that lack a farm dam.

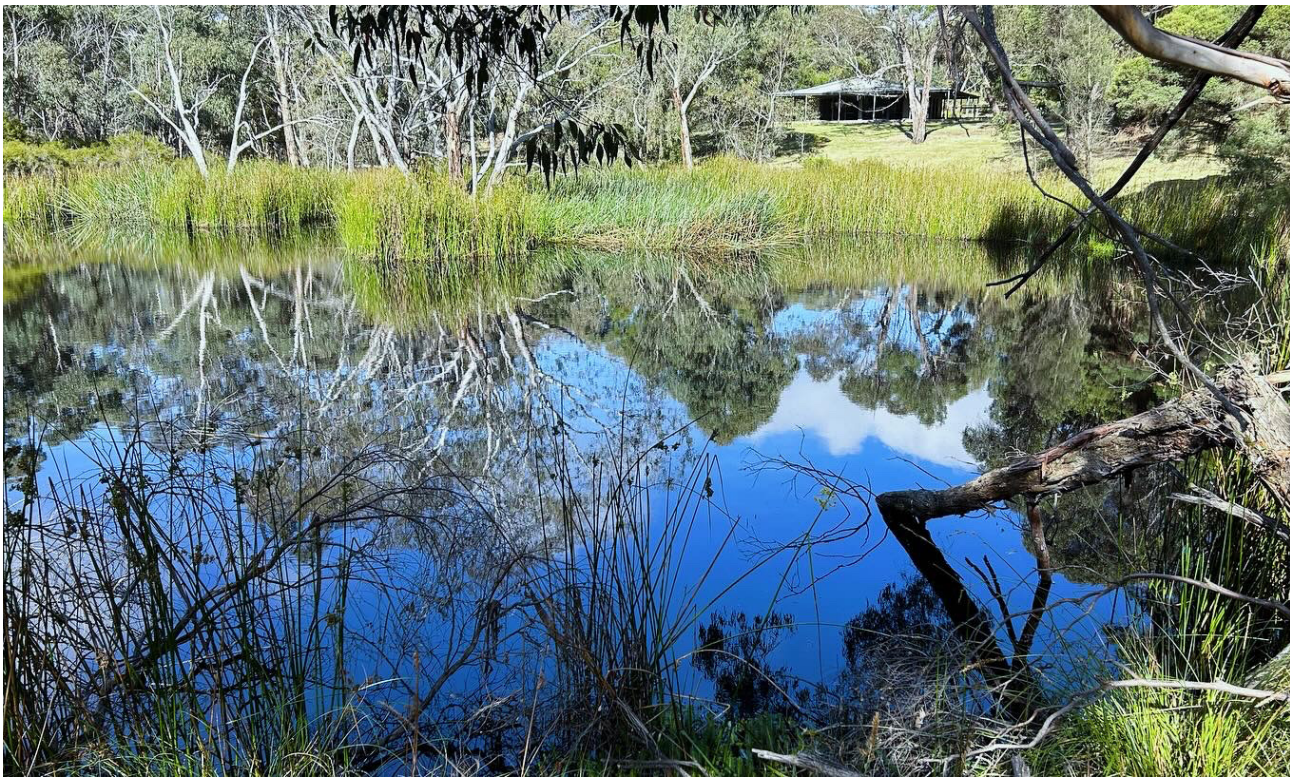
Feral predators are attracted to the increased food availability around dams, so extra effort may be required to suppress their numbers in these areas.

With experience, landholders may wish to alter the water levels in a farm dam over time to mimic the wetting and drying cycles of a natural wetland, which creates habitats for different types of waterbirds, while also promoting favourable conditions for the growth of different aquatic plants and their associated invertebrates.





Top: Black-necked Stork feeding on eel (Rod Warnock), Bottom: Pink-eared Duck (Andrew Silcocks)



Farm dam containing native reeds and rushes, logs and access points, shrubs and trees, hosting insects such as dragon-fly and waterbugs and small fish, providing fresh water and food sources for a range of fauna (Lyndel Wilson)

Farm gardens as habitats and safe havens

Most rural properties with a house are surrounded by a garden. Compared to other parts of a rural property, farmhouse gardens often have the highest diversity and density of birds, and attract species that are often uncommon elsewhere on the property (e.g. Common Blackbird, New Holland Honeyeater, Eastern Spinebill). This is often due to the facts that:

- Farmhouse gardens usually consist of many different plants which provide a diverse range of semi-reliable food nectar and insect sources throughout the year
- The variety of plants (including herb and veggies) and layered structure of the garden vegetation can provide food and nesting sites for many different birds.
- Birdbaths and ponds provide water for drinking and bathing.
- Gardens offer a refuge (as well as during extreme weather), as they can provide a reliable source of food, water and shade.



New-holland Honeyeater attracted to grevillea flowers in the garden (Rhonda Vile)



A pair of Gang Gang Cockatoo seek water at a bird bath on a hot day (Lyndel Wilson)

Gardens can provide nesting opportunities for many small birds, such as fairy-wrens and thornbills, which build their nests in the dense shrubs. Here's some tips to providing a garden that is safe and friendly for birds.

- **Keep domestic cat indoors or contained** within an outdoor enclosure.
- **Train or restrict pet dogs** from designated areas of the garden.
- **Avoid creating habitat around windows**, to reduce collision incidents, and make sure indoor plants are not visible from the outside. Keep a birdbath it within 0.5 metres away from windows to reduce the speed of any impact.
- **Chemicals applied in gardens can inadvertently cause direct harm birds** by poisoning them or contaminating their food.
- **Avoid providing inappopriate food — bread, meat or processed foods**, as these can lead to poor nutrition and health issues for birds. Seed bowls can also become a source of conflict between species and aid the spread of disease. Consider providing garden plants that naturally provides foods (e.g. insects, seeds, nectar) for birds to eat.
- **Bird baths should be elevated off the ground** and located near shrubs or other cover to protect bathing or drinking birds from predators. If a birdbath cleaned and topped up regularly
- **Nectar-producing plants marketed as 'bird attracting' often attract more aggressive species** such as New Holland Honeyeaters and Red Wattlebirds, which chase away insect-eating birds and other smaller species. A garden with a mix of plants with berries, flowers, cones or seed types is preferable, and ensure a range of layers (such as grasses, forbs, shrubs and trees)
- **Include dense shrubs and tussocky grasses** in the design of your garden. These provide small birds with protection from larger, aggressive species such Pied Currawongs, butcherbirds and Noisy Miners and other aerial predators such as hawks, eagles or Kookaburra.



Graphic 6: Grow a bird friendly garden.
1. Low shrubs with flowers, fruit or berries provide shelter and protection next to a bird bath that is off the ground away from predators (such as cats).

2. Native shrubs with nectar sources, such as Banksia, Callistemon provides nectar and insects for pollinators and nectar feeders such as honeyeaters, parrots and other small birds.

3. Ponds with grasses and reeds provide additional access to water for bathing and drinking.

4. Medium native trees with pods, nuts or cones such as Callitris, Eucalypt, Hakea and Wattles provide parrots and other seed eaters access to food.

5. Densely planted shrubs provide shelter and shade, and can be used as breeding sites for small birds, building their nests within the protective shrubbery

6. Low grasses or forbs such as Lomandra, Dianella and small shrubs, planted around the house, including near windows to prevent windowstrike. They also provide berries and seed, and attract insects for little birds such as wrens, robins, thornbills (who are also great insect and pest
controllers around vegetable, fruit or herb gardens too!).

7. Insecticide, pesticide and rodenticide free homes and gardens will also protect scavengers or predators such as owls, butcherbirds, magpies and other birds from secondary poisons.

Compared to most other habitat types on farms, 'house plots' — including their gardens — attract significantly more species of fruit-eating birds (see graph below), foliage gleaners, honeyeaters, understorey specialists, ground foragers and both small and large woodland birds. House plots can also attract more introduced species. Birds that are less common in gardens than in other farm habitats include hollow nesters, ground nesters, aerial insectivores, bark foragers and migratory species.

The BirdLife Australia 'Birds In Backyards' program has been operating for more than 20 years as a citizen science monitoring program. It encourages bird friendly garden practices and demonstrates the benefits of gardens in urban, semi rural and agricultural landscapes.

More about Birds in Backyards:
www.birdsinbackyards.net



Section 3

Managing for threats & pressures to birds and their habitats

With the modification of natural landscapes, such as clearing for farming, development, new infrastructure and the introduction of exotic plants, introduced weeds and pests, a number of threats and pressures face our native species.

This section identifies threats and pressures, and some of the ways a landholder can control or manage and reduce these in the landscape, to directly benefit individual bird species, or the habitat they rely on.

(Noisy Miner birds, Mick Roderick)

Predators and ferals

Impacts of feral animals on birds

The clearing and modification of native vegetation has greatly benefited feral predators, as it has removed or reduced the number of refuges for birds and other native wildlife.

The introduction of feral animals into Australia has caused huge impacts to native wildlife. For example, of the 21 completely extinct marsupials and rodents in Australia, the red fox and cat have most probably contributed to the extinction of all but two (Invasive Species Council Australia).

Feral predators can reduce bird populations substantially by directly preying on eggs, chicks and adult birds. They also exert indirect effects by causing behavioural changes in birds, leading to altered nesting patterns or reduced foraging activity, ultimately impacting their breeding success and survival rates.

Feral cats and foxes have thrived in the Australian landscape since the nineteenth century, and have a detrimental impact on bird populations and overall bird diversity. They are highly effective hunters and pose a significant risk, particularly to birds that spend considerable time on or near the ground.

It is estimated that feral and domestic cats predate on 272 million birds each year in bushland areas across Australia -based on individual cats killing 129 birds each per year (Centre for Invasive Species Solutions, 2024).

Feral pigs are also a threat to many birds as they eat young birds and the eggs of nests near the ground. They are also known to spread disease and damage habitats around waterways and wetlands — with negative consequences for waterbirds and other species using these areas.

Introduced Common (or Indian) Myna birds also wreak havoc on our native birds. They compete for hollows, and displace, kill or destroy nesting birds (adults, chick and eggs). Abundant in urban settings, they are increasingly present in rural landscapes.

Many feral animals, while non predatory, still cause significant destruction of habitat that birds rely on - such as feral rabbit, hare and deer. Their destruction or modification of understorey vegetation, including seedlings and regrowth due to overbrowsing, soil compaction and soil disturbance have flow on impacts- reducing available shelter, seed or food sources, and nesting sites for birds or through competing for resources.



Black Swan defending against a feral fox (Andrew Silcocks)

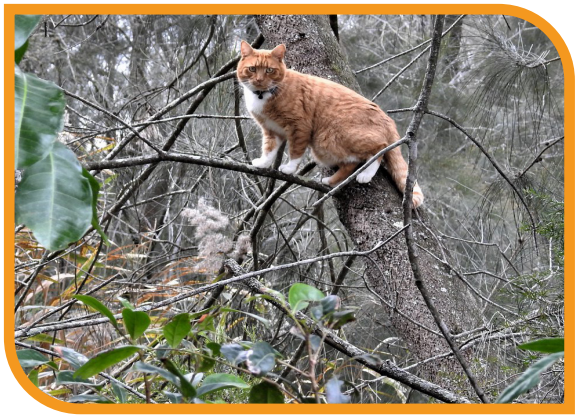
Managing introduced ferals

Landholders have a responsiblity to manage and control feral animals on their land as part of their biosecurity obligations.

A landscape approach to feral predator control is usually more effective than scattered landholders working independently at a property scale, and several government and affiliated organisations provide coordination, training and support to manage pests.

Some approaches to controlling feral predators include:

- **Trapping/Shooting and Removal Programs**: Implementing targeted trapping and removal programs to capture feral cats, pig, Indian Myna deer and foxes. These programs often employ humane traps and skilled operators to safely capture and remove the predators from the environment.
- **Baiting**: The strategic use of poison baits can be effective in controlling predator feral cats and foxes, rabbits, pigs and hares. Specifically formulated baits, such as 1080 (sodium fluoroacetate), or HogGone ((microencapsulated Sodium nitrite) can be used under strict regulations and guidelines to minimise impacts on non-target and maximise efficiency in reducing predator populations.
- **Predator-proof fencing:** Installing predator-proof fencing around sensitive areas can create a physical barrier, preventing feral cats and foxes from accessing and causing harm to populations of native birds. These fences are designed to be impenetrable and are often complemented with monitoring systems to detect any breaches. However, this is an expensive solution and is seldom viable at a farm property scale.
- **Community engagement and education:** Promoting community involvement and education about the impacts of feral cats and foxes on native birds. Encouraging responsible pet ownership, advocating for the use of cat containment areas and providing information on monitoring ferals and reporting sightings (such as to FeralScan or other Apps) or evidence of feral predators can all contribute to a more informed and proactive approach to controlling invasive species.



A free ranging domestic cat hunting for birds in a local reserve, where critically endangered Regent Honeyeaters were observed (Veronika Grether, with permission)



A wild pig causes damage to habitat, but also directly predates on chicks, egg and ground dwelling birds (Local Land Services)



Indian or Common Myna emerging from a nest box, intended for local waterbirds (Andrew Silcocks)

Managing for Noisy Miners

In south-eastern Australia, the Noisy Miner has benefited greatly from modifications to landscapes due to urban development or agricultural clearing. Contrary to popular belief, Noisy Miners are a native Australian species, and are often confused with the introduced Common (or Indian) Myna.

The Noisy Miner's preference for lightly timbered open forests or woodlands with a low or open grassy ground layer, and on edges of vegetation and cleared land (such as paddocks, lawns or cleared areas), combined with their ability to breed throughout the year and their territorial nature has seen their population explode in agricultural landscapes and urban areas.

While many other Australian birds have also benefitted from European-style land management, the Noisy Miner's increase has been particularly problematic for overall biodiversity and ecosystem health in certain areas.



Noisy Miner feeding on banksia in an urban garden (Rhonda Vile)



Studies have shown that the Striated Pardalote is regularly subjected to aggressive and territorial behaviour by Noisy Miner (Andrew Silcocks)

Noisy Miner behaviour

Forming territorial colonies, miners acting as a group, and relentlessly exclude or displace other species of birds, particularly smaller and more timid ones, mounting aggressive attacks on small-to-medium birds and harassment of larger ones, that enter their territory. This behaviour disrupts the natural balance and diversity of bird communities, leading to a reduction in the abundance and variety of other species of birds.

Noisy Miners feed opportunistically and often dominate food sources, outcompeting other native birds for resources such as nectar, insects and fruits. This can lead to a decline in food availability for the other species, further impacting their populations. Numerous studies have shown that the Noisy Miner is a major contributor to the decline of other species of birds, and is hindering conservation efforts towards the recovery of many threatened and declining species.

In 2014 under Federal Legislation, the '*aggressive exclusion of birds from potential woodland and forest habitat by over-abundant noisy miners*' was recognised as a key threatening process to temperate woodland birds, including several critically endangered species.

Trial control programs

Experimental culling trials conducted since 2016 by BirdLife Australia and the Australian National University is being conducted to reduce the local numbers of Noisy Miners to low levels within woodland habitats (below a threshold of 0.5 birds per hectare). So far this has had promising results, with regards to the return of other woodland species following control programs. In particular, experts have carried out strategic culls* of Noisy Miners around their breeding season at select sites for critically endangered Regent Honeyeater, to ensure nesting success for their small population.

However, the response from native birds can also be delayed or influenced by other factors — and there are occasions when a cull of Noisy Miners in a woodland has allowed Noisy Miners from surrounding areas to quickly take over this 'vacant' habitat within a matter of days.

***Note, the Noisy Miner is a native species- and it is illegal to harm or kill individuals without appropriate permits.**

Creating habitat to manage Noisy Miner numbers

To minimise the dominance of Noisy Miners in the landscape or on your property, there are a few long term solutions that can be adopted, that naturally manage the balance of bird species, including competitors such as the Noisy Miner.

- **Enhancing the shrub layer with a range of local native e plants-**particularly spiky ones — but minimising or avoiding species with flowers that are likely to attract Noisy Miners.(such as Grevillea or Bottlebrush) Strips of vegetation dominated by trees can be particularly attractive to Noisy Miners if they are missing a shrub layer.
- **Targeted restoration or supplementary planting of understorey-** In patches of woodland, undertake targeted revegetation to minimise the length of edges. Noisy Miners can particularly favour cleared corners — and therefore plantings in the adjoining paddock which round off the edge can be beneficial.
- **Restore or revegetate with local eucalypts that have small flowers (pollinated by insects)** such as stringybarks, peppermints and red gums. Additionally, increase the proportion of non-eucalypt trees in your plants from among the species of trees that naturally occur in the local area; sheoaks are a good example of an alternative tree that is less attractive to Noisy Miners.

Identification of the Noisy Miner & the Common (Indian) Myna

Noisy Miner (Native to eastern Australia)

Manorina melanocephala

Description: predominately grey body. Black crown and cheeks. Yellow beak and eye patch.

Diet: Insects, small frogs/lizards, lerp (sugar domes), flowers such as grevillea, bottlebrush.

Habitat: Urban environments, gardens, forests, woodlands along south-eastern Australia.

Behaviour: Usually observed in small to large groups. Display territorial behaviour such as swooping or calling loudly, and chasing away other birds (smaller birds, or other honeyeaters)

Breeding: they build small nests of twigs in trees, with 2-3 chicks. Breeding occurs all year round.



Common or Indian Myna (Introduced from south-east Asia)

Acridotheres tristis

Description: predominately brown body. Black crown and cheeks. Yellow beak and eye patch. White spot under wings (noticeable when flying, page 45)

Diet: Insects, fruits and vegetables, scavengers of scraps and cat or dog food, chicken feed

Habitat: Urban environments, gardens, close to human habitation.

Behaviour: Usually observed in small to large groups.

Breeding: Nest in hollows, roof cavities or nest boxes lining with a range of materials, including rubbish. Will evict other species (including parent, chick and eggs), and often build nests over the top of other species.

Breeding occurs in spring-summer.



Noisy Miner(top) and Common Myna (bottom) (Andrew Silcocks)

Fire regimes and risks

Role of fire, and risks for birds

Fire plays a complex role in shaping Australian environments. Fire is a natural and recurring phenomenon that has shaped the continents ecosystems for millions of years, mostly triggered by periodic lightening strike. Over the past 60,000 years(or more) before Europeans colonised the continent, fire was undoubtedly used as a tool in many locations by First Nations people to further shape the vegetation structure and composition of vegetation in many landsacpes. As as result, many Australian plants we see today have evolved to be fire-adapted, with some even requiring fire to complete their life cycles.

Fire can create a mosaic of different habitats, with areas of varying fire intensity and ages supporting a mix of vegetation types, which, in turn, provide diverse habitats for a range of wildlife. However, it is essential to carefully manage fire regimes to balance ecological benefits with the need to protect human life, property and sensitive ecosystems. Not all Australian environments require fire, and indeed many are destroyed by fire (e.g. most rainforests).

Fire regimes may be planned (hazard reduction burns) or unplanned (e.g. high intensity wildfires — either sparked by a natural source such as lightning, or accidental or intentional by human activity).

For the conservation of healthy and diverse populations of birds, fire regimes become problematic when they are inappropriate for the species in the affected geographic area, or in some instances completely absent - allowing vegetation to shift to more mesic or wetter habitat types, that also impacts on the species were adapted to it's former state vs it's present one.



Black cockatoo in burnt landscape (Tania Meuzelaar, courtesy of BirdLife Australia Photography Awards 2020)

Planned fire regimes can be inappropriate for birds and other native wildlife when they:

- Become uncontrolled and unmanageable (that is, they become wildfires)
- Burn vegetation indiscriminately.
- Occur too frequently or not frequently enough.
- Are of high heat intensity, severe and/ or extensive (damage to the surrounding environment, including vegetation)or burn the landscape in a shape or sequence which prevents wildlife from escaping the flames.
- Do not leave sufficient unburnt areas to provide a refuge for wildlife.
- Remove complex vegetation or habitat features that are difficult to replace, such as coarse woody debris, peeling bark, dense shrubs or hollow bearing trees.
- Occur at times that effects breeding, feeding, migration or other crucial activities.

Some species of birds are particularly vulnerable to fire because they:

- Are physically unable to escape fast-moving fires (e.g. poor fliers)
- Rely on breeding habitat that is susceptible to fire (e.g. nest in hollows or on the ground).
- Rely on feeding habitat that is susceptible to fire (e.g. dietary specialists which feed on only some species of plants, such as mistletoe- which is killed outright by fire).
- Rely on structural features of long-unburnt vegetation (e.g. dense shrub layer)
- Occur as isolated populations which can be wiped out by a single, extensive fire.

Fire also interacts with, and often exacerbates, other threats. For example:

- Feral or other predators move into fire-affected areas, with little or no shelter or safe refuges.
- Feral herbivores in fire-affected areas can compete with unburnt vegetation, and impede the regeneration of beneficial plants.
- Weeds can colonise fire-affected areas, reducing habitat quality or preventing the return of suitable habitat.
- Fires can reduce habitat connectivity, causing or exacerbating the isolation of populations. Isolated populations can then be susceptible to extensive fires or disease, and, over time, they can be affected by inbreeding depression.

Planning and fire

Undertaking fire management on private land requires careful planning and consideration to balance the objectives of fire management with the maintenance of biodiversity values.

Unplanned, inappropriate fire regimes (e.g. extensive, high-intensity wildfires) are becoming increasingly frequent.

Although hazard reduction burns can be used in conjunction with other approaches for managing the risk of wildfires, they are not a complete solution and are in themselves a fire risk.

It is recommended that landholders seek advice from the relevant fire authorities in your area to ensure all aspects of fire management are considered (safety, people, assets, biodiversity and location)

Below are some considerations for fire management on rural properties that considers birds and their habitat and requirements, and other biodiversity values:

- **Get to know the wildlife in your area** and their habitat requirements, including relevant information about their relationship to fire management.
- **Develop a comprehensive fire management plan** that outlines specific objectives, strategies, timing and techniques to minimise the impact on biodiversity, drawing on the expertise of specialists on the birds and in fire ecology. However, within this plan, have the flexibility for adaptive management approaches that monitor and adjust fire regimes based on ecological outcomes.
- **Burn selectively.** For example, focus the burn on less productive plants. Leave plants which provide food for birds, and avoid damaging large, old trees, particularly if they have hollows.
- **Conduct hazard reduction burns near the asset** (building or structure) they aim to protect; they are not effective when conducted too far from assets.

Right: A juvenile and two adult south-eastern Red-tailed Black Cockatoo perch in eucalypt forest (Di Vine)

Fire and the Red-tailed Black- cockatoo

The endangered south-eastern subspecies of the **Red-tailed Black-Cockatoo (Calyptorhynchus banksii graptogyne)** occurs in a limited area of south-western Victoria and south-eastern South Australia – with as few as 1500 birds remaining in the wild.

This seed-eating Black-cockatoo has specialised habitat requirements that have been greatly reduced in this landscape over the past two centuries.

One of the key threats to the persistence of the South-eastern Red-tailed Black-cockatoo is extensive and intense bushfires - and inappropriate burning - in the remaining areas of suitable stringybark feeding habitat. Where scorching of the tree canopy has occurred through a fire, it takes an average of 10 years for the stringybark food trees to return to their previous level of seed production.

As food availability is one of the primary factors limiting recovery of the South-eastern Red-tailed Black-cockatoo, any reduction in seed availability poses a serious threat to their survival. To maintain suitable foraging habitat for the species, maintenance of long unburnt habitats and/or a low proportion of canopy scorch in stringybark within any 10 year period are essential to maintain the food supply and recover the Red-tailed Black Cockatoo's population.

For more information on this species and its fire management – visit the website below:
www.redtail.com.au/fire-management.html



Management of livestock and grazing

Livestock grazing is a central activity in agricultural landscapes across Australia, and essential for the livelihood of many rural landholders. While most people think of cattle and sheep, livestock also includes a range of other domesticated species including horses, goats, alpacas, donkeys, pigs and deer, to name a few. These hooved grazing animals have indirect impacts on birds by affecting their habitats.

On working farms, is not usually possible to exclude livestock from grazing all areas or in core remnant native vegetation or other critical habitat features for birds. In some cases, grazing within these areas may have occurred for many decades, where stock seek shade and access to a more diverse range of plants to eat.

Livestock grazing regimes can be tailored to enhance the habitat values of some areas on a rural property — for example by reducing the cover of weedy grasses or reducing the overall biomass of plants to allow a diverse shrub layer and other understorey plants to flourish. Grazing practices, such as rotational grazing, crash grazing and appropriate stocking rates can mimic the natural grazing patterns of native herbivores and positively contribute to maintaining or enhancing biodiversity in some woodlands and forests.

However, livestock grazing can also have negative impacts of bird habitats and overall farm health, including soil erosion, loss of ground cover vegetation and the degradation of water quality in streams and rivers. Additionally, the soil compation by the hooves of livestock can disrupt the soil structure, nutrient cycling and retention of soil moisture. Particularly palatable species of plants can be removed from the system by overgrazing and/or selective grazing. Tree dieback is also likely in high-use areas, resulting from a combination of rubbing, which leads to ringbarking, as well as detrimental increases in levels nutrients (stock and fertilisers) and salinity levels in soils.

Rural landholders can employ various strategies to exclude livestock from areas of important or developing bird habitats, promoting the conservation and regeneration of these important ecosystems. One effective approach is the installation of exclusion fencing, preventing stock accessing sensitive areas permanently, or periodically.

Alternative watering points outside the exclusion area can redirect livestock away from waterways, dams and other hotspots for birds. Providing ample water sources encourages livestock to graze in designated areas while leaving the native vegetation undisturbed; it's generally healthier for the stock, too.



Overgrazing in native vegetation leading to a loss of understorey diversity, erosion and compaction with the shrub layer visibly absent (Rhonda Vile)

Wildlife-friendly fencing

Benefits of stock management

Benefits for farmers to manage or restrict stock from remnant vegetation or revegetation areas include:

- **Natural regeneration,** such as when the shrub layer and native ground level plants are not overgrazed, that will replace old or senescing vegetation;
- **A reduction in the spread of weeds or non-native pasture species** by stock into healthy vegetation;
- **Protected areas will foster a higher diversity of birds**, increasing their pollination and management of insect populations that benefit healthy pastures and crops;
- **Soil is stabilised** in and aroundprotected remnants with intact groundcover, shrub layer and canopy, this also filters runoff to improves water quality; and,
- **Provides shelter and shade for stock** from wind and heat, where healthy vegetation stands are retained near paddocks.

It is also important to prevent stock from entering newly established revegetation or natural regeneration areas — especially in the initial years as the seedlings become established. The young, tasty plantings can be entirely eaten or trampled by stock.

Many restoration sites avoid all grazing or 'rest' sites from grazing for the first 5–7 years, until such a time that the trees and shrubs are sufficiently tall to withstand periodic grazing.

Crash grazing is sometimes used in revegetation areas in fertile landscapes as a tool to reduce excessive ground-level biomass and/or weeds.

For tree plantings, such as shelterbelts - livestock may be able to recommence grazing within these areas after 5-7 years, once plants are big enough to withstand grazing. While these newly treed areas are not as valuable for birds as a restoration (regenerated or revegetated) area that has been set-aside and managed specifically for conservation, they are much better for bird diversity than a barren paddock — and are a neat compromise, allowing good conservation outcomes and ongoing agricultural activities.

Overall, stock also are more healthier, where they have access to shelter and shade where vegetation is conserved or restored on a farm.

Fences are an important tool to manage or restrict access of livestock to areas of remnant native vegetation or revegetation zones.

While the fencing should be of an appropriate design to keep stock out, barbed wire should be avoided for fencing the boundaries of native vegetation, along rivers or designated wildlife corridors wherever possible.

Visibility is one of the main issues for wildlife, as they often don't see the wire in time, and with the sharp barbs, are easily caught as they collide with them.

Birds, in particular, can be injured or killed by flying into the barbs. Fence entanglement is another risk, as birds, bats, and small mammals can become trapped in the wire, leading to injury, stress or death. For some species, such as Emu or other ground dwelling birds, fencing can also be a barrier of movement across the landscape.

Alternatives to barbed-wire

To mitigate the impacts of barbed-wire fences on wildlife, a number of alternate approaches can be taken. Alternate fencing options:

- **Stock-proof fences** can be constructed solely from multi-strand high-tensile plain wire.
- **Electrified fences** are another alternative, but they must be designed to ensure that stock control is effective and wildlife protection is considered.
- **Virtual fencing** is another option, depending on your cashflow.
- **Retrofit existing wire,** replacing top and bottom strands with plain wire- as these are most commonly flown into by nocturnal or ground dwelling species.

To increase the visibility of existing barbed fencing, marking fences with visual cues, such as flags, black polypipe or reflectors, can increase their visibility to birds to reduce the risk of collisions.

Regular fence maintenance and removal and replacement of old or unnecessary fencing with barbed wire to plain wire (in at the very least the top and bottom strands) can also help minimise the hazards to wildlife.

Collision impacts - fencing

The presence of other fences such as chain-mail fencing, or overhead wires can also be a collision risk for many species. Birds that fly fast, fly on dusk or where there's poor visiblity, may have limited vision and collide into fencing, causing entanglement or instant death.

To mitigate the impacts of other fencing and collision, using similar tactics such as flagging tape or reflectors, or for chain mail- providing natural barriers that encourage or direct birds to fly around the structure, such as revegetation with trees/vines.

Rescuing entangled wildlife

If you find an animal entangled, there is still a chance to rescue it. However the longer they are on the wire, the less chance they have for survival. For all rescues you will need to act quickly, and have sturdy gloves, pliers/small scissors on hand, and a towel or cloth to carefully hold the animal still.

Careful covering of the animals eyes/head (with a cloth or towel) will also keep it calm.

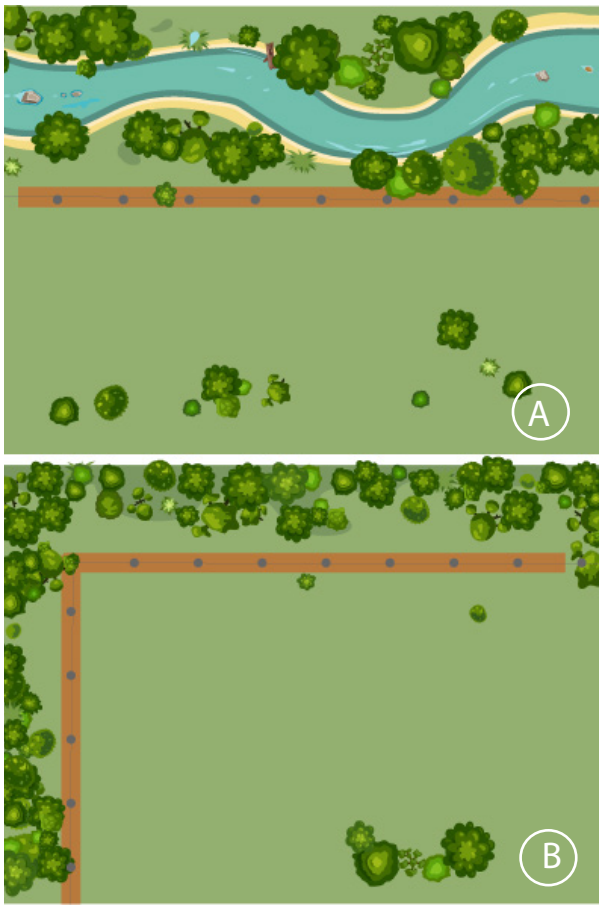
You may need to cut the whole barbed section, and then remove the animal from the barb carefully (in a location easier to work in). If you have successfully disentangled an animal, it may be dehydrated and in shock.

Place the animal in a box with a (breathable) cover in a quiet and cool place, leave a shallow dish with water in the box (do not force-feed animals water-you can drown them). Contact a local wildlife carer or vet immediately.

More information: wildlifefriendlyfencing.org



A critically endangered Swift Parrot, deceased after it collided with chainmail fencing (BirdLife Australia)



Graphic 7: Zones to install wildlife friendly fencing. **A. along the edge of waterways**- that act as natural wildlife corridor areas. **B. adjoining areas of stands of remnant vegetation**, adjoining parks, reserves or travelling stock reserves.





Brolga caught in fence and successful rescue of a Barking Owl from barbed wire (Wildlifefriendlyfencing.org managed by Tolga Bat Hospital, Queensland)

Use of chemical pesticides

As their name implies, pesticides are substances that are designed to control pests. On farms and rural properties, these include rodenticides, insecticides and herbicides. Agricultural chemicals, in particular insecticides and rodenticides, are the cause of most cases of birds being poisoned in Australia.

It is also important to report any incidents of known or suspected poisoning to native birds and other wildlife with the Australian Pesticides and Veterinary Medicines Authority (APVMA), which will assist with reviewing potentially harmful pesticides and developing a better strategy for using certain chemicals in an environmentally safe way.

Rodent control

Rodenticides to control rats and mice have been shown to be harmful to a range of native birds, particularly birds of prey and scavengers. Birds can be exposed to rodenticides either directly by consuming the poisoned bait or — more often — indirectly by feeding on poisoned rodents.

Rodenticides can also 'bioaccumulate' up the food chain, with high-order predators being affected when they eat other larger animals that have eaten poisoned rodents.

The rodent poisons used most often are anticoagulant rodenticides (ARs), which act as blood thinners. Many of the newer ARs on the market are known as second generation anticoagulant rodenticides (SGARs) and have been shown to be the most harmful for birds. SGARs break down slowly in rats and mice (some can stay in their tissues and organs for months, even years) which makes it easy for birds of prey to ingest a lethal dose of toxins, because the chance of eating a sluggish rodent (due to being poisoned) increases, and with each rodent eaten, the bird will accumulate a higher level of poison within its tissues.

Studies in Australia have found SGARs in dead birds of prey, including Southern Boobooks and Wedge-tailed Eagles. Other birds of prey susceptible include owls, eagles, hawks, kites and falcons. Other predatory and scavenging birds, including kookaburras, magpies, ravens, butcherbirds and currawongs, are also likely to be affected by SGAR rodenticides, as well as native mammals (e.g. quolls) and large reptiles (e.g. goannas, pythons).

To protect birds and other wildlife from secondary poisoning (eating a rodent that has taken a bait), it is better to use first generation anticoagulant rodenticides (FGAR). These rodenticides break down more quickly and are less likely to harm birds and other wildlife. It is recommended to purchase FGAR baits that come in block or paste form (rather than pellets) and deliver them in tamper-proof bait stations (available at all major suppliers).

Aternatives to using rodenticides including one or a combination of these options:

- Using traps and lures, such as snap-traps, live traps, non-toxic lures.
- Exclusion techniques (rodent proof wire mesh) and natural poisons (e.g. RATSAK Naturals)
- Maintaining healthy populations of birds of prey by proving adequate bird habitats-trees and dense cover.

More information: www.actforbirds.org/ratpoison#resources-and-actions

Table 2. *Anticoagulant rodenticides, examples of active ingredients and level of harm/threat to birds*

Less harmful First Generation ARs	More harmful Second Generation ARs
Coumatetralyl Diphacinone Warfarin	Brodifacoum Bromadiolone Difethialone Difenacoum Flocoumafen

A Pied Butcherbird eating the remains of a mouse during a plague event, Central NSW (Lyndel Wilson)



Insect or bug control

Toxins within some insecticides used in insect and bug control, have been shown to have significant impacts on birds, particularly those that mainly rely on insects as a food source.

These insecticides include several broad-spectrum (non-selective) insecticides (in the neonicotinoid and organophosphate chemical groups),

Birds can be affected by these chemicals through the consumption of contaminated plant tissues (pollen, nectar, seeds), poisoned invertebrates, contaminated water and via air-borne chemicals carried on the wind.

These chemicals can be moderately or highly toxic to birds, having lethal or sub-lethal impacts which weaken their overall health (e.g. affecting their breeding or growth rates).

Neonicotinoids have also been linked to reduced bird diversity in the United States, and most neonicotinoid insecticides have recently been banned in Europe, where they have been linked to dramatic declines in honeybee populations; they are also under review in New Zealand. Additionally, given that broad-spectrum insecticides are designed to control a wide range of invertebrates, they can also impact insect-eating and omnivorous birds by reducing the abundance of their food resources.

As a result of these direct effects on birds, fewer insect-eating birds in the landscape — and therefore there is also a reduced capacity for them to act as a natural control of populations of pest insects.

Below are some options to avoid and minimise the harmful effects of insecticides on birds and other wildlife on your property:

- **Follow directions carefully** to avoid misuse of chemicals;
- **Avoid broad-spectrum insecticides** if possible. Selective or bio-pesticides are less toxic, as they target specific pest species ;
- **Apply insecticides only when needed.** This will involve targeted control, identifying pests accurately and monitoring their populations and behaviour;
- **Prevent pests from becoming a threat** by using techniques such as selecting pest-resistant plant varieties and crop rotation;
- **Use cultivation techniques** which expose pests to predation or destroy their food, shelter and breeding habitats;
- **Prevent pests from entering an area** using barriers and natural traps (e.g. beer traps for slugs and snails), as well as property-level quarantine regulations;
- **Supress insect pests by encouraging biological methods**, such as promoting or introducing natural predators, parasites or microbial pathogens; seek advice from your state agricultural representatives; and
- **Encourage a healthy population of insectivorous birds** and other native wildlife on your property, and let nature do the work for you!



Natures most loved insect and bug controller, the pouncing robin! This Scarlet Robin found a tasty caterpillar and is hitting it and tenderising it on a branch before eating it (Mitchell Roberts)

Weed threats

Weeds significantly impact on Australian birds and their habitats. Invasive plants can degrade native vegetation, resulting in the loss of critical food sources, nesting sites and shelter for birds. Weeds often form dense thickets or monocultures, that lack the necessary diversity to support a variety of birds. These changes in vegetation structure and composition disrupt the natural balance of ecosystems, leading to a decline in bird populations. In addition, some weeds produce seeds or fruits that are of low nutritional value or even toxic to birds, placing further stress on already declining species. Weeds can also alter the availability of insects, affecting foraging opportunities for insect-eating birds. Some weedy areas are also known to be preferentially used by rabbits, feral foxes, pigs and cats.

To protect birds from both the direct and indirect impacts of weeds, it is essential to implement effective weed management, such as early detection and eradication, control measures tailored to specific species of weeds, and at the same time, the restoration of native plant communities. High quality areas of native vegetation, dominated by locally native endemic species of plants, will almost always be more beneficial to the overall health of birds and other wildlife than areas with widespread invasive weeds.

Herbicides can be an effective, fast and cost-efficient approach to weed management and restoring the integrity of native vegetation. However, care is recommended if you are planning its use, as it can have unintended adverse effects on birds. For example, some herbicides can contaminate the seeds and fruits of the treated plants (example being blackberry fruit), as well as the insects that rely on the treated plants. Always read the Herbicide Label for chemical use, to minimise these impacts.

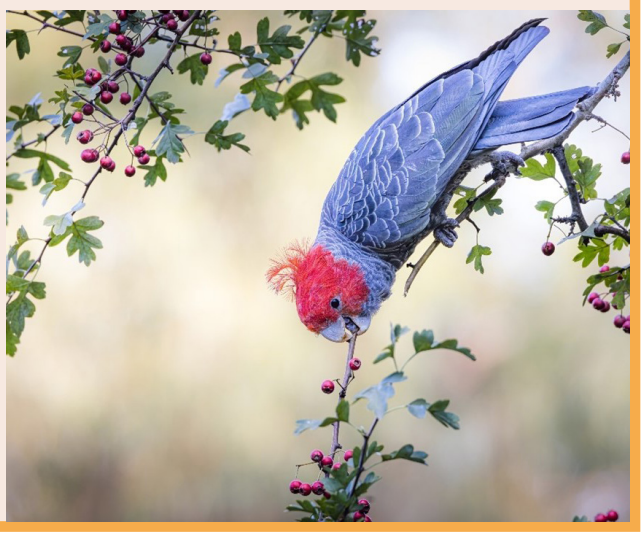
Birds that feed on vegetation or insects that have been exposed to herbicides may be toxic or have reduced nutritional value, leading to negative health effects. Herbicides may also accidentally damage or kill nearby native plants, leading to a temporary decline in habitat condition. In areas where rare or threatened species occur, alternative weed management strategies that prioritise manual or mechanical removal may need to be adopted.

Weeds as bird habitat

It is often raised by land managers that the removal of weeds, particularly woody species with dense cover, edible fruits or nectar-producing flowers, will have a negative impact on birds and other native wildlife that use them. Sometimes this is a legitimate concern — there are a few threatened species that periodically feed, nest or shelter in weeds. For example, the endangered **Gang-gang Cockatoo *(Callocephalon fimbriatum)*** often feeds on the fruits of the Hawthorn tree, a woody weed that infests both farmland and natural environments. However, it's mostly common and widespread birds and other native wildlife that use weeds.

With few exceptions, the long-term benefits from a patch of healthy native vegetation that is free of noxious weeds will outweigh any short-term impacts from their removal. However, if you have concerns about the impact of weed control on the birds and other native wildlife on your property or in your Landcare project area:

- Seek advice from a local wildlife expert (e.g. birding group, government representative, field naturalist club) on the best approach to weed management in your situation
- Establish a process where the gradual removal of weeds is accompanied by concurrent planting of native plants - or facilitated natural regeneration - that provides similar resources or habitat protection
- Undertake weed control at a time of the year that minimises impacts on the target species of birds; for example, once the food resources on the plant are gone, or outside of the bird's typical breeding period



Gang Gang Cockatoo feeding on Hawthorn(Jason Shackleton, BirdLife Australia Photography Awards)

Section 4

Getting started -making your farm bird-friendly

Now that you have a greater understanding of the range of bird habitats and some of the species they support, land and restoration management strategies, benefits and considerations, and threats to birds that can be managed property-by-property, locally or at a regional scale, it's time to get started!

Learn more about the birds on your property, resourcing and other considerations. Link in with local organisations or networks and other options to enable meaningful conservation on your land.



Galah (Ryan Kilgower)

Get to know the birds on your property

One of the best ways to inform management of a farm or property is to get to know the fauna that are present (or absent). Conducting fauna surveys and monitoring species over time, can inform how your actions are benefitting biodiversity, and what specific habitat needs there are, and what is absent and may need additional land management.

Birds as indicators of environmental health

Birds are often used as an indicator of environmental health, and can be used to monitor changes over space, time, in a variety of habitats and under differing management or restoration strategies.

Some of the characteristics of birds that make them valuable indicators of environmental health (Lederer, 2018) include:

- We have a much better understanding of their biology, population, behaviour, habitat preferences and distribution than those of most other animals.
- They occur in most habitats.
- They eat a variety of foods, and collectively rely on and use a broad range of habitats.
- They are diverse, easy to observe and relatively easy to identify by sight and call (without the need to capture individuals to confirm their identification, unlike many mammals, reptiles, frogs and invertebrates).
- Most species are active during daylight hours.
- Their populations respond to changes in the environment.
- There are a many people, both professionals and amateurs, who are skilled in rapid bird identification.

Recent Australian research has also provided greater clarity regarding the link between the variety of woodland birds detected and the quality of woodland health (Fraser 2017). In broad terms, a woodland containing many birds that have specialised requirements (e.g. Chestnut-rumped Heathwren, Varied Sittella) is likely to be of a higher quality than one dominated by widespread generalist species, such as Australian Magpies, Eastern Rosellas, and Noisy Miners.

However, caution must also be taken when using birds as an indicator of environmental health. Birds are generally far more mobile than most other animals, and some birds more so than others, so their presence during a single bird survey provides a low level of certainty regarding a particular species' long-term use of the habitat. They can also be cryptic, and thus accidentally overlooked during a survey. They can have broad home ranges and might therefore be missed because they were in a different part of their home range. Particularly for migratory and nomadic species, their presence or absence is also influenced by factors outside of the property boundaries (e.g. weather, availability of food, time of the year). Many of these challenges of using birds as an indicator of environmental health can be overcome by having a scientifically robust monitoring regime; for example, using a standardised survey method, undertaken at multiple survey sites that are surveyed over many visits.

Establish a bird monitoring regime on your property

The establishment of a bird monitoring regime on your property would provide greater clarity on the positive impacts of management and possibly identify additional areas for further improvement. While there is a moderately comprehensive understanding of bird diversity and distribution across Australia, the level of survey effort is still low, and there's still much to learn- which is another reason to establish your own monitoring regime.

For example, monitoring the birds would provide insights into the environmental health:

- Of the overall property at a single point in time, or across a period of time.
- Within different habitats on the property.
- Within different management zones in the property (e.g. within and outside of revegetation areas)
- Within the property in comparison with the surrounding landscape.
- Of the bird community as a whole, or particular sub-groups of birds (e.g. nectar feeders, woodland birds, waterbirds).

Birdwatching for beginners

About 800 different species of birds have been recorded in Australia. Some are unmistakable, but others are a little more difficult to identify.

Luckily, most of the hard work of identification has already been done. Field guides are books with colour illustrations of all Australian birds, with notes on how to identify them, and other information, such as their distribution, calls and habits. Many of these are also available as Apps on your mobile or in online form.

With a little practice, they are easy to use, and essential whenever you see an unfamiliar bird.

Here's a few of the basics to assist with you familiarising with the bountiful birds on your property, both resident birds and birds that visit or stop by on their way through:

- **Listen** Listening for bird calls will increase your awareness of the birds active in the area. Many online platforms such as eBird.com and iNaturalist, and Birdly include photos and recordings of calls, to cross reference.
- **Watch** Observing birds is the best way to identify them - additional equipment such as binoculars, or for the more adventurous, SLR camera with zoom lense may help ID'ing birds.
- **Make a list** You can simply make a list of birds observed, and add to this over time. Take a note book in the field with you and make notes, and add to a more formal list (Excel or other). You can also record your records over time using the Birdata App* which is a handy repository.
- **Timing** Birds are more active during the morning and evening, especially near water sources such as dams, creeks or troughs.
- **Record observations** You may also benefit from making notes for birds you see, such as nesting, foraging other behaviour or where you saw them, to assist being able to identify them again, and make decisions on your property that benefit them (such as retaining paddock trees where regular nesting occurs).
- **Share your data** Upload your data, or record it in central citizen science tools, such as Birdata, Natural Values Atlas or NSW BioNet - this way the information will be accessible to researchers and decision makers in landscape based conservation initiatives.

It is preferable to wear subdued clothing (no bright colours), and as it's an outdoor activity to also wear a hat, sunscreen and sturdy/covered walking shoes. Be still and quiet, and move slowly (to not scare away birds).

The **Birdata App** developed by BirdLife Australia, allows individuals to record individual bird sightings into a single repository for users. The lists generated include photographs, and includes alerts to species that are unlikely to be on your property, to discourage misidentification. Individuals can upload new sightings at any time, and also use records over time to generate more complete and comprehensive species lists.

The **Aussie Bird Count** is a regular Australia wide bird watching event. It encourages anyone interested in birdwatchingeveryone to record birds and contributes to a national scale bird census, and a great way to learn more about birdwatching through this BirdLife Australia supported initiative.

The Aussie Bird Count App also has a useful Bird ID tool, to help identify birds in your area.



The Aussie Bird Count is a great way to join in a national citizen science program, as well as learning more about birdwatching and birds at your place, a win-win-win! (BirdLife Australia)

Establish your own monitoring program

To undertake monitoring using the standard recommended survey approaches requires a landholder to have a moderate to high level of experience or confidence in identifying birds, or has a friend or colleague with this level of experience who is able to participate in the surveys.

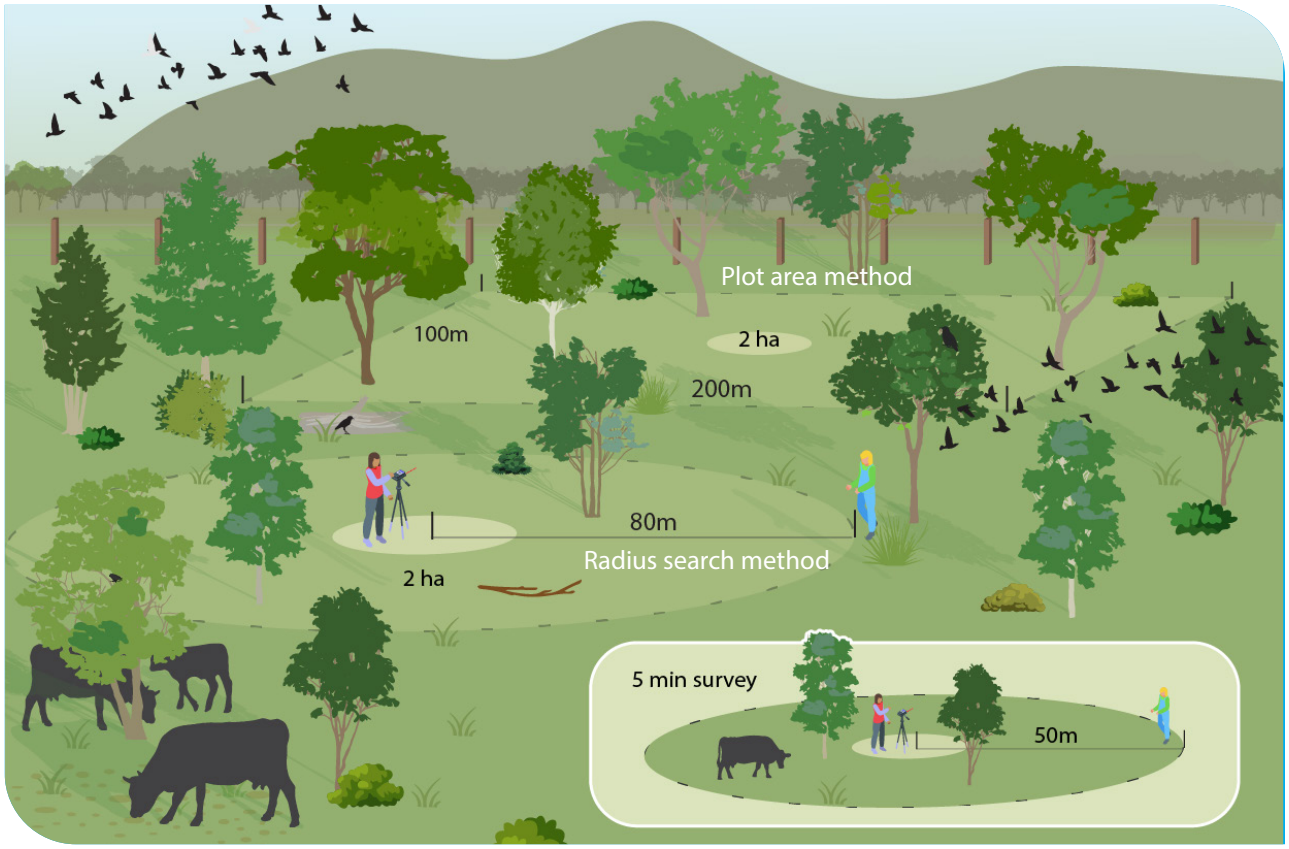
The Birds on Farms team at BirdLife Australia has developed a simple guide on how to establish bird monitoring sites on a property (and for those engaged in the program a Birds on Farms monitoring module is also available in BirdLife Australia's Birdata App). A copy of the guide can be requested from the Birds on Farms team: birdsonfarms@birdlife.org.au.

A standard Birds on Farms monitoring method, that can be adopted on any bird friendly farm:

1. **Identify the different types of habitats on your property** (e.g. grassy paddock, woodland, orchards, waterways and wetlands, farm-house garden, revegetation zone). Aerial photography and online mapping programs such as Google Earth can be useful for this process.
2. **Decide upon a small number of habitats for which you'd like to establish permanent monitoring sites** ('plots') — each covering an area of 2 hectares. Each plot ideally encompasses one main habitat type only. To keep the monitoring effort to be sustainable for the birdwatcher, a maximum of four plots per property is recommended. Provide each plot with a unique name (e.g. 'creek woodland', 'western reveg area'). Long term monitoring of these will provide information on how birds are responding to your bird friendly management actions.
1. **Conduct a 20-minute search across each 2-hectare plot**, recording the numbers of all species seen and heard within this area during the survey. Sightings can be documented by pen and notepad and then later entered into Birdata via the website (birdata.birdlife.org.au/record-survey), or can be entered directly into the Birdata phone app in real time into the General Bird Survey App module (or Birds On Farms for landholders engaged in the program)

2. **Survey frequency**: Any surveys conducted in the plots are of value, and at the minimum are conducated at least once in autumn and once again in spring, and then repeated annually. Additional surveys in summer and winter will add further value - or even more often if you're particularly keen. Surveys undertaken before and after commencing management can help demonstrate the benefits of your conservation actions.
3. **Surveys should be undertaken during the day**, preferably early morning or late afternoon, and preferably not during extreme weather (e.g. strong wind, high temperature, heavy rain). Nocturnal searches can also be conducted, for those with more experience and appropriate spotlighting equipment.

Graphic 8: Examples of 20 minute-2-hectare survey methods-radius and plot searches (and often used alternate 5 minute-50-metre area radius search method)



Case Study: Birds on Farms

In 1995, Birds Australia (predecessor to BirdLife Australia) initiated the Birds on Farms project. A major impetus for the establishment of this citizen science-based monitoring project was to assess how birds were responding to land management efforts by groups such as Landcare Australia, and to use birds as indicators to assess the heath of habitat on farms.

Over a two-year period, 330 farms participated in the surveys, and 430 species of birds were recorded. Around 500 experienced birdwatchers were involved in the quarterly monitoring periods; they were mostly farmers or external birdwatchers who volunteered to assist the farmers. This project covered south-western Western Australia, Victoria, South Australia, NSW, the ACT, south-eastern Queensland and Tasmania. After 20 years, the Birds on Farms project was relaunched in 2017, to build on the successes of the original 1990s project and to re-engage with rural landholders.

Anne Hughes is a Birds on Farms landholder based near the north-west Victorian town of St Arnaud. A passionate birder, Anne has been involved in Birds on Farms since the original project in the mid-1990s.

- **Back in 1982,** Anne observed just nine bird species on her property, with one species observed breeding – Welcome Swallow in the farm shack!
- **In 1996** Anne joined the Birds of Farms project and *"learnt how to do scientifically useful bird surveys."*
- **Over the four decades since 1982**, the almost treeless grazing property has become dense and varied habitat from creek line to Ironbark and Stringybark rises.



- **In 2019** - more than 130 species have been recorded for the property.

  "37 breeding here - Welcome Swallows have been evicted and the shack has become our home."

  "Some species have been rare sightings, such as the one Regent Honeyeater that turned up in 2004 and then in 2019, several Dollarbirds and dozens of Crimson Chats."

  What changed? The property was de-stocked in 1996 and extensive revegetation and habitat expansion works were undertaken, including 40km of direct seeding.

- **2023** – Anne is still doing bird surveys, "quarterly ones for our district (since 2002), Swift Parrot Counts for the long-running project and now, back on my original sites for the new Birds on Farms

"What a lot of work it has been and not only the bird surveys—millions of footsteps and countless hours, three pairs of binoculars and several cameras, but I would never have learnt as much about our bush, our property and the species that live around us if I had not signed up for Birds on Farms in 1996."

BirdLife Australia's Birds On Farms remains active in several locations iacross eastern and western Australia and builds on the decades of work- drawing on citizen science and need to protect habitats for our most threatened birds, a plethora of landscapes and species to ensure the natural environment is protected into the future.

Local birdwatchers conducting surveys on a Birds on Farm property (Rhonda Vile)

Bird networks & groups

Bird community groups

Across Australia, BirdLife Australia is the national not for profit supporting and promoting bird conservation. Nationwide. There are many BirdLife Branches in regional areas, and birdwatching clubs, interest groups or even bird photography groups. By joining these groups, you can connect with other like minded community in your area, some with advanced bird knowledge, or local initiatives or learning opportunities. Several groups will run regular outings or activities, that encourage birdwatching.

This is another great way to learn more about the birds in your area, make new friends and be part of a broader conservation program. Most groups also have online presence, web pages or social media, with information updates, regular events and training and access to resources relevant to the local area.

The grassroots member groups promote local bird issues, community events, monitoring and survey programs and education and lobbying. Joining as a member enables local community to tap into these member groups, learn more about local birds and bird conservation issues, and meet like-minded people.

Landcare or environment groups

Landcare is a nationwide movement targeted at protecting agricultural and rural , urban and peri-urban landscapes.
Joining a Landcare group (or similar community-based group) offers many benefits and opportunities for people who are passionate about conservation and land stewardship.
By becoming a member of a Landcare group, you can actively contribute to the protection and restoration of natural environments in your local area. Landcare groups provide a platform for like-minded people to come together, share knowledge and work together on conservation projects, including restoration such as revegetation, bush regeneration, weed control or pest control.

Joining a Landcare group also offers valuable networking opportunities, connecting people with experts, other local landholders and community organisations involved in environmental initiatives. Moreover, Landcare groups provide educational resources, workshops and training programs to help members develop their skills in sustainable land management.



Birdwatchers survey for threatened birds in western NSW (BirdLife Australia)

Planning for birds

By developing a habitat management plan, landowners can strategically target areas for protection, enhancement and expansion, and thereby maximise the effectiveness of their efforts to benefit birds, other native animals and native vegetation.

Planning allows you to identify key ecological goals, such as restoring specific habitats, targeted actions for particular birds, reintroducing suitable native plants or managing other essential resources for wildlife. It allows landowners to assess the existing condition of the land, identify potential challenges and develop appropriate strategies to overcome them.

Planning ensures that restoration activities align with broader conservation objectives (such as connecting fragmented habitats, creating wildlife corridors or supporting the recovery of threatened species) while integrating agricultural objectives and other uses of the property.

Resourcing on-ground restoration and management

Landholders have access to various funding opportunities to support their conservation activities and contribute to the protection of natural resources on their properties. This can be done through reinvesting profits of the landowner (such as a commercial or other agricultural enterprise), as part of their management of their land, securing external funding, such as grants, participating in offset programs or the nature repair market, or by conducting the labour themselves or with the support of local community networks such as landcare groups and volunteers.

Landholders can also explore partnerships with environmental organisations, community groups and research institutions that offer funding or subsidies for conservation projects. There are also landholder-driven initiatives like crowdfunding platforms and environmental impact investment schemes that provide alternative funding options. Engaging with local land management agencies (such CMA's, NRM's or Local Land Services), agricultural extension services and industry associations can provide valuable guidance and assistance in identifying and accessing available funding streams. By actively seeking and utilising these funding opportunities, rural landholders can obtain financial support to implement conservation activities that benefit both their properties and the broader environment.

Grants or incentives programs

Government programs at the federal, state and local levels offer grants, incentives and funding schemes specifically designed to support landholders in implementing sustainable land management practices. These funding opportunities can cover a wide range of activities, including habitat restoration, weed and pest control, erosion management, fencing and grazing regime change, revegetation and waterway protection. Most require submission of an application, detailed budget and often require cash or in kind matching contributions.

Nature repair market, carbon credit or offset schemes

There are increasing opportunities for rural landholders to participate in the emerging nature repair markets. Participating in these markets provides rural landholders with opportunities to diversify their income streams, improve the ecological sustainability of their farms and contribute to the long-term conservation of Australia's unique variety of wildlife. One example is for landholders to engage with carbon market platforms, government initiatives or local land management agencies that provide guidance and support for people interested in participating in the carbon credit and offset programs, enabling them to contribute to climate change mitigation while generating economic value from their sustainable land management practices. These credits can then be sold to industries, organisations or other people seeking to offset their carbon emissions.

Another example of an opportunity for some landholders is to engage with biodiversity offset agencies, environmental consultants and government bodies to help navigate the requirements, guidelines and monitoring processes associated with biodiversity offset schemes. Appropriate land management practices undertaken in high conservation value habitats can generate biodiversity credits, which can be sold to developers or industries as legislated compensatory measures for impacts on biodiversity elsewhere. Many businesses and individuals are also seeking to voluntarily protect environmental values by purchasing carbon and biodiversity credits.





Grant funded stock fencing installed around a restoration area, and bush for birds program (Hunter Local Land Services)

Conservation covenants

There are statutory authorities in most states which enable people to permanently protect their land for conservation. In general, these are more suited to large properties that contain high biodiversity values and the protection of these contribute to a national network of privately conserved lands. In agricultural landscapes, where land clearing and fragmentation has been extensive, private land conservation is important, and properties that sustain threatened vegetation and species, such as birds, become important refuges or permanent habitat sites.

Covenants are agreements established on property titles, providing time-bound or permanent protection. Trust for Nature defines a conservation covenant as *"a voluntary, permanent, legally-binding agreement placed on a property's title to ensure native vegetation is protected forever. When you put agree to put a covenant on your land, it restricts certain activities that might damage native habitat, including land clearing, planting non-native plants, grazing and collecting wood. The covenant remains in place even if you sell the property, protecting habitat on the land literally forever. Every covenant adds to the area of habitat protected for Victoria's wildlife. It's a bit like creating new national parks — except on private land."*

There are a number of covenanting programs across Australia, such as Victoria's Trust for Nature; Biodiversity Conservation Trust in NSW, federal Biodiversity Stewardship programs and other non-government initiatives such as the Tasmanian Land Conservancy or Australian Wildlife Conservancy. Contact your local State Agency to understand the many options available to you.



Placing a conservation covenant on your private property in Australia holds immense value for the preservation of the variety of wildlife present and the long-term protection of natural habitats. By voluntarily entering into a conservation covenant, landowners make a legally binding commitment to conserve and manage their land in a manner that supports its ecological integrity. This proactive step ensures that the unique environmental values of the property, such as native vegetation, wildlife habitat, wetlands or rare species, are safeguarded for future generations.

Conservation covenants provide a powerful tool for landowners to actively contribute to landscape-scale conservation efforts, enhancing connectivity and creating ecological corridors across fragmented landscapes. They also offer opportunities for collaboration with local conservation organisations, government agencies and neighbouring landholders, fostering a sense of community and collective stewardship. Conservation covenants may also provide landowners with financial incentives, such as tax benefits or grants, and can enhance the value and marketability of the property.

By placing a conservation covenant on their private land, landholders can demonstrate their commitment to environmental sustainability, contribute to the conservation of Australia's unique biodiversity and leave a legacy of conservation for future generations to appreciate and enjoy.

Far left: Farm actively restoring wetland and woodlands through a NSW government grant, Left: Landholders in Hunter Valley, NSW run conservation and landcare activities, and joined a Bush for Birds program (Local Land Services)
This page: Agricultural property with diversity of intact high quality vegetation (Greening Australia)

Time to get started! Make your farm bird-friendly

Now that you have the basics, you can now get started in making your farm more bird-friendly, and ensure that your rural property is sustainable for your livelihood, for the preservation of the natural environment and the natural resources and ecosystem services they provide, and for biodiversity now, and in the future.

Birds are by far the most iconic, loved animals, and provide the sounds of the Australian bush, provide life and movement on a property, and also valuable ecosystem services. Having high or varied bird diversity is general a good sign of a healthy landscape.

Here's a few steps to take to get started, that can go a long way on your journey for sustainable land management, and engaging with local native birds:

- **Start small** Landholders who try to take on too much all at once can be easily overwhelmed. Starting small breaks down the tasks, into more achievable goals. Simple things, like planting shrubs around the house or installing a bird bath or trough costs little, but can provide a lot!
- **Seek assistance** This guide is a good starting point, but if you are new to this, it's always better to get a professional expert to help, or a local expert, such as a volunteer. Get them onto your property if you can, to talk through and see the issues- they can provide great advice, and often link you to local opportunities or networks too!
- **Get to know your property** You may be a new land manager, or have inherited a property, or lived on the property a long time, but looking to manage it differently. Whatever relates to your situation, by getting to know your property and observing changes before you start, can make a difference. Where are birds already on the property, what types, when do you see them? Does the property have natural features, such as watercourses or wetlands (some may only be seen in wet times). Use online maps such as Google maps/Google earth to see your property in aerial view, to also understand how it relates to nearby properties or features.
- **Obtain local information and resources** This guide is general in nature, and cannot provide information that is going to be relevant to your property, your local area and landscape. Seek information such as bird, vegetation or plant guides (species lists), local guides or bird information specific to your area, attend local workshops or training.
- **Record your journey over time** Each small action you take can make a big change. Take photos, record species over time, and monitor your progress- it's very rewarding!
- **Have fun!** Enjoy the experience, bring back the birds and be fulfilled that you are making a difference.





Top: a commonly seen Red-rumped parrot (Ryan Kilgower) Bottom: Landholder workshop in theCapertee Valley on bird habitat conservation (NSW Biodiversity Conservation Trust)



General further reading and references

Local Land Services

www.lls.gov.au
Search for these titles, or search within the 'Natural Resource Management' 'Weeds' or "TSR" category of our publications page or contact your local regional staff (hard copies may be available on request) or search titles online

- Planting your Patch(Hunter/Central West)
- Native Revegetation Establishment Guidelines
- Fenced, but not Forgotten (Hunter/Central West)
- Recognising Habitat Features (Hunter/Central West)
- Breaking down myths about mistletoe
- Rural Living Handbook
- Pest Animal Plan (Northern Tablelands)
- Travelling Stock Reserves, Best Environmental Management Practice (toolkit) (Northern Tablelands)
- Fencing that's friendly to wildlife (South East) www.youtube.com/watch?v=itwGFtidmD4

Other resource publications

- Ten Ways to Manage Natural Assets on Farms (ANU) www.sustainablefarms.org.au/news/ten-ways-to-improve-the-natural-assets-on-a-farm
- Planting Farm Dams (ANU) www.sustainablefarms.org.au/wp-content/uploads/2021/07/Farm-Dam-Planting-Guide-brochure-8.2.pdf
- Stock and Waterways Guide (WaterNSW) www.stockandwaterways.com.au
- Common (Indian) Myna Control Handbook (North Coast LLS) www.lls.nsw.gov.au/__data/assets/pdf_file/0018/1361133/Indian-Myna-Booklet-2021-PRINT.pdf
- Noisy Miner-Challenges in Managing an Overabundant Species (Latrobe University) www.latrobe.edu.au/-LR-LatrobeUni-Birds-Brochure.pdf
- Saving the Regent Honeyeater Conservation Guide (BirdLife Australia)*
- Saving the Swift Parrot Conservation Guide (BirdLife Australia)*

**may be available hard copy from LLS or BirdLife Australia*

Other NSW or related organisation contacts:

- NSW Department of Climate Change Energy and the Environment (NSW DCCEEW) www.nsw.gov.au/departments-and-agencies/dcceew
- Landcare NSW landcarensw.org.au
- BirdLife Australia www.birdlife.org.au
- NSW Biodiversity Conservation Trust (BCT) www.bct.nsw.gov.au

Other websites of interest:

- Wildlife Friendly Fencing www.wildlifefriendlyfencing.com
- Sustainable Farms (ANU) www.sustainablefarms.org.au
- Nest Box Tales nestboxtales.com
- Birds in Backyards www.birdsinbackyards.net
- Rodenticides and pesticides (BirdLife Australia) www.actforbirds.org/what-to-buy-and-avoid
- Threatened Species (NSW Department of Climate Change Energy and the Environment) www.nsw.gov.au/environment-land-and-water/plants-and-animals/threatened-species
- NSW BioNET - search species sightings www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/nsw-bionet
- Birdata App (BirdLife Australia) birdata.birdlife.org.au
- BirdLife Australia Library library.birdlife.org.au

Detailed references and further reading lists

For a detailed list of suggested further reading, references in this publication, please see the separate complete reference list for this publication.

Addendum: Bird-friendly Farms - References 2024.pdf



Vulnerable Superb Parrot feeding on Dodonea seed (Andrew Silcocks)

NSW GOVERNMENT

birdlife AUSTRALIA









Bird-friendly Farms: A guide for rural landholders to protect birds and their habitats on farms in rural landscapes of NSW.