

# Best Practice Guidelines for Enhancing Urban Bird Habitat: Scientific Report



Produced by  
Birds in Backyards Program



# Best Practice Guidelines for Enhancing Urban Bird Habitat

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## **Executive Summary**

The Best Practice Guidelines for Enhancing Urban Bird Habitat consists of two products: a *scientific report* and a series of *guideline handouts*. Taken together, these products aim to provide practical, science-based guidance for people involved in managing urban land. Both the scientific report and the guideline handouts have been designed with a range of key stakeholders in mind. These include environmental officers and local government agencies that make decisions about the management of urban land, landscape architects who design both newly developed and redeveloped urban land, and homeowners who control the design of their own gardens. The seven guideline handouts (available at <http://www.birdsinbackyards.net/spaces/guidelines.cfm>) provide summaries tailored for particular users. The following general conclusions are relevant to all land managers.

The protection of remaining natural areas should always be the number one priority for providing bird habitat, but urban habitats have the capacity to support a range of bird species and become important components of the conservation network. Urban habitats also have value as an education tool, encouraging people to connect with the natural world.

We should aim to provide habitat for those native birds that were once common in the urban landscape but are now in decline. Providing structural and plant diversity (preferably using local native species) is fundamental for supplying this habitat. We should be moving away from the traditional garden of tall trees and open lawn which tends to provide habitat for larger, more aggressive and abundant birds.

While we cannot replicate a large, continuous, nature area of vegetation, and therefore cannot encourage all birds into urban habitats, we can create habitat that can be used by a wide variety of native birds. While preserving and enhancing the remaining natural vegetation and riparian habitats in urban areas is paramount, they should be coupled with the development of a series of corridors connecting these patches throughout the urban matrix. Remediation efforts should be done slowly, and completed over a long time period in order to minimise disturbances to the birds already present and provide them with ongoing habitat. The value of exotic vegetation, including weed species, for birds should be recognised and removal only conducted after new plantings become established.

The value of suburban parks, streetscapes and gardens for providing bird habitat must also not be underestimated. However, the development of suitable habitat that provides a diverse range of structures and different species needs to occur at the landscape scale rather than the individual garden scale. Still, in order to change the culture of gardening in Australia and initiate the necessary landscape scale changes, individual residents should be encouraged to make their gardens bird-friendly. The more residents that create these gardens, the better the neighbourhood will be for birds.

The impact of cats is not yet certain but their threat to wildlife is likely to be greater in suburban gardens close to remnants than in inner city suburbs. Still, we recommend that households use cat-runs or keep cats indoors, not only for the safety of wildlife but also for the cats themselves. Feeding birds should not be encouraged, especially of carnivores, as this can result in an over-abundance of a few more aggressive species which dominate, and may result in a loss of smaller species. Instead, emphasis should be placed on creating a bird-friendly garden through planting. However, it is recognised that for many people, feeding birds is the only contact they have with wildlife and it can therefore be an important part of their wellbeing. In this case, feeding areas must be kept clean and only good quality seed or nectar mix should be provided. There is evidence that some artificial foods can spread disease and are nutritionally poor. The provision of bird baths and nest boxes in a garden can prove not only valuable for the birds, but a great way to educate homeowners, as long as usage by introduced species is monitored, and hygienic practices are followed.

Establishing an emotional connection with our urban wildlife is important for implementing long term management change at the whole spectrum of scales; the city, the suburb and the individual household level. All people who make management decisions about our urban landscape, whether they are developers, local council employees or residents, can benefit from education about the value of these habitats and the best way to manage and conserve them for native birds.

## **Part 1: Preface and Background**

### **Site Assessment Features**

Birds are particularly good as environmental indicators because they:

- live in almost every type of environment in Australia and occupy many different niches (places or roles) within those environments
- are often at the top of the food-chain and are therefore very vulnerable to accumulating chemicals
- have representatives that depend on the full range of animal and plant diets
- are easy to see and observe
- are already relatively well-known and documented, providing a good baseline against which change can easily be monitored

### **Preface**

Australia is a highly urbanised country and the rate of urban development continues to increase. Today over 12 million Australians live within capital cities and their suburbs, and a further 3.6 million in coastal towns and regional cities. As these towns and cities expand, natural vegetation is cleared and replaced with roads, buildings and related infrastructure, leaving much of our native wildlife unable to adjust to this new habitat. This loss of biodiversity as a consequence of urbanisation is of great concern, and while no amount of remediation will be able to exactly recreate a natural ecosystem, urban habitats can be made more suitable for a range of native species. In turn, this can have great benefits for us all.

Birds are often used as indicators of the health of ecosystems (i.e. bio-indicators). Since an appropriately diverse ecology is needed to support a healthy number and range of species, a lower than expected number or range of species in an environment indicates poorer ecological health.

Birds can also help achieve environmental education outcomes. Many of the bird species that visit urban areas are highly valued by the general public and there is a collective sense of responsibility to ensure their survival. Species such as the Superb Fairy-wren (*Malurus cyaneus*) or Red-browed Finch (*Neochmia temporalis*) are particularly iconic birds and can be included in programs such as Birds in Backyards to encourage people to become involved in conservation in urban areas. Such community-based research and education programs are some of the best ways to initiate change in our urban landscape, whether through identification of iconic species or simply through recognising and enjoying the every day native birds in our backyards.



## **How to Use the Guidelines**

The Guidelines for Enhancing Urban Bird Habitat Project has produced two products: a *scientific report* and a series of *guideline handouts*. Overall both products aim to provide a practical approach for those involved in and responsible for modifying urban land, from local councils managing remnants and public spaces through to the private homeowner creating a garden. The principles we are presenting examine a variety of practices that impact on urban birds in general and, as such, should be applicable to towns and cities throughout the whole of Australia. Of course, there is often no single 'correct' way to do things and specific information about sites or circumstances should always be considered. We are aiming in both this scientific report and in the guideline handouts to provide the basic information about what we know affects birds in urban areas and recommendations on how to minimise and manage these impacts.

### **What is the basis for these recommendations?**

Until now, there has been no document or location consolidating all information about creating and managing urban bird habitat. Similarly the results and recommendations of many scientific studies are not readily available or accessible to the people who can make the best use of them. Therefore the scientific report we are presenting here will examine the major threats to birds inhabiting urban areas, and broad issues of bushland and urban matrix management to provide practical recommendations.

The scientific report and guidelines handouts are the result of an extensive review of scientific studies, using their findings as the basis for the recommendations. This scientific report has been reviewed by members of the scientific community, and assessed for utility and practicality by a review committee consisting of local government officers and environmental managers. It should be noted, however, that much more research is needed about how birds are affected by urbanisation and we have highlighted throughout the document where such gaps in the literature exist.

## Who should use the scientific report and the guidelines handouts?

Both the scientific report and the guideline handouts have been designed with a range of key stakeholders in mind. These include environmental officers and local government agencies who make decisions about the management of urban land, landscape architects who design both newly developed and redeveloped urban land and homeowners who control the design of their own gardens. We have created seven guideline handouts aimed at these users: open space managers, urban planners, bushland managers and bushcare volunteers, street tree planners, landscape architects, schools and domestic gardeners. The seven guideline handouts are available on our website (<http://www.birdsinbackyards.net/spaces/guidelines/cfm>).

We have divided the scientific report into a number of sections based on the most important factors that influence urban birds and also on different habitat type. Therefore different sections are applicable to different users. The *Preface and Background* outlines the different types of urban



*Photo: These Guidelines are aimed at a wide audience. From local council employees through to homeowners  
Photographer: R. Major, Australian Museum.*

birds and what urbanisation is doing to birds in general. It is applicable to all users of the document. *Part 2: How to Undertake Habitat Restoration for Birds* provides information on how to go about managing any urban habitat for birds, generally dealing with larger scale management and factors that must be considered in order for restoration to be successful. Again this section provides information that can be used by all readers though much of the planning information is aimed at managers of large scale habitat rather than domestic gardeners. *Part 3* through to *Part 6* deals with a range of habitats managed

by local governments, planners and landscape architects whilst *Part 7: Domestic Gardens* is designed principally for the home gardener, providing information on how to create and manage a bird-friendly garden.

## Background

### What do all birds need?

First and foremost, birds must feel safe in their environment, and while the amount and type might vary greatly, all birds need food and water, shelter and a place to nest, whether that is a dense thicket, tall tree or hollow. Most of these requirements can be met by the availability of suitable



Photo: A Willie Wagtail (*Rhipidura leucophrys*) nest on a grape vine.  
Photographer: R. Major, Australian Museum.

vegetation, whether that is a large tract of remnant forest or a suburban area. In a fragmented environment the size of these habitat patches, and their connectivity to one another, is also important as most birds will need to travel considerable distances to find mates, avoid predators and search for food. The specifics of these habitat requirements are dependent upon the type of bird, but the guidelines will present generalised assessments of how to remediate urban habitats in order to create a bird-friendly environment.

### Urbanisation and its effects on birds

The process of urbanisation removes, fragments and isolates natural vegetation, replacing it with roads and buildings and it introduces exotic plants, predators and competitors to the native wildlife. The result is typically a landscape vastly different from the original, with the original vegetation often surviving only in small pockets scattered throughout the city. It is unsurprising that, given the dramatic impact that urbanisation has on the natural environment, some bird species simply cannot make the transition into urban areas<sup>(7, 31, 36)</sup>. However urban environments are not totally devoid of vegetation, with remnant patches of bushland, parks and suburban gardens all forming suitable habitat for a range of native bird species. There is a range of native birds that can cope in these new habitats, and some live more successfully than they did in their traditional habitat. Medium and large bodied-species such as the Pied Currawong (*Strepera graculina*), Australian Magpie (*Gymnorhina tibicen*), Rainbow Lorikeet (*Trichoglossus haematodus*) and Noisy Miner (*Manorina melanocephala*) are increasing in number in urban habitats<sup>(2, 3, 4, 6, 39, 41)</sup>. The popular urban park and garden design of open lawn space and tall trees is most reminiscent of natural woodland habitats and the addition of exotic plants that produce large crops of edible berries has created ideal food sources for some birds, but fails to provide an appropriate vegetation structure required for many others<sup>(5, 8, 30, 36)</sup>.



Photo: Common members of many Australian urban bird communities. Clockwise from top left: Pied Currawong (*Strepera graculina*), Australian Magpie (*Gymnorhina tibicen*), Noisy Miner (*Manorina melanocephala*) and Rainbow Lorikeet (*Trichoglossus haematodus*).  
 Photographer: R. Major, Australian Museum.

Thus, while some native birds are increasing in number in our urban environment, scientists have noted that small birds appear to be in decline<sup>(18, 33, 36)</sup>. Vegetation structure<sup>(30, 33, 36)</sup>, vegetation composition<sup>(8, 18, 19, 21, 25, 33, 40)</sup>, distance to natural vegetation<sup>(8, 30)</sup> and interactions with other birds<sup>(29, 33)</sup> have all previously been shown to influence the composition of the bird communities of urban habitats in Australia and are suggested to be contributing towards the decline of our smaller natives. Many of our native birds require a shrubby understorey<sup>(20)</sup> or the presence of remnants of natural forests near urban areas<sup>(36)</sup> to survive. Only through such restoration of these habitats and the management of threats, such as domestic and feral animals, can we halt the loss of our native birds.

It should also be noted that the composition of urban bird communities is not uniform across the urban landscape. Habitat characteristics at a local scale play a large part in influencing community composition. For example Australian Magpies and Willie Wagtails (*Rhipidura leucophrys*) are found in areas with little canopy cover and an abundance of open lawn<sup>(33, 41)</sup>, but Rainbow Lorikeets prefer suburban habitats with an abundance of flowering native trees and shrubs<sup>(13, 14, 37)</sup>. Conserving and enhancing urban bird populations (particularly through encouraging less common species) is largely dependent

on the development of structurally dense habitats (both remnant and within the urban matrix) preferably comprising local native plants (11, 16, 18, 19, 31, 32, 33, 35, 36, 40).

The fragmented nature of our existing urban environment means that we can never restore a traditional bird community in our urban habitats. The exception to this may be in large (> 50 ha) remnants of native vegetation within urban areas where the original community is largely intact. Instead, most urban bird communities are now dominated by medium to large-sized omnivores and nectarivores with many smaller bodied species being much less common and apparently in decline. We should, therefore, be aiming to provide a habitat for these smaller birds through remediating human-dominated landscapes by minimising the further removal and fragmentation of natural vegetation and replacing missing habitat components.



*Photo: Little Wattlebird (Anthochaera chrysoptera) feeding on a hybrid grevillea. Large honeyeaters like these are abundant in urban habitats.  
Photographer: R. Major, Australian Museum*

## Categories of Urban Birds

The birds that live in urban areas may be categorised into three broad groups of birds, on the basis of their ability to live in the types of general habitat available:

- *Urban Specialists* – these are birds (usually medium to large bodied omnivores, nectarivores and frugivores) that are now more common in urbanised environments than in their traditional habitats. They include species like the Pied Currawong, Australian Magpie, Noisy Miner, Rainbow Lorikeet, Australian White Ibis (*Threskiornis molucca*) and Laughing Kookaburra (*Dacelo novaeguineae*).



Photo: Australian White Ibis (*Threskiornis molucca*).  
Photographer: R. Major, Australian Museum



Photo: A family of Laughing Kookaburras (*Dacelo novaeguineae*).  
Photographer: Margaret Uhr.

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- *Remnant Specialists* – these are birds that are found in large remnant areas of vegetation and are largely reliant on these for survival. They occasionally visit urbanised habitats (like suburban gardens) that are located near remnants but are unlikely to ever become residents of urban habitats given their requirements and the current urban vegetation. They include smaller insectivorous and nectivorous species such as the Grey Fantail (*Rhipidura fuliginosa*), Golden Whistler (*Pachycephala pectoralis*), Eastern Yellow Robin (*Eopsaltria australis*), Striated Pardalote (*Pardalotus striatus*), Scarlet Honeyeater (*Myzomela sanguinolenta*) and White-throated Honeyeater (*Melithreptus albogularis*)<sup>(7, 31)</sup>.



Photo: Eastern Yellow Robin (*Eopsaltria australis*).  
Photographer: Bob Ravich

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- *Urban Generalists* – these are birds that use both urban and remnant habitats. They usually show some dependence on remnants but can also occur in urban habitats. However, they are unpredictable in abundance in the urban matrix and, in conjunction with the remnant specialists, are thought to be in decline. These are the species within urban habitats (particularly gardens and parks), for which efforts should be made to secure their populations. They include small insectivorous or nectarivorous species like the Superb Fairy-wren, New Holland Honeyeater (*Phylidonyris novaehollandiae*), and Eastern Spinebill (*Acanthorhynchus tenuirostris*).



Photo: A male Superb Fairy-wren (*Malurus cyaneus*).  
Photographers: Wojciech Dabrowka and Kevin Vang



Photo: New Holland Honeyeater (*Phylidonyris novaehollandiae*)  
Photographers: Wojciech Dabrowka and Kevin Vang



## Fragmentation: The Noisy Miner Effect

The nature of a disturbed urban habitat means that fragmentation-specialist species (both native and non-native) are very successful colonisers of this habitat. Throughout the guidelines we will refer to the impact that Noisy Miners (*Manorina melanocephala*) are having on bird assemblages as a result of their aggressive exclusion of other bird species. While Noisy Miners are limited to the eastern states of Australia, their influence provides a good example of the effect that an aggressive species can have. We feel that this impact warrants close attention, given their apparent influence over the composition of bird assemblages. This colonial honeyeater species is increasing in abundance, with a 15% increase in reporting rates in NSW documented by Birds Australia volunteers in 1998-2001 compared to 1977-1981, and a 10% increase nationally<sup>(2, 3, 4, 6)</sup>.



Photo: Noisy Miner (*Manorina melanocephala*)  
Photographers: Wojciech Dabrowka and Kevin Vang

While traditionally living in eucalypt woodlands and forests, particularly along their edges where there is little understorey and an open canopy, Noisy Miners have invaded rural habitats as well as urban areas where similar habitats exist. The ability of this species to aggressively exclude small birds from their territories has been well documented, particularly in rural and woodland settings<sup>(12, 13, 15, 17, 22, 23, 24, 26, 27, 28, 34)</sup>. However in recent years, their impact in urban habitats has also been examined<sup>(7, 9, 10, 32, 33, 38, 42)</sup>. A Birds in Backyards survey conducted throughout Greater Sydney in 2000 found that gardens that had Noisy Miners were less likely to have any of seven small bird species abundant elsewhere<sup>(33)</sup>.



*Photograph: The Gunn's garden in Victoria has a Eucalypt canopy and open grass and is ideal Noisy Miner habitat. Photographer: Diane Snape from The Australian Garden by Diane Snape (Bloomings Books 2003).*

Any remediation work in urban habitats where Noisy Miners are observed, including remnants, corridors or parks and gardens, should expect this species to influence the bird community that is present. Noisy Miners, however, tend to occur in higher densities in fragmented habitats with a thin canopy, little understorey and a high proportion of eucalypt trees <sup>(7,10, 24)</sup>. There have also been suggestions that high nectar-producing Australian cultivar shrubs (especially Grevilleas) have promoted their dominance in urban areas <sup>(10, 36)</sup>, although this has not yet been supported by research <sup>(1,16)</sup>. In Section 3.2.1 we provide recommendations on how to create habitats undesirable for this species in an attempt to minimise their impact.

## Goals for restoring bird habitat in urban areas

The Birds in Backyards Program believes that in order to conserve urban wildlife habitat we need to promote interactions between people and wildlife and foster awareness of environmental values which will lead to behaviour sympathetic to the conservation of biodiversity. Some examples of objectives/goals, for which implementation details will be provided in the next section of this report, include:

1) *Improving the habitat value of areas of community land*

These larger 'green' spaces have the potential to support a range of bird species, although many will require remediation in order to provide high quality habitat. Planting with a diverse range of local native species, weeding (cautiously and slowly), allowing some grassed areas to grow (to provide seed for granivores where they are members of the bird community) and creating structural diversity, are some ways to create good bird habitat. While these areas may never be suitable for breeding, they are important to provide habitat for migratory or non-sedentary species, especially in the wake of catastrophic events, such as bushfires.

2) *Building the landscape-level ecological function of a vegetation remnant*

Rebuilding linkages between high-quality bushland remnants, and other patches of vegetation scattered throughout cities by:

- (a) restoring riparian and other corridors.
- (b) targeting private gardens along potential linkages to create extensive corridors.
- (c) improving permeability of edges by planting rather than using solid fences to allow birds to better access urban areas.

Such corridor linkages may also have a critical role in response to predicted climate change.

3) *Community education*

Community awareness about biodiversity issues can often be enhanced by focussing on well-known species that are in decline and developing aims for conservation of locally iconic species. Creating community interest is necessary to ensure the long-term success of remediation efforts.

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## **Part 2: How to Undertake Habitat Restoration for Birds**

The following section provides information about major impacts and management considerations, and is especially applicable to public land and locations where new developments are planned. The creation and maintenance of wildlife habitat should be a primary aim in any remediation work. This section outlines key considerations for successful restoration works undertaken to restore bird habitat.

### **2.1 Planning and Site Assessment**

#### **2.1.1 Plan of Management**

Prior to commencing any remediation or revegetation, a Plan of Management for the site should be created. Such a plan should outline the objectives of the management strategies and clearly identify the proposed actions to be undertaken and the sequence in which they will be completed. This ensures that all stakeholders and personnel involved in the restoration of the habitat are working towards the same goals and have appropriate practices in place.

Following the creation of this Plan of Management, action plans can then be formed. These provide specific information about techniques to be employed and detailed restoration actions needed, timeframes and benchmarks, as opposed to the overall aims of the Plan of Management. As work progresses these action plans must be revisited and updated.

## Plan of Management Design

Both Plans of Management and action plans must be carefully designed with a number of things considered prior to their inception.

- When working with large scale habitats (such as developments, bushland and parks), remediation efforts should have input from people with suitable experience in ecology, specifically in restoration. One of these people should also have the ability to assess which bird species are being targeted by comparisons of the current assemblage with historic records or nearby larger native habitats.
- The management and action plans should include a realistic assessment of what can be done but also maintain a flexible approach to the implementation of the strategies employed. They should be revisited and revised whenever necessary.
- Requirements under state conservation acts such as the *National Parks and Wildlife Act (1997)* and *Threatened Species Conservation Act (1995)* in NSW and equivalent acts in other states and territories must be considered and incorporated in to the plans of management and action plans.
- The landowner must be identified. Those plans of management for habitat on council or community-owned land need to be in accordance with the *Local Government Act (1993)* and the *Land Amendment to the Act (1998)*. If the land has other ownership then other requirements may need to be fulfilled.
- They must include plans for ongoing monitoring and evaluation of the project with outcomes as measured against original plans. Documentation of this process should also be kept for future reference and to provide information for other projects.



### **2.1.2 Site Assessment**

Prior to the commencement of any remediation work, and as a part of the Plan of Management, an assessment of the site should be conducted. This assessment is used to identify the type of work required to remediate the site and direct the work program. Wherever possible it should be completed by individuals who have experience and extensive knowledge about the plant communities within the site and any impacts that may be detrimental to them. Employing such individuals should occur when large-scale land management is involved.

#### **Site Assessment Features**

Key features indicating the health of a site, and therefore the amount of remediation needed, include:

- The extent and quality of native vegetation available including the diversity and abundance
- The structural complexity of the vegetation. More layers available such as leaf litter, fallen logs, understorey and canopy suggest that more wildlife will be able to live within it
- The type of pollination and dispersal mechanisms required by the plants (persistence and ease of the pollination of flowers or the spread of seeds as well as the use as food sources for fauna)
- Soil condition (natural or use of filling)
- Remnant size and connectivity (to be discussed later)
- Weed types and degree of infestation
- Current and past land use as well as disturbance and fire history
- Presence of other disturbances both within the site and adjacent to it

### 2.1.3 Identifying Fauna and Faunal Habitat

The presence of fauna and their habitat requirements must be considered in the site assessment, as the creation and maintenance of faunal habitat should be a primary aim in any remediation work. While these Guidelines focus on birds, reptile, frog and mammal surveys are all relatively easy to complete. Identifying the invertebrates (or at least major functional groupings) within the site is also important given the range of bird species (and other fauna) that is dependent on them as a food source, not to mention their role in the ecosystem as decomposers and pollinators.



*Photo: Invertebrates such as this cicada provide an important food source for many bird species.  
Photographer: R. Major, Australian Museum.*

Establishing baseline data about what is present prior to remediation allows comparisons to be made throughout and after the restoration and can be considered to form part of the measurement of success of the project. This work should also aim to ensure that faunal habitat is not destroyed during the course of restoration and important plant-animal interactions such as pollination and seed dispersal, that are crucial to the long-term health of the site, are not disturbed.

The importance of habitat features to bird communities and methods of creating habitat and minimising impacts will be discussed throughout the Guidelines.

#### 2.1.3.1 Bird Surveys

Establishing a bird survey method that can be used for long-term monitoring, extending beyond the involvement of those initiating the remediation, is important for assessing the success of the project. In particular, community involvement in bird surveys is strongly recommended. This capacity-building dimension of the exercise instils a sense of ownership in the participants and encourages them to connect with their environment. We also recommend that any bird surveys are submitted to Birds Australia where they will form part of either the *Atlas of Australian Birds* or the Birds in Backyards database. Each of these major projects has survey methods that are applicable for a range of habitats and new surveys will contribute to our knowledge about the distribution and abundance of birds in Australia.

- *The Atlas of Australian Birds* – Specific details about the aims of the atlas can be found here: <http://www.birdsaustralia.com.au/atlas/index.html>. This is usually recommended for people with some prior experience in bird watching, although pairing experienced with inexperienced birdwatchers for surveys can quickly educate participants. There are two survey methods used for Atlas data and both of these methods are commonly used in scientific studies.

The **2 ha area search** involves walking a 2 ha area for 20 minutes and recording all birds seen during this time.

The **area search** is more flexible than the 2 ha search as it involves listing all the birds seen around a central point, with the area searched being any shape. A minimum search time of 20 minutes is required and must be consistent for each of the surveys conducted at the site. Standard urban blocks could be searched using this method.

- *Birds in Backyards Surveys* – These are primarily designed for surveying suburban gardens but can be used to survey vegetation remnants. Because the survey method includes lists of bird species with accompanying photos and calls and are quick and easy to complete, they are more appropriate for novice bird watchers and are a good place to start. There is a range of bird surveys that can be completed and submitted online, ranging from incidental sightings of migrant visitors (such as the Common Koel, *Eudynamys scolopacea*, or Channel-billed Cuckoo, *Scythrops novaehollandiae*) through to week-long surveys of all birds visiting a garden. Details about these surveys and their methodologies can be found here: <http://www.birdsinbackyards.net/surveys/index.cfm>. Results of these surveys are also available online and are regularly updated.
- Professional bird surveys are also important. Many councils are now engaging ecologists to conduct ongoing wildlife monitoring to measure biodiversity values over time in their local government areas.

### 2.1.4 Long-term Commitments

One of the major goals of any restoration or management project in urban habitats should be to minimize harmful disturbances and maximise the biodiversity of the site. The ultimate ecological goal when creating and managing urban bird habitats should be the return and establishment of a range of bird species within the site, particularly those that were in the site historically, as well as creating a habitat that is ultimately self-perpetuating.

Restoring ecosystem health requires long-term commitment and it should be recognised that there are often substantial constraints in restoration work. In particular, work carried out with quick-fix solutions for the benefit of public relations will have little chance of long-term success both in terms of the bird community that results and the ecosystem in general.

### 2.1.5 Need for Community Engagement

Involving the community as a key stakeholder in any urban habitat project is highly beneficial and is often critical to the success of many projects. By increasing public awareness and involvement throughout the initial planning stages it also provides the community with a sense of ownership, increasing the likelihood that the project will be accepted and has long-term support. Various methods of outreach can be used to obtain community support and involvement including media coverage, organised project campaigns, public meetings and technical workshops. Making contact with volunteer bushcare or landcare groups can also make available a wealth of knowledge and experience.



*Photo: Involving a variety of community groups or schools, in urban habitat projects is a great way to achieve management goals as well as educate and foster environmental responsibility. Photograph obtained from Lynne Kavanagh, Wollongong City Council.*

In addition to the benefits gained for your project, there are tremendous opportunities to educate the community about the value of urban habitats for fauna. Education programs have the ability to not only teach the community about general topics relevant to urbanisation, but can also promote their interest in wide ranging environmental issues. Partnering with local schools in activities such as weed removal and tree planting or even at a larger scale in an entire restoration project is an excellent way to foster environmental responsibility in a new group of future custodians.

Including particular iconic species is an effective way of encouraging community participation in the remediation of urban habitats. Iconic species that have been used in this way are typically well-known birds that are sometimes in decline in urban areas, and may be identified with local sites or characteristics of a particular habitat.



*Photo: A female Superb Fairy-wren (Malurus cyaneus)  
Photographers: Wojciech Dabrowka and Kevin Vang*

## **2.2 Impacts and Management Considerations**

The following are general impacts and management issues applicable to a range of different urban habitats that need to be considered when implementing any on-ground works. These impacts and issues must be addressed when determining if existing habitats are valuable for birds and when undertaking restoration works.

### **2.2.1 Revegetation versus Regeneration**

In order to create a bird-friendly habitat, work should primarily be focussed on enhancing and protecting the available vegetation, both in terms of floristic origin (local native, native or exotic) and structure. While there are some specific thoughts to be kept in mind when designing a management plan with a bird habitat focus, many principles of remediation are very general and can be adopted for a wide range of situations.

A thorough site assessment, conducted as part of a Plan of Management, should indicate the method of remediation needed. Wherever possible, retaining remnant vegetation indigenous to the site should be paramount. Regeneration within the site should then be undertaken based on the needs of the site. A range of methods may be required to encourage regeneration of plant species such as fire, smoke or soil scarifying, as well as minimising weeds. Many sites will be missing a large number of species and natural regeneration will result in a species poor, although green, environment. In such cases the focus should be on assessing how species diversity could be elevated with plantings/seeding using ecologically sound practices, rather than just aesthetics. Given that many Australian plants need fire for germination to occur, fire frequency and fire management plans must also be incorporated into ongoing maintenance plans.



*Photo: Monitoring of the bird life within an urban remnant in Wyong, NSW.  
Photographer: R. Major, Australian Museum.*

### **2.2.2 Key Principles for Plant Selection and Planting Design**

In this report we refer to native vegetation as any vegetation native to Australia, while locally or local native refers to vegetation that occurs, or traditionally occurred, in the local area. We use the terms introduced or exotic vegetation to refer to vegetation originally from outside Australia.

Before planting for birds it is important to know what birds are in the area, including the surrounding habitat, and what was previously there. Once this is established, the types of plants that will support these species can be identified. It should be noted that in any planting scheme, the time required for plants to establish (produce flowers and/or fruit) and provide suitable shelter and/or food for birds can be many years. Therefore we suggest that removal of exotic or weedy vegetation, including trees, only occurs after replacement vegetation has been established and is observed being used by birds. Many weed species provide valuable habitat in the absence of native vegetation, and therefore in this case should be considered as 'vegetation' while native vegetation is becoming established. Removal of tracts of such vegetation is likely to further disturb the bird community, remove their main cover and protection and make it more difficult to encourage them to return. Therefore the gradual removal of weeds and establishment of new plantings/regeneration is recommended.



*Photo: Here both the eucalypt canopy and lantana understorey are providing important habitat for birds. Weed removal should be gradual and consideration given to the replacement species to be used. Photographer: R. Major, Australian Museum.*

The value of exotic vegetation (plants from outside Australia or that are not indigenous to the area) should also be considered and not automatically discounted. Although it is generally accepted that native birds prefer native vegetation <sup>(5, 6, 10)</sup>, some studies have indicated that this is not always the case. Catterall *et al.* (1989)<sup>(3)</sup> and Green *et al.* (1989)<sup>(7)</sup>, for example, suggest that native birds are simply more selective in their use of both native and exotic plants than are introduced birds. Many native birds do use exotic plants, and are often responsible for the spread of certain introduced plant species through their use of their berries as a food source <sup>(1)</sup>. However, not all species utilise exotic plants to this degree especially those with specialised diets. Generally, fewer insects for insectivorous birds are found on exotic vegetation, and their seeds are not readily eaten by seed-eaters with specialised food preferences. However, if exotic vegetation does provide food, shelter or nest locations for native birds, it should remain at the site until native plants of equivalent structure or food availability become established.





*Photo: A garden containing a mix of both native and exotic vegetation in Milton, NSW. Over 70 species of birds have been recorded visiting this garden. Photographer: Geoffrey Andrews.*

In order to maximise bird diversity within a habitat, regardless of whether it is remnant bushland, park or garden, selecting native vegetation (preferably local to the area) and creating habitat with a high degree of structural complexity (at the ground, shrub and canopy levels) is recommended as this is the most effective way to imitate many undisturbed habitats <sup>(2, 3, 8, 11)</sup>. Local vegetation (native plant species that occur traditionally in the area) is usually best suited to the soil and climatic conditions at the site and therefore is likely to establish relatively easily. Nurseries specialising in growing local native plants from local provenance (seed collected in the area) are becoming more common in many locations. Local councils in some areas also can provide information about local plant species. Consultation with nurseries and councils should provide valuable information about the particular species best suited to the habitat.

Structural complexity (the availability of vegetation at a variety of different heights) is considered to be more influential on the bird community than whether the vegetation is native or exotic and is therefore vital to the establishment of bird friendly habitat <sup>(4, 11)</sup>. The structure and complexity of diverse plantings of vegetation provides habitat suitable for foraging, moving, nesting and avoiding predators. In natural forests and woodlands a variety of different plants of different ages all growing together creates this complex structural layer, so individual plants established far apart in revegetation projects will not provide a structure that will be of use to many birds <sup>(3, 11)</sup>. Maximising this structural complexity by revegetating with native trees, shrubs (of various heights), herbs, ground covers and grasses, will increase the numbers of different bird species that can be supported by the site. Creating patchiness in areas with open space as well as dense shrubby areas provides a range of different microhabitats that a variety of birds can use.



*Photo: A structurally diverse garden at Mount Tamborine, Queensland.  
Over 150 mostly rainforest trees and shrubs have been planted and lawn removed.  
Photographer: Jeff Eller.*

Photo: A range of native grasses, shrubs and trees including *Lomandra longifolia*, *Dianella* spp., *Themeda australis*, *Bursaria spinosa*, *Hakea sericea*, *Melaleuca nodosa*, and *Dodonaea triquetra* have been planted in this garden in Bexley North, a suburb of Sydney. A total of 46 species of birds have been recorded visiting this garden in the past 7 years. Photographer: Debbie Little.



## How Vegetation is Used by Birds

Each layer of vegetation provides vital resources for a range of birds.

- **Trees.** These are the main perching and lookout sites, roosting (sleeping) locations and food resources. Some trees, especially *Eucalyptus* species, also have hollows that are needed for nest sites by birds such as parrots.
- **Shrubs.** Many smaller remnant specialist and urban generalist birds are reliant on dense plantings of shrubs for food, shelter and nest locations. Restoring this understorey shrub layer in the form of dense plantings, as opposed to isolated shrubs, is vital. This layer is often missing from urban habitats and its establishment is critical to encouraging small birds back into revegetated habitats. While it is generally suggested that added protection for smaller birds can be provided by selecting prickly species such as *Hakea* and *Grevillea*, there is little scientific evidence to support this. However Nias (1984)<sup>(9)</sup> found that Superb Fairy-wrens (*Malurus cyaneus*) selected territories that contained dense and prickly blackberry brambles as these provided understorey habitat that was otherwise absent from their territories.
- **Grasses, ground covers and herbs.** Many birds need some relatively open area with herbs and grasses to forage on. This layer provides a rich availability of insects and native seeds.

The table below shows a list of different types of native birds with some generic plant types that provide them with food and shelter. The actual species (both bird and plant) will vary with location.

<b>Bird Type</b>	<b>Food Source</b>	<b>Habitat Preference</b>
<b>Large Nectarivores</b> (nectar feeders) Honeyeaters and some parrots e.g. Noisy Miners, Red and Little Wattlebirds, Rainbow and Scaly-breasted Lorikeets	<i>Banksia</i> , <i>Callistemon</i> (Bottlebrush), <i>Eucalyptus</i> , <i>Grevillea</i> , <i>Hakea</i> , <i>Melaleuca</i> (Paperbark)	Shrubs and trees for foraging, perching and nesting Some require hollows for nesting
<b>Small Nectarivores</b> Honeyeaters e.g. Eastern Spinebill, New Holland Honeyeater, Brown Honeyeater	<i>Banksia</i> , <i>Callistemon</i> (Bottlebrush), <i>Eucalyptus</i> , <i>Grevillea</i> , <i>Hakea</i> , <i>Melaleuca</i> (Paperbark), <i>Epacris</i> , <i>Correa</i>	Spend most time foraging and perching in shrubs but also use trees. Generally nest in dense shrubs
<b>Granivores (Seed Eaters)</b> Parrots, finches and pigeons e.g. Eastern Rosella, Pale-headed Rosella, Galah, Sulphur-Crested Cockatoo, Common Bronzewing, Red-Browed Finch, Double-Barred Finch, Chestnut-breasted Manikin	Trees and shrubs: <i>Acacia</i> (wattle), <i>Casuarina</i> (she-oak), <i>Leptospermum</i> (tea-tree) Grasses: <i>Lomandra</i> , <i>Themeda</i> , <i>Poa</i>	Utilise shrubs and trees for perching, nesting and foraging but also forage on mature grasses
<b>Frugivores (fruit eaters)</b> Pigeons and cuckoos e.g. Wonga Pigeon, Common Koel, Silvereye, Satin Bowerbird	<i>Ficus</i> (figs), <i>Syzygium</i> (Lillipillies), <i>Eleocharpus</i> (Quandong)	Shrubs and trees important habitat
<b>Insectivores</b> e.g. Superb Fairy-wren, Eastern Yellow Robin, Spotted and Striated Pardalotes, Willie Wagtail	Insects and other invertebrates either on the bark and foliage of shrubs and trees or on the ground	Dense shrubs important for protection and nest sites as well as some open areas for foraging
<b>Carnivores (Meat Eaters)</b> e.g. All species of Currawongs, Laughing Kookaburra, Grey and Pied Butcherbirds, Powerful Owl, Black-shouldered Kite, Peregrine Falcon	Other birds, reptiles, frogs, mammals, invertebrates	Tall trees for perching, roosting and nesting. Some require hollows for nesting

## Planting Selection and Design Recommendations Summary

General recommendations for plant selection are:

- Do not remove vegetation, particularly native, from a site, but add plants where needed
- Remove weeds only after the establishment of replacement local native species
- Use only local native plants for revegetation
- Use layers of vegetation to create a structurally diverse habitat
- Create a dense understorey of shrubs to provide essential habitat for small birds
- Create patchiness to provide a range of microhabitats
- Establish a diversity of species in each layer to increase the resilience of the plant community in the future and increase diversity of foraging opportunities for birds and their food sources.

### 2.2.2.1 References

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### 2.2.3 Weeds and Weed Control

A weed is any plant that can invade a habitat and establish itself. Essentially it is any plant that is living outside its traditional range. Therefore weeds are not only exotic plants such as lantana (*Lantana camara*), cotoneaster (*Cotoneaster glaucophyllus*) or bitou bush (*Chrysanthemoides monilifera sub. rotundata*) but can also be native plants such as golden wreath wattle (*Acacia saligna*) or sweet pittosporum (*Pittosporum undulatum*). Invasion typically occurs in areas disturbed by humans, such as along roadsides or bush tracks, but some are so invasive that they can invade undisturbed ecosystems. They impact upon the ecosystem by suppressing the regeneration of native vegetation (in some cases due to toxicity) and replacing the plants that birds and other animals (including insects), use for food, shelter and nest sites.

Weeds can be broadly divided into two main categories:

- Environmental weeds – most weeds fall into this category. These are non-local plants that invade natural systems and pose a threat to native flora and/or fauna. Although it is not a legislative requirement to remove these weeds, they do impact on the natural environment and therefore should not be encouraged. More detail on when to remove weeds will follow.
- Noxious weeds – a weed is declared noxious under the NSW *Noxious Weed Act 1993* and similar acts in other states if it poses a problem to the environment, livestock, the agricultural industry or human health. Legally these weeds must be either controlled or removed by the owner of the land on which they occur.

There are numerous websites that identify and provide information about weeds for each state and often for local regions. However, a comprehensive search engine can be found on the Weeds Australia website at: <http://www.weeds.org.au/index.html>.

### 2.2.3.1 Complex Bird-Weed Relationships

Birds are one of the major causes of the spread of many weed species<sup>(3,12,17)</sup>. Fleshy fruits, such as those produced by privet (*Ligustrum spp.*), bridal creeper (*Asparagus asparagoides*) and blackberry (*Rubus fruticosus*) provide a great food source for a range of birds such as Pied Currawongs (*Strepera graculina*), Figbirds (*Sphecotheres viridis*) and Silvereyes (*Zosterops lateralis*)<sup>(1, 2, 5, 6, 16)</sup>. Exotic fruit-producing plants provide food that is high in sugars and other nutrients and is available at times when traditional food sources are scarce. In fact, the presence of privet and other fruiting plants in suburban gardens of Sydney has resulted in the dominance of Pied Currawongs in the suburbs<sup>(1, 2, 5)</sup>. Whilst historically these birds used to leave Sydney to breed due to winter food shortages, they have now become permanent residents, have increased in number and are known to be responsible for spreading weeds<sup>(2, 5)</sup>. In turn they are thought to threaten populations of small birds as they also feed on their eggs and nestlings<sup>(7, 11, 13, 14)</sup>. It has been calculated<sup>(18)</sup> that one pair of currawongs can consume the broods from 40 nests of small birds to rear one clutch of its own. The extent of the impact of this behaviour is currently unknown<sup>(4)</sup>.



Photo: A juvenile male Figbird (*Sphecotheres viridis*) feeding on fruit. Photographer: Luke Grange.



Photo: Pied Currawongs (*Strepera graculina*) are thought to not spread weeds by feeding on fruit but they are considered a threat to many small birds due to their predatory nature. Photographer: Nicholas Hunt.

In addition to providing a food source, an even greater number of weeds are used by birds for shelter and nest sites<sup>(8, 9, 12)</sup>. Lantana has been listed as a 'Weed of National Significance' due to its highly invasive nature and environmental and economic impacts. It forms dense, often impenetrable thickets that suppress native plants, is toxic to stock and is highly flammable. However, many small birds, such as Superb Fairy-wrens (*Malurus cyaneus*), Eastern Spinebills (*Acanthorhynchus tenuirostris*) and White-browed Scrubwrens (*Sericornis frontalis*), use lantana, primarily for shelter and nesting, but some also feed on the flowers and seeds as well as the

insects that live in it <sup>(12)</sup>. Thickets of lantana and other dense weedy shrubs such as raspberry (*Rubus spp.*) are also a preferred habitat of Australian Brush-turkey (*Alectura lathamii*) chicks and therefore impact upon their dispersal and survival by providing them with shelter <sup>(10)</sup>. Using large-scale techniques (such as fire or slashing) to remove all woody weeds like lantana from a site is therefore likely to cause serious disturbance to the existing bird community and may result in these birds being lost permanently from the site. While many weeds should be removed, we advocate a long-term and cautious approach to doing this, with a staged replacement of the weed species to try to minimise the impact on the bird community.



*Photo: This site just outside a suburban development in Wollongong is infested with a range of weeds including crofton weed (*Ageratina adenophora*), lantana (*Lantana camara*), blackberry (*Rubus fruticosus*) and coral trees (*Erythrina X sykesii*). Still, a range of species including Superb Fairy-wrens (*Malurus cyaneus*), Eastern Yellow Robins (*Eopsaltria australis*), Eastern Spinebills (*Acanthorhynchus tenuirostris*), White-browed Scrubwrens (*Sericornis frontalis*) and Yellow Thornbills (*Acanthiza nana*) use the site.  
Photographer: Holly Parsons*



### 2.2.3.2 Effective Weed Management

Before attempting to remove or manage the weeds at a site it is important to consider the impact that the weeds are having as well as the cost (both financial and ecological) of removing them.

#### Weed Removal

Prioritising weed removal depends upon:

- The types of weeds present and the extent of the infestation
- The size of the site and local conditions (topography, soil type, rainfall etc)
- Level of threat posed to native flora and fauna. Is weed presence suppressing regeneration or removing habitat for fauna?
- Type and extent of weed control that is needed
- The biology of the weeds. How are they dispersed (wind, water, bird)? Can they regenerate after the initial removal (such as via underground tubers or seed banks)?
- Can the cause of the factors promoting weed growth, eg stormwater runoff, be minimised?
- The ecological function of the weeds. Are they providing habitat for birds and other fauna? Are they stabilising slopes and stopping erosion?
- Physical and financial resources available, including opportunities for follow up

The type of weed removal necessary is highly dependent on the particular species involved and there is an abundance of advice available online on the best ways for controlling and eradicating specific species (see [http://www.weeds.crc.org.au/index\\_flash.html](http://www.weeds.crc.org.au/index_flash.html) and <http://www.weeds.org.au/index.html>). Generally a combination of techniques is needed to effectively control or remove the infestation and monitoring should be ongoing to ensure that any changes to the site and the effectiveness of the techniques used can be documented.

Whenever weed removal is deemed necessary, to minimise the impact on the birds utilising them we suggest that only small patches be treated at a time. By leaving patches of weeds untreated, birds and other fauna have areas of refuge to avoid the disturbance. If the option is available, it is also better to remove weeds outside the peak bird breeding season which, for most birds, is between July and January/February. Removal should begin in the areas with the greatest proportion of native vegetation (and presumably lightest weed infestation) and work towards the heaviest infestation. This not only allows valuable bird habitat to remain but also reduces the chances of reinfestation of the weeds and allows natives to regenerate.

Ondinia and McAllan (1999)<sup>(15)</sup> have proposed a mosaic approach to weed removal. They recommend that an area of no larger than 1/3 of the total area (up to 20 x 20 m) be removed at any one time with mature trees being left in situ. Once the replacement vegetation has become established (usually a minimum of 3 years), more of the weeds can be removed using the following pattern.

#### UPSLOPE

1	2	1	2	1	2
3	4	3	4	3	4

#### DOWNSLOPE

Weed the no. 1 areas initially (20 x 20m) and once the native vegetation has either regenerated or revegetated and established (usually a minimum of around 3 years to flower and/or fruit), no. 2 areas can be weeded and so on.

The replacement vegetation should be locally native and create a habitat structure similar to that provided by the weed. In most cases, therefore, a dense understorey should be planted. Once the initial removal is conducted, follow-up weeding must occur.

#### **2.2.3.3 Case Study: Terrys Creek**

Terrys Creek is a small waterway that runs through Epping and eventually joins the Lane Cove River in suburban Sydney. Remediation has occurred along part of the creek to remove expansive infestations of weeds that occur along the banks of the creek and into backyards. Lantana, wandering jew (*Tradescantia fluminenss*) and stands of privet have been gradually removed and the slopes of the banks stabilised with logs. Dense plantings of a range of native plants have replaced the removed weed patches and dense mulching has been used to minimise reinfestation. While the work is still ongoing, Superb Fairy-Wrens have been observed within the remaining lantana while White-browed Scrub Wrens use the grasses, forbs and low shrubs planted adjacent to the lantana. Therefore the replacement habitat, as well as the weeds, are providing habitat that can be used by small native birds.



*Photographs: New plantings along side weeds such as lantana at Terrys Creek.  
Photographer: Lucinda Coates.*



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## 2.2.4 Minimising degrading impacts

There are a variety of human-induced practices that degrade urban habitats and impact on birds both directly and indirectly. Ways to minimise the impacts of some of the more common ones are addressed below.

- Mowing – the regular clearing of grass removes important habitat for some smaller native birds, may decrease important insect sources <sup>(1)</sup> and prevents grasses from setting seed that can provide food for granivorous birds, particularly finches. It also stops the regeneration of other plants. Following the cessation of mowing, weed control should be conducted to remove unwanted plant species. Snakes may be a real or perceived risk where long grass is found. Creating and maintaining paths will minimise this risk. Native grasses should be used to replace introduced grasses. They require less water and maintenance than introduced grass while still providing an important food source.



*Photo: Lawn provides important foraging locations for many species including Red-browed Finches (Neochmia temporalis) (left) and Superb Fairy-Wrens (Malurus cyaneus) (right). Granivorous birds such as finches particularly like grass that has been allowed to go to seed.  
Photographer: Nicholas Hunt*

- Trampling – using physical barriers (fences, bollards and gates), establishing pathways and signposting can reduce the harm caused by trampling by vehicles and people. Trampling leads to soil compaction damaging established plants and limiting regenerating vegetation, thereby removing bird habitat. Studies have shown that fencing off areas can encourage more regeneration than in unfenced areas. During the breeding season, disturbances can cause birds to abandon nests and ongoing interruptions can force them from a site completely.

- Fires – deliberately lit fires caused by dumping and burning of cars or simply arson attacks can remove important habitat as well as kill birds. Too frequent fires will also simplify vegetation structure. Physical barriers barring car access to sites can minimise this threat but only education and vigilance can prevent arson.
- Firewood – fallen logs and branches can provide invaluable habitat for a range of vertebrate and invertebrate fauna. Education initiatives and signs indicating the value of wood for habitat for fauna and harbouring insects for birds should be implemented.

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#### 2.2.5 Wildlife corridors

Remnant patches of vegetation are often too small and isolated to support faunal communities. Wildlife corridors can link areas connecting pieces of vegetation to each other, and allowing native fauna to move between the patches in search of food, mates or nesting sites. They allow patches to become recolonised by new individuals following local extinctions caused, for example, by wildfire. They may also provide important habitat within themselves, avoiding overcrowding of existing habitats<sup>(13)</sup>. These corridors are likely to be especially important for birds that do not readily venture into urban and suburban habitats, but the extent of this effect is still largely unstudied<sup>(3)</sup>. However, Powerful Owls (*Ninox strenua*), a species thought to be sensitive to habitat fragmentation, have been shown to use corridors on the urban fringes of Melbourne and are being detected more often in these urbanised habitats as the corridors give them access to greater food resources<sup>(5)</sup>.

Corridors are generally linear strips of native vegetation but can also be stepping stones of habitat scattered across a landscape (such as wetlands or roadside vegetation), and in agricultural regions these stepping stones have been shown to be important for species such as frugivorous pigeons<sup>(6)</sup>. However the usefulness of such stepping stones in urban areas has not been examined in Australia. Suburban streets and gardens can also be used to create corridors, and these are discussed in the *Suburban Gardens: Wildlife Corridors* section later in the guidelines.

In order to maximise their usage and the success of corridors, a number of key elements must be taken into account:

- Their locations should be carefully planned, taking into consideration the placement of the remnants to be connected and the natural features of the landscape such as ridge lines and riparian strips. In NSW, the Department of Environment and Climate Change (DECC) has made key habitat and corridor data available through the Natural Resources Atlas located at <http://www.nratlas.nsw.gov.au/wmc/savedapps/nratlas>. This site allows users to view habitat maps and current corridors.

Green Web Sydney is an initiative of the combined Sydney Regional Organisations of Councils (ROCs) that promotes the establishment of a green web of native vegetation to protect, conserve and enhance remnant bushland in the Sydney region. It encourages local councils to take a leading role in biodiversity management in their area to ultimately connect the entire Sydney region with corridors.

- As a general rule when it comes to the shape of corridors, wider is better, with birds strongly influenced by both the width of the corridor and the habitat characteristics<sup>(4, 18)</sup>. Urban corridors have been shown to support high species richness and abundance but the width needed to accomplish this has not been determined<sup>(3)</sup>. Being of a sufficient width allows the corridor to be used as habitat in its own right, as well as reducing edge effects (such as increased nest predation, weed infestations and temperature and other abiotic changes) that result from having a high edge to area ratio in thinner corridors. Wider corridors tend to support a higher diversity of birds<sup>(14, 15)</sup>, particularly encouraging forest specialists to move through them and live within them.
- To be effective in providing habitat for Remnant Specialists, corridors need to be wide enough to remove edge effects. In Sydney, edge effects have been shown to occur for up to 30 m into a remnant<sup>(7)</sup>. Therefore a corridor 60 m wide would be all edge. In order to provide some interior habitat that would be suitable for these types of birds, corridors must be much wider than this. For example, a corridor of 80 m wide would only provide 20 m of interior habitat. We would therefore recommend that corridors in urban areas whose aim is to provide habitat for Remnant Specialists need to be, at an absolute minimum, 80 m wide.
- Corridor width for birds such as Urban Specialists (e.g. parrots, Australian Magpies, Laughing Kookaburras) or Urban Generalists (e.g. Red-browed Finches, Superb Fairy-wrens) has not been determined in the literature. Given the availability of vegetation outside corridors that are scattered throughout the urban landscape in parks and gardens and can act as buffers, it is likely that narrower corridors would be used by these birds. Corridors should therefore be as wide as is possible in the space available.

- Current vegetation cover should be maintained and increased, where needed, to maximise the connectivity between remnants. This includes creating structural complexity utilising ground covers, shrub layers, a canopy (that retains live and dead hollow-bearing trees) and fallen logs and other natural debris. Where stepping stone type linkages occur such as with wetlands and isolated trees, the vegetated area should be enlarged and vegetation cover increased.
- Corridors should provide the specific habitat requirements needed for the species being targeted. Forest specialist birds that will not move between remnants without corridors tend to be the smaller insectivorous birds. They generally require a dense understorey of vegetation to provide sufficient shelter, food and protection similar to that found in their remnant habitats, as well as provide a refuge from edge specialists, especially Noisy Miners that might otherwise aggressively exclude small birds<sup>(12)</sup>. In urban habitats, vegetation from adjacent areas such as gardens and parks may be used as a buffer to increase the overall width of the corridor.
- Corridors that incorporate riparian habitat in the form of a creek or waterway tend to support more birds<sup>(3, 16)</sup>. Therefore the establishment and management of riparian corridors should be a priority.
- The functioning of the corridor should be monitored and remediation should occur when necessary. This involves revegetating, weed control and minimising degrading impacts as outlined previously.
- The overall aim should be to create a web of corridors throughout a region that connects high quality remnants with all other patches of vegetation and utilises a range of different habitats including riparian strips, linear bushland, streetscape vegetation, parks and suburban gardens.



### 2.2.5.1 The Noisy Miner Effect

Noisy Miners (*Manorina melanocephala*) are traditionally edge specialists, that is, they live along the edges of woodland<sup>(8, 9, 10)</sup>. They are most common within 20m of an edge but their influence can extend 100-200m into forests<sup>(17)</sup>. Therefore, corridors, which largely consist of edge, make ideal Noisy Miner habitat.



Photo: Juvenile Noisy Miner (*Manorina melanocephala*). Photographers: Wojciech Dabrowka and Kevin Vang.

Noisy Miners are particularly associated with eucalypts as they feed on the nectar produced and the visiting insects, and the open structure (little or no understorey) allows them to chase other birds. It is possible that rather than act as a habitat to protect and aid small birds, corridors may instead facilitate the spread of Noisy Miners and thereby threaten small birds unless a suitable habitat is created.

In a study conducted by Hastings and Beattie (2006)<sup>(12)</sup> in a rural setting, Noisy Miners dominated corridors of eucalypts (where there was little understorey), excluding nearly all small birds. However, corridors that were comprised of either native acacias, exotic deciduous trees or conifers supported a range of small birds while Noisy Miners were absent. The greatest diversity and abundance of small birds occurred when corridors were comprised of both eucalypts and acacias with a shrubby understorey. It is thought that acacias and a shrubby understorey provide small birds with shelter from Noisy Miners and a food source that is not usually used by Noisy Miners<sup>(2, 11)</sup>.

Therefore we recommend adding other canopy species besides eucalypts to corridors and also developing understorey vegetation. While corridors without eucalypts may also support a high diversity and abundance of small birds, including those comprised of exotic vegetation, the value of eucalypts for other fauna such as koalas, possums, gliders and microbats means that the presence of these trees in corridors (and remnants) should be regarded as essential.

It has often been suggested that hybrid grevillea shrubs may also attract Noisy Miners into urban areas due to their abundant nectar and large flower size. There is, however, little evidence to support this, with a study by Ashley *et al.* (in review)<sup>(1)</sup> also emphasising the importance of eucalypts over grevillea cultivars as a food source. We would still recommend selecting native plants that occur locally when planting as opposed to hybrids as the food source supplied is more likely to be used by small birds but may be more difficult for larger honeyeaters to access.



*Photo: A native vulnerable grevillea species (Grevillea oleoides) grown from seed in a suburban garden in Coal Cliff, NSW. Photographer: R. Major, Australian Museum.*

### **Wildlife Corridor Recommendations**

It is recommended that:

- A web of corridors be created, using not only remnant vegetation but also streetscapes, gardens and parks as well as waterways.
- Corridors be created as wide as physically possible. Generally a minimum width of 80 m needs to be adopted in order to create interior habitat and minimise edge effects.
- Structural and floristic diversity should be created as in other remnants and in gardens using local native species.
- A mix of canopy species should be used in an attempt to reduce Noisy Miner invasion.
- Monitoring and maintenance must be ongoing to reduce weed infestations and other degrading impacts.

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### 2.2.6 Introduced Birds

Introduced species such as the Common Myna (also known as the Indian Myna, *Acridotheres tristis*), Common Starling (*Sturnus vulgaris*) and Rock Dove (feral pigeon, *Columba livia*) have a long history of cohabitation with humans and are well adapted to living in urban habitats. Many of these birds are regarded as pests. They are often associated with real or perceived impacts on the man-made environment resulting from agricultural damage, overabundance in urban areas and bushland remnants, their potential to spread weeds and competition with native birds for resources <sup>(1, 2, 5, 7, 8, 9, 12, 13)</sup>.

Most introduced birds are found within urban and suburban habitats as opposed to patches of remnant vegetation <sup>(1, 17)</sup>. White *et al.* <sup>(17)</sup> found that introduced birds in Melbourne were much more prevalent in streets consisting of primarily exotic rather than native vegetation and were even less common in remnants. Antos *et al.* (2006)<sup>(1)</sup> found that introduced birds could invade remnants of various sizes (from 1 ha to > 15 ha), suggesting that all landscape areas were susceptible to invasion. However, the composition of the introduced bird communities was different, which reflects the foraging and nesting behaviours of each individual species. Just what impact these species are having in remnants is largely unknown.

Habitat manipulation may be an effective way of controlling introduced birds both in remnants and in the greater urban habitat. Improving vegetation quality, such as ensuring the presence of understorey vegetation and reducing the amount of grass cover, may create a habitat unfavourable to many of these species. Population control is both labour and cost-intensive and the success of such control measures is unknown <sup>(2, 15, 16)</sup>.

The Common Myna is a species that is gaining particular notoriety for its impact on native birds, particularly in competition for nest hollows <sup>(12, 13)</sup>, as well as its habit of forming huge communal roostings which leads to complaints of noise and the fouling of buildings. There are also suggestions that these birds may transfer disease. However there is little scientific evidence in Australia that supports these claims, despite the World Conservation Union <sup>(8)</sup> listing the Common Myna as one of the top 100 World's Worst Alien Invasive Species.



Photo: The Common Myna (*Acridotheres tristis*) is one of the world's most invasive species.  
Photographers: Wojciech Dabrowka and Kevin Vang

Much of the published data in Australia has focussed on the spread of the Common Myna in Canberra, following its release there in 1968 <sup>(3, 4, 6, 14)</sup> and it has only been in Canberra that any potential negative impacts of Common Mynas on native birds have been reported. These claims relate mainly to observations of Mynas aggressively excluding hollow-nesting parrots from potential nest sites <sup>(11, 12, 13)</sup>.

It is unknown, however, what impact Common Mynas are having on urban bird communities in general and

elsewhere in Australia. The species is omnivorous, foraging primarily on the ground, using selected trees for communal roosts and generally nesting in man-made structures <sup>(18)</sup>. Therefore it is unlikely that their requirements overlap with many other native birds. Parsons *et al.* (2006)<sup>(10)</sup> found that small insectivores such as Superb Fairy-wrens (*Malurus cyaneus*) and Willie Wagtails (*Rhipidura leucophrys*) were more likely to be found in gardens with Common Mynas, and may be due to the fact that all three of these birds forage on open lawn.

Therefore, in the majority of urban habitats it appears that Common Mynas may not be having as significant impact on native birds as has been generally asserted. There is some evidence to suggest that where nest sites are in short supply (such as where hollows are limited) they may interfere with hollow-nesting parrots. Given that they are found in ever increasing numbers, further research into the impacts of this species is clearly warranted.

## Introduced Birds Recommendations

- Introduced birds are some of the most prevalent bird species in our urban habitats.
- There is some evidence that some species, such as the common myna and common starling, may compete with hollow-nesting natives for breeding sites.
- There is little scientific evidence in Australia that they competitively exclude other birds despite public perception.
- They are more often found in habitats that have mostly exotic vegetation but can invade remnants.
- There is little information about how to control numbers. We recommend creating habitats that are unfavourable to introduced birds by creating structural diversity, minimising grass space and using local native plant species.

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## **Part 3: Bushland Remnants**

### **3.1 Introduction**

Bushland remnants represent a wide variety of different vegetation types throughout Australia, such as grasslands, heathlands, mallee scrub, woodlands, forests and rainforest. The retention of these patches of remnant vegetation is imperative for the maintenance and the recovery of a diverse bird community within cities and should be a priority. Many bird species will be lost if the remaining natural vegetation surrounding and within our cities and towns is not conserved and remediated.

### **3.2 Remnant Size and Shape**

It is well recognised that the size of remnants within connected habitats is the most important factor in determining the bird communities that they support <sup>(3, 5, 11, 12, 13)</sup>. It is generally accepted that the bigger the patch of vegetation, the more bird species it can support. Edge effects (such as increased nest predation, greater wind exposure, and increased invasion from exotic species) influence small remnants more than larger remnants due to a higher perimeter to area ratio. Larger remnants have a larger 'core' area that is protected from these effects.

There are minimum size thresholds, below which certain species are likely to be absent <sup>(5, 8, 10)</sup>.



## Remnant Size Thresholds

While there is some conjecture about the exact sizes of these thresholds and the local habitat characteristics that are likely to also influence bird communities <sup>(5, 8, 13)</sup>, we always recommend conserving as large a remnant as possible for the following reasons.

- Small remnants, less than 1-2 ha in size, tend to only support birds that already are established and successful in urban habitats (the Urban Specialists such as the Noisy Miner, Pied Currawong, Australian Magpie-lark, Laughing Kookaburra and Rainbow Lorikeet).



*Photo: Small remnants (< 2 ha) only tend to support those birds already common in urban habitats (Urban Specialists) such as Red Wattlebirds ([Anthochaera carnunculata](#)).  
Photographer: Margaret Owens.*

Cont...

- At least 4 ha is required to support many birds (particularly Urban Generalists like Silvereyes, Superb Fairy-wrens, and Eastern Spinebills). Below this size species richness decreases rapidly <sup>(5)</sup>. This remnant size is larger than the home range of many birds but the long term survival of a species within remnants is not guaranteed. Good connectivity to other remnants is necessary to ensure a large population and high genetic diversity.



*Photo: Urban Generalists such as Superb Fairy-wrens (Malurus cyaneus) are able to use remnants of around 4 ha and greater in size. Photographer: Holly Parsons.*

- Only in very large remnants, greater than 50 ha in size, do birds that occur in the interior of remnants (Remnant Specialists) become more common members of the bird community. These birds often have larger home range sizes and very specific habitat requirements that are not found in smaller remnants.



*Photo: Remnant Specialists such as this Golden Whistler (Pachycephala pectoralis) are reliant on remnants of at least 50 ha in size. Photographers: Wojciech Dabrowka and Kevin Vang.*

While the dimensions of these thresholds are likely to vary with geographical regions, the sizes suggested here are the typical recommended in the scientific literature <sup>(1, 4, 5, 6, 13, 14, 15)</sup>.

The shape of remnants also influences the bird communities within them. Remnants that are more rounded in shape suffer less from edge effects than do remnants that are long and thin <sup>(1, 12)</sup>. Therefore a greater diversity of birds is found in these rounder remnants whilst Urban Generalists (introduced birds and very common native species) are more likely to dominate linear remnants <sup>(1, 7)</sup>. Establishing wildlife corridors that connect all patches, regardless of their size and shape, is also vitally important.

While remnants of all sizes and shapes have some conservation value, large, rounder patches are needed in order to safeguard a wide range of birds within these urban habitats. Efforts should still be made to protect, regenerate and manage all current remnants within an area, regardless of size and shape with careful planning done when creating new ones.

### **3.2.1 The Noisy Miner Effect**

Smaller remnants (<10ha) with a eucalypt canopy and little understorey vegetation are more likely to be invaded by Noisy Miners. While most likely to be found within 20m of the edge, they can penetrate 100-200m into large remnants <sup>(9)</sup>. Therefore conserving larger remnants that are rounder in shape (thus reducing the amount of edge and the ability of Noisy Miners to penetrate the interior of remnants) is necessary to create some habitats that will protect small birds.

A canopy that does not consist solely of eucalypts and the presence of a diverse range of understorey vegetation (which includes local native acacias, banksias and small flowering species) are also needed to provide a habitat less favourable for Noisy Miners but one that also acts as a food source and shelter for small birds <sup>(7)</sup>.



*Photo: This Epacris spp. provides nectar for smaller nectarivores. Larger birds such as the Noisy Miner (Manorina melanocephala) are unlikely to be able to access the small flowers. Photographer: R. Major, Australian Museum.*

### **3.3 Location and Management Implications**

The location of a remnant will have significant implications for the remediation steps that can be taken. Remnants located closer to inner metropolitan areas are likely to suffer from a greater range and severity of disturbances and impacts. They are usually smaller in size and more isolated, supporting smaller populations of flora and fauna. While the sizes and shapes of these remnants are likely to be already established, management of these sites to minimise further disturbances is vital<sup>(14)</sup>. Even highly degraded remnants should be retained, regardless of a poor conservation value. These still have value in bringing people in contact with semi-natural vegetation and wildlife and therefore should not be cleared.

Sometimes in inner metropolitan areas, small remnants may be significantly enhanced by revegetation of adjoining wasteland areas. Fabricating natural bushland through landscape contouring and planting with local native plants can create excellent habitat, as shown in Case Study 1 of Flat Rock Gully in the Willoughby local government area in Sydney.

Most large bush remnants are located in the outer metropolitan areas of cities, where new developments expand into and fragment the native vegetation. It is important to retain remnants here that will not be further reduced in size. We have the opportunity in these areas to conserve more, larger patches of vegetation and to ensure that there is a high degree of connectivity between these remnants. In order to maximise the retention of these remnants, thorough planning should be undertaken when considering any new developments.

### 3.4 Case Study 1: Flat Rock Gully

Extensive earthworks were involved in capping a council tip site in Naremburn (lower North Shore of Sydney Harbour). Water treatment channels and ponds to treat stormwater and prevent leaching were also created. Extensive planting using local native grasses, ground covers, reeds, shrubs and trees has resulted in dense mounds of vegetation adjacent to open lawn areas with a natural bushland gully also present at the top of the site. Shared pedestrian and bicycle paths transect the site. Ongoing surveys have recorded over 100 different bird species using the site, with a range of different bird types present from waterbirds to raptors and forest-dwelling birds. Small birds are particularly abundant. Flat Rock Gully (both the natural and created habitat) has the highest diversity of birds in the whole Willoughby Local Government Area including their larger reserves.



*Photo: Flat Rock Gully in 1998 after the council tip site was capped but before revegetation. Photographs obtained from James Smallhorn, Willoughby City Council.*



*Photo: Flat Rock Gully in 2003 after revegetation. Over 100 species of birds have been recorded using the site. Photograph obtained from James Smallhorn, Willoughby City Council.*

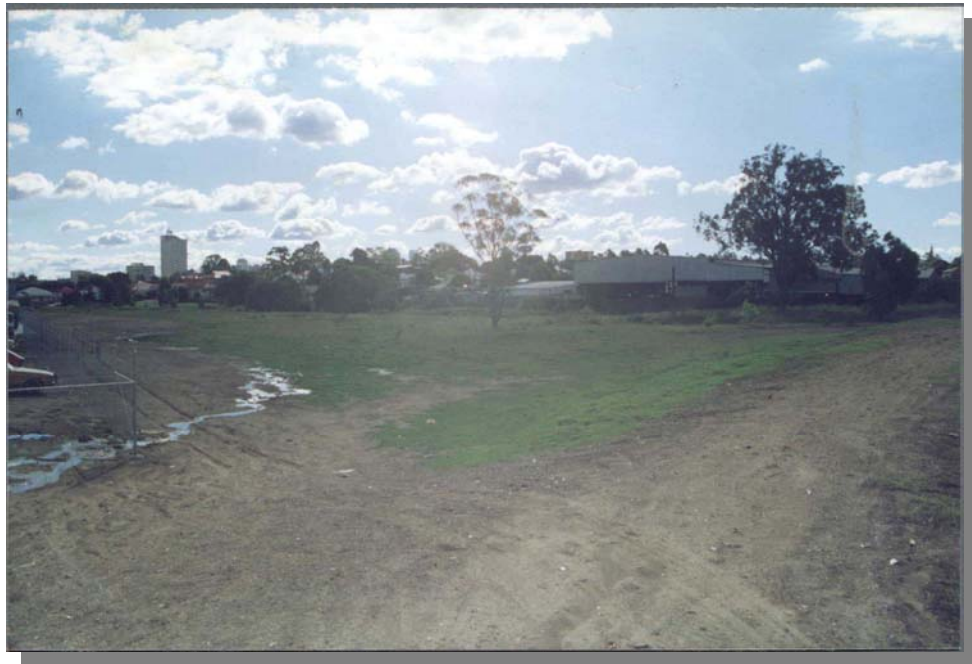
## **Case Study 2: Moorhen Flats.**

This 4 ha section next to Norman Creek is one of the closest areas of bushland to inner-city Brisbane. Prior to 1993 this former industrial area was bare wasteland left from flood mitigation works. However, starting in 1993, the Norman Creek FREECS (Friends Rejuvenating Ecological Environmental Creek Systems) have planted a variety of different habitats within the area including native grassland, dry rainforest, eucalypt forest and melaleuca wetland. The use of community volunteers has allowed monthly planting events to be conducted, with around 70 000 grasses, ground covers, shrubs and trees now planted with other areas set aside for walking and bike trails to encourage public recreation. Due to its location in one of the most urbanised areas of Queensland, the plant species originally occurring in the area cannot be known with certainty. However, in consultation with Brisbane City Council Habitat Officers, plants that are most likely to be indigenous to the region have been used in regeneration.

Birds have responded positively to the changes made. The number of bird species present has increased from 30 in 1994 to 90 by 2003. The site still has ongoing management issues, however, with a number of weed species invading and requiring ongoing maintenance.



*Photo: This is Moorhen Flats after flood mitigation works in the late 1980's but prior to any remediation and revegetation of the site.  
Photo obtained from Damien Madden.*



*Photo: On the ground view of Moorhen Flats prior to any revegetation work in 1993.  
Photo obtained from Damien Madden.*



*Photo: A photograph taken of Moorhen Flats from the same location as above in 2003. Extensive revegetation has involved the planting of over 70 000 grasses, ground covers, shrubs and trees and the bird life has tripled to over 90 species since planting began in 1993. Photograph obtained from Damien Madden.*

### **Key Issues for Managing Urban Bushland for Bird Habitat**

- Urban bushland remnants are important for a large number of birds and should be conserved wherever possible.
- Management considerations will be associated with the location of the remnant. Remnant size and shape on the urban outskirts may be able to be managed. However for remnant surrounded by urban development, minimising degrading impacts would be more important..
- The size of the remnant will influence what birds are found in it. Those smaller than 2 ha will likely only support common urban birds. At least 4 ha is required for many of the urban generalist species that are less prevalent in urban habitats and at least 50 ha is needed for those birds usually unable to live in the urban landscape.



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## **Part 4: Riparian Habitats**

### **4.1 Introduction**

Waterways play an important role within all environments, including urban areas. While they provide habitat for a range of fauna, they are also used for the enjoyment of the public (swimming, fishing, walking and cycling tracks) and managing water quality is vital.

Riparian ecosystems, such as rivers, creeks, wetlands or lakes, provide habitat for a disproportionately high number of floral and faunal species <sup>(1)</sup>, yet they are being removed or modified at an alarming rate <sup>(5)</sup>. The bird species supported include not only waterbirds such as ducks, swamphens and cormorants but also birds living in the vegetation on the banks. Supporting these birds within and around water bodies contributes not only to urban bird diversity but is also important for the health of the water bodies themselves. Birds control insects such as herbivores, or mosquitoes and their larvae which thrive in water, as well as aiding pollination and seed dispersal of the vegetation both within and around the water body.

Urban waterways are particularly sensitive to a range of impacts. As well as the typical disturbances such as trampling, mowing and weed invasion (both land and water weeds)<sup>(7)</sup>, poor water quality caused by heavy metals, rubbish and nutrient overloads (caused by dumping of lawn clippings and fertilisers) can become toxic to the vegetation and fauna using the site <sup>(11, 12)</sup>. The use of hard surfaces such as sealed roads and stormwater channels can also result in changes to the flow rate of water and the overall volume of water in waterways. The removal of vegetation can destabilise soil on banks and can cause erosion and increased sediment in the water <sup>(15, 16)</sup>.

The focus below is on some of the major issues that affect waterways in general, how to minimise these impacts and make these habitats bird-friendly. These Guidelines do not cover the actual process of designing and constructing urban waterways. However there is an abundance of information available online, such as:

- <http://www.publish.csiro.au/samples/UrbanStorm.pdf>
- <http://www.csiro.au/science/UrbanWater.html>
- <http://www.urbanecology.org.au/topics/water.html>



*Photo: Little Pied Cormorant  
(Phalacrocorax melanoleucos).  
Photographers: Wojciech Dabrowka and  
Kevin Vang*

## 4.2 Creating Bird-Friendly Waterways

As in bush remnants, creating structural diversity around waterways is the best way to encourage birds to use the habitat. Any vegetation already present should not be removed but rather native species allowed to either regenerate (if the soil seed bank is adequate) or be planted. Removal of vegetation along waterways can impact on water quality, causing erosion of the soil and sedimentation problems in the water. There is a range of plant species from reeds and grasses through to trees that do well in close proximity to water. Creating multiple layers of vegetation, using a diverse range of local native plant species, is the most effective way of developing these locations as good bird habitat.

Three years after restoration plantings along Toohey's Creek on the Atherton Tablelands in North Queensland, a range of birds, including some rainforest species, were beginning to use the riparian corridor <sup>(4)</sup>. Restoration work was conducted followed by plantings of a very diverse range of local rainforest species including pioneers (early establishing plants), fruiting species and trees found in mature forest. Plantings created a corridor width of between 80 – 120 m. Within three years, trees had reached a height of between 10 – 15 m and the canopy had closed but structural complexity was not yet achieved <sup>(4)</sup>. While occurring in a predominately cleared and grazed landscape rather than an urban one, the value of riparian corridors to provide bird habitat in a relatively short time frame is evident.

As well as providing good bird habitat, vegetating the banks of waterways has positive impacts on the health of the ecosystem. In conjunction with stabilising the banks with their root systems and thereby stopping soil washing into and polluting waterways, plants also absorb large amounts of water from the surrounding soil. This lessens the amount of water entering the waterway, especially during high rainfall, and can decrease the impact of flooding <sup>(3)</sup>. In concreted stormwater drains, water cannot seep into the concrete and therefore travels much faster (approx. three times faster than in grassed waterways). Therefore the meandering and slow-moving vegetated waterways have a slower flow-velocity and hold more water, creating a healthier ecosystem both in terms of biodiversity and water quality <sup>(3)</sup>.

As previously mentioned, water quality is an important management consideration in riparian habitats. Polluted water will damage the plant and insect communities in and around the water, which can then reduce the amount of food and shelter available for birds. Education programs can make householders aware of the damage to waterways caused by lawn clippings, fertilisers, detergents, oil and other liquid pollutants.

Those visiting the waterways should also be encouraged to not feed the birds even though this is a popular tradition. Feeding bread to waterbirds, especially ducks, is unnecessary and is likely to harm the birds as it does not provide enough nutrition<sup>(6)</sup>. It can also result in elevated numbers of birds at the site which can upset the balance of the ecosystem and may result in disease spreading through



Photo: Australian Wood Ducks (*Chenonetta jubata*)  
Photographers: Wojciech Dabrowka and Kevin Vang

the bird population. Moreover, the build-up of significant amounts of uneaten bread is frequently a major cause of local eutrophication, degrading the waterbody for all users including birds and people. Simple signs stating 'Do not feed the birds' are often used by some local councils, but they are usually ignored. Alternative signage, providing a more ecological context for not supplying bread, are currently being designed but are yet to be evaluated<sup>(6)</sup>. For more information about supplementary feeding see the supplementary feeding section in Suburban Gardens.

### 4.3 Wildlife Corridors

Riparian habitats are valued as centres of high bird diversity<sup>(1)</sup>. They support a range of waterbirds reliant on the habitat, and, provided they have suitable vegetation, a wide variety of land birds as well. Rivers and creeks often move through remnant patches and into urban settings like suburbs while also connecting into wetlands or lake habitats. They may often provide the main strips of vegetation available in urban areas. Therefore, they have enormous potential to act as corridors for bird movement. However, their high edge to perimeter ratio means that they are particularly vulnerable to changes in the surrounding habitat, making them more susceptible, for example, to invasion by edge specialist bird species such as the Noisy Miner<sup>(10, 13)</sup>. Therefore, remediation efforts should also extend beyond the riparian strips if possible and their context should be considered in plans of management.

Riparian strips along rivers and creeks are not the only waterways with the potential to be useful as wildlife corridors. Vegetation surrounding wetlands, lakes and ponds (both natural and artificial), can act as stepping stone-type corridors. There needs to be a sufficient number of these to form a suitable network. Although the potential for stepping-stone habitat to act as a suitable corridor has rarely been examined in Australia (but see Date *et al.* 1994)<sup>(2)</sup>, they have been incorporated into the identification of strategic habitat to conserve Florida's biodiversity<sup>(7)</sup>. In Australia there is the

potential for artificial lakes, wetlands and ponds to supplement what is already available (rather than to replace natural systems). While these are popular in newly developed estates and suburbs, careful planning (with vegetation selection and density of planting) is needed for them to be of any ecological benefit as discussed in Part 6: New Developments.

The amount of space available dictates the sizes of the buffers of vegetation on the edges of waterways, whether they are linear or isolated. Attempts should be made to maximise vegetation within the available space using a variety of different local native plants, to create a large buffer around the waterway. While it has been suggested that such buffers may lessen the impacts of the surrounding landscape on riparian habitat <sup>(14)</sup>, no Australian studies have examined the impact of different buffer widths on bird species.

#### **4.4 Case Study 1: Scotchmans Creek and Valley Reserve**

This area of approximately 15 ha, dominated by stringy-bark woodland is located in Waverley, Victoria. It is dissected by two small creeks (one with ephemeral flow, one with a small permanent flow) lined with dense riparian scrub and melaleuca thickets.

During the past 15 years remediation efforts have focused on enhancing the existing vegetation and revegetating degraded and cleared sites. Most revegetation has involved improving the ground and understorey vegetation. Understorey shrubs planted include *Bursaria spinosa*, various acacia species (eg. *Acacia myrtifolia*, *Acacia paradoxa*, *Acacia verticillata*), *Cassinia aculeata*, *Correa reflexa*, *Goodenia* sp., various Hakea species (eg. *Hakea sericea*, *Hakea nodosa*), *Indigofera* sp., *Leptospermum juniperinum*, *Melaleuca ericifolia*, *Spyridium* sp. and *Viminaria* sp. Ground level planting has been dominated by indigenous grasses like wallaby grasses (*Danthonia* sp), tussock grasses (*Poa* sp) and kangaroo grass (*Themeda australis*). Other ground level plants include *Brachyscome decipiens*, *Clematis aristata*, *Dianella* species, *Gahnia radula*, *Juncus pauciflorus*, *Lomandra longifolia*, *Viola hederacea* and *Wahlenbergia stricta*.

Fencing off areas of vegetation has also assisted with successful regeneration. With the development of this understorey layer, small native birds have become much more prevalent including White-browed Scrubwrens (*Sericornis frontalis*), Brown Thornbills (*Acanthiza pusilla*), Silvereyes (*Zosterops lateralis*) and Superb Fairy-wrens (*Malurus cyaneus*). All the replanting and protection of existing vegetation has provided more food and habitat for other insectivores like the Grey Shrike-thrush (*Colluricincla harmonica*), Willie Wagtail (*Rhipidura leucophrys*) and Grey Fantail (*Rhipidura fuliginosa*). Seasonal visitors like the Golden Whistler (*Pachycephala pectoralis*) and Sacred Kingfisher (*Todiramphus sanctus*) are also attracted by the increased availability and variety of food. Planting of more eucalypts and other large trees provides more habitats for mistletoe to grow on. Mistletoe birds are now permanently found in the reserve.

Branches that fall are left on the ground and provide a haven for insects and reptiles. Consequently, predatory birds including Powerful Owls (*Ninox strenua*), Southern Boobook (*Ninox novaeseelandiae*), Grey Butcherbirds (*Cracticus torquatus*) and Laughing Kookaburras (*Dacelo novaeguineae*) are also observed in the site. It is hoped that in years to come hollows will develop and provide nesting sites.

The regeneration of the riparian habitats with dense, thick vegetation including Melaleuca thickets has also helped provide many birds with suitable feeding habitat and shelter. The creation of permanent wetlands has attracted Dusky Moorhens (*Gallinula tenebrosa*), White-faced Herons (*Egretta novaehollandiae*), Pacific Black Ducks (*Anas superciliosa*), Australian Wood Ducks (*Chenonetta jubata*), Chestnut Teals (*Anas castanea*), Little Pied Cormorants (*Phalacrocorax melanoleucos*), Straw-necked (*Threskiornis spinicollis*) and Australian White Ibis (*Threskiornis molucca*), Eurasian Coots (*Fulica atra*), a Great Crested Grebe (*Podiceps cristatus*) and a Buff-Banded Rail (*Gallirallus philippensis*).

However the presence of Noisy Miners (*Manorina melanocephala*), Red Wattlebirds (*Anthochaera carnunculata*) and Little Wattlebirds (*Anthochaera chrysoptera*) and Bell Miners (*Manorina melanophrys*) is thought to be preventing smaller honeyeaters such as New Holland Honeyeaters (*Phylidonyris novaehollandiae*), White-plumed Honeyeaters (*Lichenostomus penicillatus*) and White-naped Honeyeaters (*Melithreptus lunatus*) from becoming permanent residents, though they still regularly visit the reserve.



Photo: White-faced Heron (*Egretta novaehollandiae*). Photographers: Wojciech Dabrowka and Kevin Vang

## 4.5 Case Study 2: Tom Thumb Lagoon

Once occupying over 500 ha in Wollongong, Tom Thumb Lagoon and its associated habitats now cover just 7 ha, with much of the habitat removed in the 1930s to create Port Kembla Harbour. In the last 10 years extensive remediation including earth works and planting has seen a number of different habitats created including wetlands, saltmarsh, mudflats and terrestrial forests. In conjunction with community volunteers working two days a week on site, other volunteers are also regularly involved in planting activities, with corporate days and school excursions ongoing. Over 60 species of birds have been recorded at the site since work began in the 1990s.



*Photo: With the development of Port Kembla Harbour Tom Thumb Lagoon has been reduced from over 500 hectares to 5 in 1994.  
Photograph obtained from Lynne Kavanagh, Wollongong City Council.*



*Photo: Various projects currently underway to restore Tom Thumb Lagoon. Photographs obtained from Lynne Kavanagh, Wollongong City Council.*

## Riparian Habitat Recommendations

Riparian habitats:

- Are often centres of high bird diversity.
- Can act as wildlife corridors, both as linear strips and stepping stones. Therefore connecting these areas with other riparian habitat or vegetation is important.
- Are particularly vulnerable to disturbance and pollution. Steps must be taken to minimise pollution.
- Can be at risk of water contamination with ramifications for the bird life and other fauna.
- Benefit from vegetation used around the waterway as buffer, to provide habitat for terrestrial birds and to stabilise banks. This planting will also help keep the waterway clean.
- Have enhanced bird habitat qualities when floristic and structural diversity is present.



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## **Part 5: Parks and Public Spaces**

### **5.1 Introduction**

The largest uninterrupted patches of ‘green’ space scattered throughout suburban areas are usually parks and public recreation areas. These have traditionally been designed for people to use to relax and enjoy. However, these parks can also play a large role in the conservation of biodiversity, and recreational needs and bird habitat requirements do not need to be mutually exclusive. Whilst conservation value is highest in remnants of bush or wetlands, parks and other public spaces are much more prevalent in our urban areas and therefore have the potential to supplement these reserves. In order to conserve our native birds (and other fauna), we must take advantage of the availability of parks and public spaces and, with careful planning and straightforward revegetation, bird friendly habitat can be created.

Nature strips and streetscapes are another common publicly owned ‘green’ feature of our urban areas. While there are significant limitations on the size of these areas due to their narrowness, streetscapes can add to other existing vegetation and facilitate the movement of birds through the landscape.



*Photo: This retirement village in Port Elliot, South Australia has created garden beds next to walking paths and on the edges of open spaces using a range of shrubs and grasses.  
Photographer: Pat Klynsmith.*

## 5.2 Vegetation Selection for Parks and Streetscapes

While some parks retain remnant trees from the original vegetation, this does not comprise a complete vegetation community. Planted trees, usually exotics such as liquid amber (*Liquidambar styraciflua*) or natives that are not indigenous to the region (like spotted gum *Corymbia maculata*), are also frequently present. These trees were chosen for their aesthetic value rather than their ecological value. Similarly, streetscapes generally consist of a single species of tree (where any vegetation is present at all), planted in a row adjacent to the footpath. Many exotic trees, in particular, do not provide an adequate food source for native birds and, while non-local native trees such as some common eucalypts do provide an abundant nectar source, these tend to support a range of larger nectar-feeders such as Noisy Miners (*Manorina melanocephala*),



Photo: A newly planted liquid amber at a new development in Wollongong. These provide little value for birds.  
Photographer: Holly Parsons.

Rainbow Lorikeets (*Trichoglossus haematodus*) and Red Wattlebirds (*Anthochaera carnunculata*) that can already find a surplus of food in urban habitats.

However, insectivorous birds (which are the ones most disadvantaged in urban habitats) may not be able to locate sufficient food in these trees, as insect availability tends to be lower in non-native trees<sup>(4, 5)</sup>. Indigenous eucalypts have been shown to support a larger arthropod biomass than both non-indigenous eucalypts and exotic trees<sup>(1)</sup>.

Still, trees should not be automatically removed if they are not locally-native. Many birds are likely to use these trees for nest locations, perching and roosting.

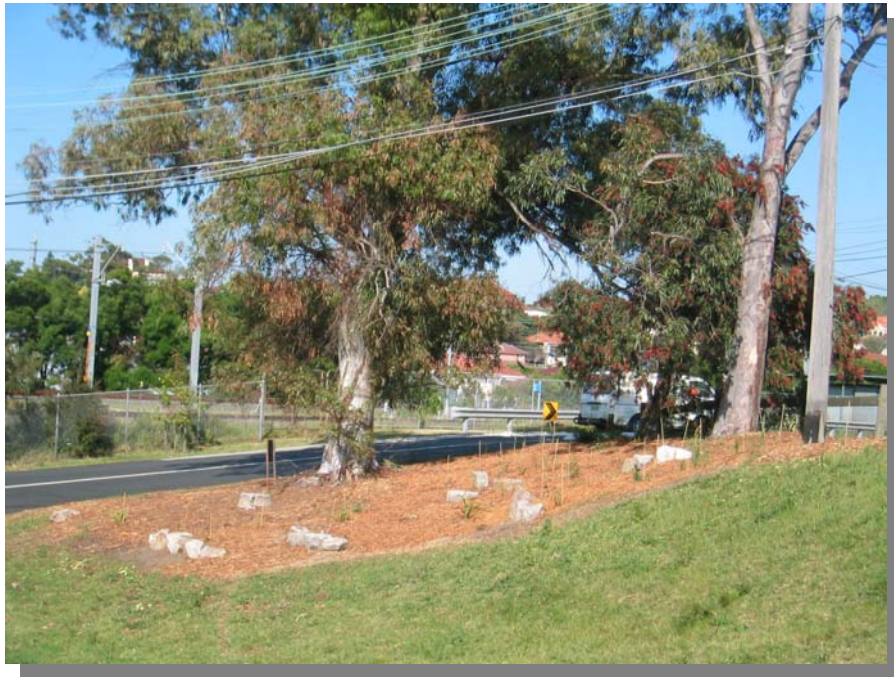
Therefore, rather than removing such trees, local native trees should be added and allowed to establish before the removal of existing vegetation occurs. It can take many years for plants to establish and therefore those involved in remediation efforts should be aware of such a time frame.

As well as trees, parks and streetscapes are dominated by lawns and mown grasses and while this does provide habitat for some native birds like the Magpie-lark (*Grallina cyanoleuca*) and Willie Wagtail (*Rhipidura*

*leucophrys*) that forage on these open lawns, many native birds require a shrubby understorey in which to shelter and forage. Grassed areas also require large amounts of water and fertiliser. Local native plants require much less water and no fertilisers, with mulching of the ground around the plants sufficient.

### 5.3 Park and Streetscape Design

Creating garden beds both within parks and along streets that surround the already present vegetation can reduce watering and also provide bird habitat. Within the garden beds, a range of local native plants should be selected to create structural diversity (ground covers, shrubs of varying heights and trees) as well as provide food sources for a number of native birds including nectar-feeders and insectivores<sup>(2, 3, 6)</sup>. If created under and around established trees they can also encourage birds that may not do so otherwise, to move up to and use the trees. Small birds such as the Superb Fairy-wren that forage in open space but require shrubs for shelter, may also benefit from such a design.



*Photographs: New low lying shrubs and grasses have been added along these streetscapes in Sydney as part of a 'Bush Pockets' program.  
Photographer: Michael Easton.*



*Photographs: New low lying shrubs and grasses have been added along these streetscapes in Sydney as part of a 'Bush Pockets' program.  
Photographer: Michael Easton.*

These garden beds do not need to take up vast amounts of the space that is set aside for recreation but should not be isolated from other areas of similar habitat. However for many native birds to use such locations, especially the smaller species, the distance between these small patches of vegetation must be relatively short or movements from patch to patch will be avoided. In effect, such a planting design would create a wildlife corridor system, linking areas within parks to suburban gardens, remnants of vegetation (if any are nearby) and along the linear streetscapes.

Many parks and public open spaces incorporate water – artificial ponds or lakes and channelised creeks or rivers. If managed well, these can increase the habitat opportunities and bird species diversity. See the section on riparian habitats and the following section which discusses artificial water bodies in new developments for a discussion of the habitat management issues.

## Parks and Public Spaces Recommendations

To improve the bird habitat in parks, public spaces and streetscapes:

- Plant dense shrubs and structure in conjunction with and complementing areas set aside for public recreation.
- Construct garden beds around trees
- Replace lawns with plants that require less fertiliser and water
- Do not remove vegetation automatically, even if exotic; other planting should be conducted and exotic vegetation only removed once new planting is established
- Approach the management of streetscapes as an opportunity to facilitate the movement of birds and provide corridors connecting remnants with gardens and parks
- Plant various species of local native trees along streets rather than single species or exotics

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## **Part 6: New Developments**

### **6.1 Introduction**

New estates that are established on the outskirts of urban centres often have the highest potential to create valuable bird habitat. This is where there is most control over the sizes of remnant vegetation that is left, where corridors can be planned and also where garden design starts from scratch with new homeowners. Yet trends in the design of new estates are seeing smaller house blocks filled with larger houses, with very little backyard available for potential habitat vegetation, and high impervious fencing strongly partitioning and segregating the landscape<sup>(9)</sup>. Rather than having the structurally diverse gardens and streetscapes needed to support the urban bird community, new estates usually lack mature trees and display a minimalist approach to planting due to a lack of space<sup>(6)</sup>. To compensate for a lack of space in private gardens, due to large houses on small blocks, open park space is often set aside and artificial ponds or lakes are created (unfortunately sometimes at the expense of natural waterways)<sup>(6)</sup>. These spaces are designed to be aesthetically pleasing but may actually hold very little ecological value as they consist primarily of open grass and scattered trees.

### **6.2 How is the Bird Community Affected?**

To date there has been very little research focused on these new developments and, given how prevalent they are in urban areas throughout Australia, further work is vital. What is known, however, is that these 'bare' suburbs support relatively few birds and only a low diversity of species, with introduced birds like Common Mynas, Common Starlings and House Sparrows and common natives like the Australian Magpie dominating the bird community<sup>(14)</sup>. These are species that favour open lawn spaces and highly human-altered habitats<sup>(10, 14)</sup>.

### **6.3 Creating a Bird Friendly Estate**

Given what we know about bird requirements in general and what is missing from these new estates, there is a range of methods that can be implemented to utilise the potential of these suburbs. These are the methods of remediation applicable to any suburban park, which have been previously described, and approaches at the garden scale, dealt with specifically in the Suburban Garden section (Part 7).

A major consequence of the creation of most new estates is the removal and fragmentation of traditional native vegetation. Wherever possible numerous large remnants (a minimum of 4 - 5 ha is needed for most bird species) of vegetation should be conserved and consideration made as to how to connect these patches with wildlife corridors.

Ideally the outcome of urban consolidation - using less land for housing should result in decreasing the larger impact on the remaining bushland. However, often the result is a suburb largely devoid of vegetation and of little ecological value. Other options would be to build fewer houses on larger parcels of land or build smaller houses. This allows trees and shrubs to be planted, which encourages a diverse bird community and also gives the homeowners more yard space and privacy. However, only the demands of potential buyers on a large-scale are likely to change this.



*Photo: New developments such as this one in Wollongong build large houses on small blocks, leaving little room for vegetation.  
Photographer: Holly Parsons.*

### **6.3.1 Land Division and Fencing**

A common feature of the new estate is the extensive use of privacy fencing (often 2m high colourbond or other solid materials) both between houses and surrounding the estate. These types of fences are not restricted to new estates and are gaining popularity in many older suburban houses because of the feeling of privacy created. However it is highly likely that these fences restrict the movement of many smaller birds.

Most native species (with some exceptions) do not use man-made structures with any great frequency <sup>(6)</sup>. The presence of a tall and solid fence may, therefore, restrict the lines of visibility for birds attempting to travel from one of these small yards to the next. The presence of natural perching sites that sit above this fenceline (such as a tall shrub or a tree) will allow birds to assess the location before moving on. As space is a priority in these small backyards, pruning to keep the base small, or create a topiary shape, may assist this as well as creating a dense pocket of vegetation the birds can use.



Alternatively, the creation of hedges or thickets may remove the need for solid fences altogether (once established). These create permeability for the birds but also privacy for the homeowner. Hedges also provide thick cover that protects smaller birds. Whilst not examined in Australia, hedges in rural landscapes in Europe have been shown to provide important protection and habitat for small birds <sup>(5, 7, 13)</sup>. Traditionally, hedges are created from introduced plants, however a wide range of native species such as lillipilly (*Acmena smithii*, *Syzygium* spp.), *Grevillea* spp., *Melaleuca* spp. (Paper barks), *Hakea* spp, and *Westringia* spp. can all be used as hedging plants.

### **6.3.2 Garden Planting**

Space is limited, especially in backyards of these new developments, and so trees and shrubs are often not suitable. In order to create bird friendly habitat the space that is set aside for the garden needs to be maximised and the right types of plants selected. While the use of non-native drought-tolerant plants like succulents is wise from a water-saving perspective, many hold little more than aesthetic value.

Local native plants are a great choice for any garden. They are best suited to the local conditions of the site and therefore are likely to grow quickly and be more successful. Many native plants are also drought-tolerant and once established, require less water than exotic plants, an important consideration in environmentally sustainable homes. There are a range of private and local council nurseries that will be able to identify plants best suited to the gardens. The environmental sections of local councils also often have information on suitable local native plants.

Developing layers is vital when creating bird habitat. Devoting a pocket of the garden (front or back) to the dense planting of a mix of different shrub species and ground covers will be the best way to encourage birds, as this creates a habitat similar to many traditional woodlands and forests <sup>(3, 11)</sup>. Regular pruning will help control the size of the shrubs and also create a dense habitat, providing shelter for small native birds. However creation of good bird habitat is dependent on an area much larger than a single garden <sup>(2)</sup>. Efforts need to be replicated throughout the suburban landscape in order to provide sufficient vegetation. Still, it is likely that well vegetated suburban gardens in new suburban developments, that are on the fringe of an urban area, will receive visits from birds more often seen in remnants and natural vegetation due to their relative location.

For more information on creating a bird friendly garden see the Suburban Garden section (Part 7).

### 6.3.3 Parks with Artificial Lakes/Ponds

Due to the small size of individual homes, suburban estates often set aside large open areas for public recreation <sup>(6)</sup>. Artificial lakes and ponds are also developed within the parks as a method of holding and managing stormwater. These artificial waterways do have the potential to support a range of bird species if they are vegetated and monitored to ensure that the water quality is well managed; to date, however, their ecological value has not been examined in detail in Australia. Moreover, artificial lakes and ponds should not be constructed at the expense of a natural water body. If a natural water body is already present at the site then this should be retained and restored. See **Riparian Habitats** (Part 4) for more information on habitat management issues.

Unfortunately parks and open spaces in most new estates follow the traditional characteristics of open lawn and scattered trees which generally support urban birds that are already common in the suburbs, in particular Noisy Miners, rather than the smaller native birds <sup>(12)</sup>. Pockets of land should be set aside for densely planted local native vegetation, ideally incorporating remnant trees, patches of native grasslands and other natural vegetation. Again, the principles of creating many layers of vegetation (trees, shrubs, ground covers) using a diverse range of local native plants should be applied. Walking tracks can be placed along the outskirts of larger patches as long as trampling does not become an issue. This will also minimise disturbances to birds. Isolated trees can have shrubs planted under them to encourage visits from small birds as these species are more likely to use these trees if there is a safe place to retreat to. The use of dense, spiny and prickly shrubs may also reduce the risk of criminal activities that are often associated with having shrubs next to paths.

Especially in new developments, having a central 'green' location may be used as a focal point to get homeowners involved in monitoring the environmental management of the park. Residents can become involved in planting shrubs and trees and maintaining the health of the park and can also keep a record of birds that are using it. Organising a community action group such as this is a great way to give the residents a sense of ownership and pride, as well as maintaining or initiating revegetation and remediation work. A long-term bird monitoring project can also be established to observe changes in the bird community.

### 6.3.4 Wildlife Corridors

Given that many new estates are often immediately adjacent to large tracts of native vegetation, they may either block the passage of birds into other urban areas because of the predominance of unsuitable habitat, or they may provide a stepping stone enabling native birds to move throughout a city. Therefore the correct management of this land is very important.

There is the potential to develop riparian or bush corridors through the open parklands. While these often contain patches of trees, understorey vegetation is needed to make these corridors suitable for most birds, especially small native species. Lightly treed parks simply support common urban birds including the Noisy Miner <sup>(4)</sup>. Wetlands, lakes and ponds, whether natural or artificial, scattered throughout the landscape may also provide an important corridor for waterbirds, although the value

of such stepping stone corridors has not been assessed in urban areas. Linking corridors from natural bushland into the suburbs may be an effective way of encouraging birds to use the corridors<sup>(1)</sup>. The location and the positioning of the corridors depends largely on the individual site, however, enhancing remnant vegetation patches found in parks by softening the abrupt edges (by planting local native shrubs and trees) that are seen between remnants and suburbs is an important first step in creating effective corridors.

While small backyards that are enclosed within fences are difficult to vegetate, front yards and streetscapes could be used to create suburban wildlife corridors. Rather than planting minimally, these strips of green space could be planted with local native plants (ground covers, shrubs and trees) to encourage bird movement through the suburbs. Native streetscapes do support a more diverse and abundant range of birds than either exotic or newly developed and relatively bare streets<sup>(14)</sup>. While all households should be encouraged to plant in this way, with council approval, planners of new developments should identify streets in which suitable corridors could be created, such as ones that may connect parks with remnant habitat, and provide planting advice for households to use.

## Features of New Developments

New developments:

- Are often very species poor, providing simple habitat that can only be used by common birds.
- Have the potential to provide important bird habitat as they often occur on the boundary of remnants. Structural and floristic diversity must be encouraged both in the gardens of residents and parks.
- Often have green spaces in the centre of the development which can act as a corridor however these often lack structure needed for birds.
- Use solid fencing which creates barriers. Instead hedges and thickets should be used to provide habitat for birds and also privacy for residents.
- Have central parks which provide an opportunity to encourage community groups to be involved in monitoring bird life as well as maintain the area.
- Could encourage planting of front yards and streetscapes to act as habitat corridors.

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## **Part 7: Domestic Gardens**

In this section we will discuss what can be achieved on a small scale to create suitable habitats for urban birds. We will also present some of the impacts that can be detrimental to birds in suburban gardens and how these can be minimised.

### **7.1 Domestic Garden Management**

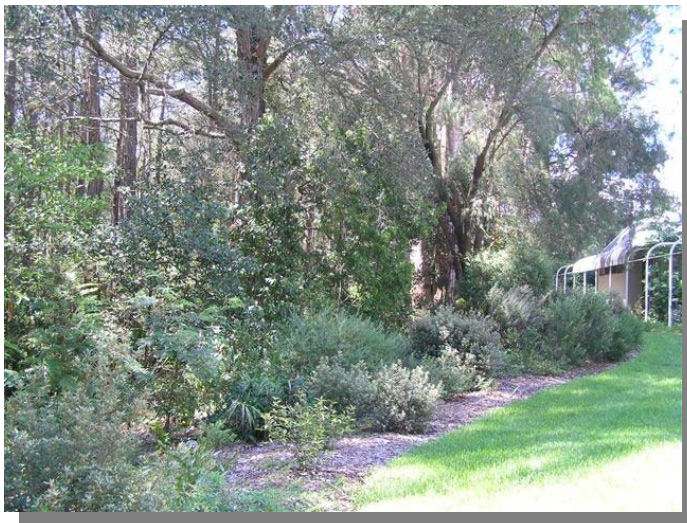
Urban areas are not devoid of suitable bird habitats and many suburbs provide significant areas of vegetation potentially available to birds. In fact, domestic gardens support the vast majority of urban biodiversity in many countries throughout the world and are likely to become increasingly important for the conservation of many birds in the future. The original continuous forests with tall trees and a structurally complex understorey of shrubs and grasses originally found along the Australian coastline, have mainly been removed during the early development of our cities and towns. The predominant habitat of our suburban gardens with sprawling lawns that require watering and mowing, a few scattered trees and some shrubs, in suburbs intersected with concrete, roads and houses, bears little resemblance to the original forest cover<sup>(2)</sup>. Even the species of plants are different; exotic and a select few native plants (especially hybridised species and cultivars) replacing the local natives. As a direct result of these major changes, our suburban gardens support a bird community that is very different from those in natural habitats<sup>(3, 4, 6, 7)</sup>.

While the specific species might differ depending on location, the big winners in suburbia are the introduced birds, especially the Common Myna (*Acridotheres tristis*), Common Starling (*Sturnus vulgaris*), Common Blackbird (*Turdus merula*) and the Spotted Turtle-dove (*Streptopelia chinensis*), the omnivores (those that feed on animals and plants), large nectarivores (those that feed on nectar from flowering plants) and frugivores (fruit eaters). High densities of these exotic and generalist native species have successfully adapted to the new habitats created by domestic gardens. They feed on prolific fruit producing plants like privet (*Ligustrum spp.*), nectar-rich hybrid natives, the well-watered and fertilised open lawn space or the abundance of anthropogenic sources of food (food sources due to people) that are available year-round. Traditionally, and away from urban areas, many of these native species range widely in search of food. In gardens, however, the abundance of flowering plants in particular, is resulting in these species becoming less nomadic<sup>(1, 8)</sup>. In contrast, specialist native birds that are dependent on a more natural habitat for survival, such as small insectivores, granivores (seed-eaters) and carnivores such as Australian Hobbys (*Falco longipennis*) and Nankeen Kestrels (*Falco cenchroides*), have not adapted as well to these urban environments.

There are some simple steps that can be undertaken to attract birds into domestic gardens and these will be presented here. However, it is important to note that habitat modification has to occur on a scale larger than a single garden if communities of native birds are to be recovered in towns and cities.

The common assumption that simply by planting a few native nectar-bearing cultivars, bird diversity will increase and that birds found in forests will start to appear in the garden is simply not true. Birds need abundant resources that cannot be provided by such a small area.

Therefore suitable habitat cannot be managed simply at the garden level but must occur across numerous patches at the landscape scale, with structure as well as the variety of plant species taken into account. We need to change the culture of gardening in Australia to make changes across the landscape. However, individuals can make a start right now and the more people that create these gardens, the better the neighbourhood. The principles outlined earlier about plant selection, planting design, management of existing vegetation, weeds and corridors (in Parts 2-6) all apply to the suburban context and will be reiterated again in the next section.



*Photo: This garden is surrounded by remnant habitat and also uses native plants. It attracts a high diversity of birds.  
Photographer: Jo Hambrett.*

The spatial context of a garden also influences which birds may visit. Gardens located close to bush remnants normally have a higher probability of being visited by a diverse range of birds, including Remnant Specialist species, than those gardens that are further away from the bush<sup>(2, 5)</sup>. Education programs run by local government agencies should target those areas where the bird community is likely to benefit from changes to gardens.

### 7.1.1 Success Stories: Native Havens – A North Sydney Council Program

North Sydney Council initiated the Native Havens program in 2001 to assist residents provide habitat for local fauna and have sustainable gardens. Under the program, residents are entitled to:

- Free, local indigenous plants
- An on-site visit to discuss specific plant suitability and habitat value of the garden
- Free mulch
- On-going advice and assistance (workshops and educational activities)

When a resident registers their interest in the program, an appointment is made to visit their garden. The resident is supplied with an information pack including brochures on habitat requirements, establishing a native garden, weed identification and an extensive list of local indigenous plants. This list contains a key detailing the sun, watering and drainage requirements and fauna-attracting qualities of each plant. This list is also available on Council's web page, with some pictures of local plants available: <http://www.northsydney.nsw.gov.au/www/html/3267-native-plants-of-north-sydney.asp>.

The number of new residents participating in the program increases each year. Awareness is growing that having a fauna-friendly garden is one small way that an individual can help conserve biodiversity and have a lovely sustainable garden as a bonus!

#### Domestic Garden Management

Successful management of private land should involve:

- Maintaining the current vegetation (especially indigenous species) and removing weeds and other exotic vegetation only after the establishment of replacement habitat.
- Maintaining landscape connectivity .
- Limiting disturbances.
- Coordinating garden management with the surrounding landscape.
- Minimising or eliminating edge effects by providing buffer habitat between remnants and surrounding suburban land by enhancing garden vegetation.

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## 7.2 Gardening for Birds

To encourage a range of birds in domestic gardens, habitats need to be created that are similar to those in their natural environment. For the smaller birds most adversely affected by urbanisation, this means creating dense, understorey vegetation in gardens as opposed to scattered trees and lawn. Many small birds use vegetation up to a height of about 2 m for shelter, feeding and for nesting<sup>(15, 17, 18)</sup>. By providing a diverse range of different shrubs and ground covers within gardens we not only replicate what is found in natural woodland and forest habitats<sup>(6)</sup> but also provide a range of food sources (primarily nectar and insects) that can be used by birds. Insect pollinated plants encourage a greater diversity of insects, providing food for insectivorous species and shelter for all birds. While the use of prickly shrubs such as *Hakea* spp. is often recommended for providing refuge for small birds, there is little scientific evidence that this is the case (though not entirely<sup>18</sup>). Nonetheless, planting dense thickets comprising local native plants is to be encouraged.



There is a common perception that native gardens need to be messy to provide good bird habitat but this is not necessarily true. Shrubs and trees can be grown in garden beds, leaving patches of open grass available in other parts of the garden. Creating pockets of dense shrubs can be achieved in two ways. Firstly, by growing plants close together in garden beds. (While plant mortality may be slightly higher due to increased interplant competition, weeding is also reduced). Secondly, by pruning and shaping shrubs as they grow, allowing the gardener to have control over the shape of the shrub and encouraging dense coverage.



*Photo: Pruning of native shrubs can help create a neater and tidy looking garden that can still provide good bird habitat. This garden on the NSW Southern Highlands uses garden beds but also has areas of open lawn space. Photographer: Kate Ravich.*

Logs can make good edging around beds and also provide habitat. The use of mulch around plants and in garden beds encourages a range of invertebrates that not only improves the quality of the soil and reduces the amount of water needed in the garden but also provides food for many bird species. However mulch can also reduce regeneration potential if the garden is near bushland with original soils.



Photo: Garden beds with new plantings of natives have been added to traditional camellias and roses in this garden in Perth. Photographer: Sue Keogh.

Invertebrates are also found on grass so retaining some areas of grass is necessary for ground foraging species <sup>(20)</sup>.

Allowing patches of grass to grow and go to seed (unless a non-seeding variety is used) also provides food for a number of granivorous species, including parrots and finches. This can be done on a rotation basis so there is some open short grass space available. Fallen wattle seed is also a potential food source for these birds.



Photo: Granivores like these Red-browed Finches (*Neochmia temporalis*) forage on open grass. Photographer: Nicholas Hunt.

Native birds tend to prefer native vegetation <sup>(8, 10, 11, 19, 23)</sup>, although the relationship is not clear-cut. Catterall *et al.* (1991)<sup>(1)</sup> suggests that native birds are more selective in their choice of plants than introduced birds. Rather than removing exotic vegetation, local native plants should be added to the garden. By selecting a range of nectar-producing shrubs, as well as insect attracting species, the garden can provide food and habitat for different types of birds. In particular species of banksia, grevillea and eucalypts have been identified as important for nectarivores and insectivores <sup>(6, 8, 10, 11, 22)</sup>. However the propensity for eucalypts to attract Noisy Miners (*Manorina melanocephala*) must also be considered <sup>(1)</sup>. See **Fragmentation: The Noisy Miner Effect** (Part 1 and Section 3.2.1) for more details. Groups of at least 5 to 7 of the same species of plant should also be clumped together to provide a sufficient resource (food or shelter) for the birds to use. This use of thickets is also better for overall aesthetics and the design of the garden.

Local native plants are best suited to the climatic conditions of the area and they have traditionally provided food and shelter for the bird species present. Once established they also require less water and fertilisers. It is commonly thought that hybrid native plants, particularly grevilleas, are responsible for the increase in the numbers of Noisy Miners, other large honeyeaters such as Red Wattlebirds (*Anthochaera carnunculata*) and nectarivorous parrots like Rainbow Lorikeets (*Trichoglossus haematodus*) in urban habitats. However there is no evidence currently to suggest that this is the case <sup>(1)</sup>. Nonetheless, given the abundance of these bird species and the potential for aggressive encounters with smaller species (particularly from the large honeyeaters), we recommend that these hybrids be avoided.

Along the east coast of Australia, the popularity of fruit-bearing shrubs and trees, particularly privet (*Ligustrum spp.*), is thought to be responsible for an increase in the abundance of Pied Currawongs (*Strepera graculina*) in urban areas <sup>(2, 3, 12)</sup>. Whilst largely frugivorous, this species also feeds on the eggs and nestlings of small birds <sup>(5, 9, 14, 24)</sup>.

Concerns have been raised about the high levels of Pied Currawong predation on the nests of other species, particularly small birds, and the potential consequences in urban habitats <sup>(13, 14, 21, 24)</sup>. Pied Currawongs have been shown to be significant predators of small bird nests in urban areas of Australia <sup>(14)</sup> with predation levels on artificial nests decreasing following the removal of this species <sup>(9)</sup>. Although it may be difficult to separate the potential impact of predation from other impacts on birds brought about through habitat change <sup>(4)</sup>, discouraging the presence of Pied Currawongs through habitat modification is advisable.

Pied Currawongs are typically found in urban areas with high tree cover and open grass space, similar to their traditional forest habitat of tall trees with reduced understorey. In addition, they are



Photograph: Dense grassy and understorey planting in garden beds.  
Photographer: Andrew Telfer

commonly fed by people (usually meat) and opportunistically consume cat and dog food <sup>(24)</sup>. To minimise their impact, fruit-bearing trees (like cotoneasters or privet) should not be planted or the fruit should be removed before ripening. Supplementary food should not be left for these birds and dense shrubs instead provided as potential nest and cover sites for small birds that would be difficult for currawongs to access.

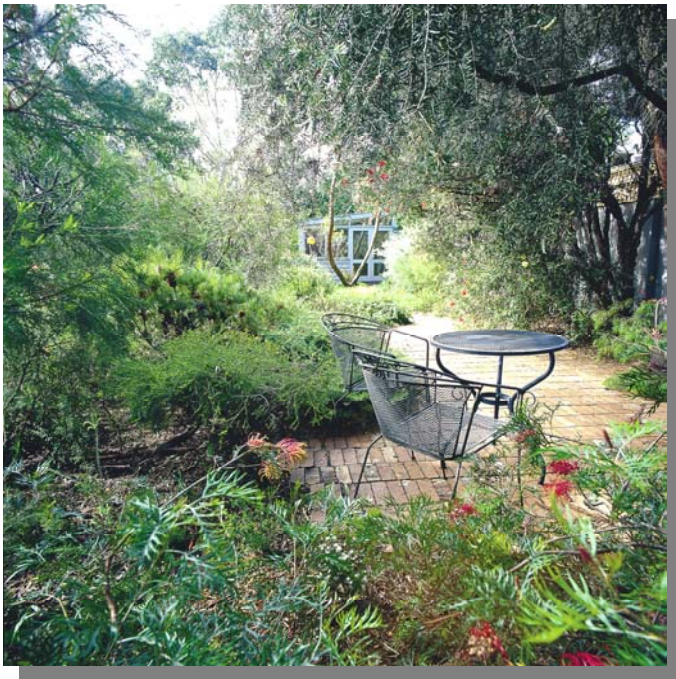
## Garden Recommendations

To create useful bird habitat, gardens should:

- Contain shrubs and ground covers, planted to restore understorey vegetation.
- Include a diverse range of plants.
- Contain local natives rather than exotics, non-local natives or hybrid natives.
- Have fruit removed or bagged from weedy fruit-bearing shrubs and trees.
- Have density in shrubs created through pruning, close planting and including multiple individuals of the same species grouped together.
- Be mulched to encourage insects for insectivores.
- Have seed producing shrubs and areas of grass allowed to grow and go to seed to provide food for granivores.



*Photograph: Dense shrubs are prevalent throughout the Davidson's garden in Victoria, providing great small bird habitat. Photographer: Diane Snape from [The Australian Garden](#) by Diane Snape (Bloomings Books 2003).*



*Photograph: The Snape garden shows multilayered structure and space that can still be used by people. Photographer: Simon Griffiths from The Australian Garden by Diane Snape (Blooming's Books 2003).*



*Photograph: The Tube's garden has replaced much of the lawn using a variety of native tussocks and ground covers. Photographer: Diane Snape from The Australian Garden by Diane Snape (Blooming's Books 2003).*

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## 7.3 Weeds and the Garden

Many weeds which have invaded native habitats have originally come from suburban gardens. Of the 2779 weed species known to be established in the Australian environment, 66% are escaped garden plants <sup>(1)</sup>. This does not include native species that now occur outside their natural geographic range. Unfortunately, a number of plants that have been identified as invasive, and many that have become weeds overseas, are still available for sale in markets, chain stores or even nurseries <sup>(1)</sup>. Therefore households should consider the dispersal mechanisms of the seeds and whether plants they are selecting may escape from their garden as well as if the plant would benefit urban birds.

Exotic and native plants that have wind-dispersed seeds, such as grasses, and seeds that are ingested by birds due to attractive fruit such as cotoneaster (*Cotoneaster glaucophyllus*), pepper tree (*Schinus molle* var. *areira*) or sweet pittosporum (*Pittosporum undulatum*), are known to escape into nearby remnants and may become established there. Weeds also spread when dumped as garden waste. Weed species should therefore be removed from a garden (slowly if they are being used by birds) and replaced with local native species similar in structure so as to provide a similar habitat for birds with the remains disposed of responsibly in green bins. More details about the value of weeds to birds can be found under **Weeds and Weed Control** (Section 2.2.3).

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## 7.4 Wildlife Corridors

There is the potential for suburban gardens to form a significant part of the web of wildlife corridors connecting remnant vegetation throughout a city. To be effective, however, entire streets and even suburbs need to be considered and developed together as a complete ecological unit. The principles of creating good bird habitat through planting of a diverse range of local native tree and understorey species remain the same, and planting along property lines (preferably backyard) could create a strip of vegetation through which fauna could travel.

While there are currently no studies assessing the value of suburban wildlife corridors, the 'Neighbourhood Bushways' project <sup>(1)</sup> is a concept being used in some areas in New Zealand in which backyard corridors are connected throughout neighbourhoods. Similarly, the Green Web Sydney program in Sydney encourages local councils to develop corridors through all available green space within their boundaries.

In addition to potentially providing important bird habitat, establishing suburban corridors provides an opportunity to educate householders about the value of birds, enrich their environmental experiences and raise awareness about these and other important conservation issues.

### Suburban Corridor Recommendations

Gardens, nature strips and streetscapes have the potential to act in conjunction with other strips of vegetation as wildlife corridors connecting all urban habitats.

- Connections can be made on private land through backyards or along streets.
- They can be an education tool to encourage people to change garden style.
- Corridors should be created and maintained as for other wildlife corridors. See section 2.2.5

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## 7.5 Supplementary Feeding

The issue of whether or not to provide food for birds is divisive, although it is a popular practice throughout the western world. The supplementary feeding of birds, particularly during the harsh winter period in Europe and North America has long been encouraged due to food shortages at this time<sup>(6, 10)</sup>. In Australia, however, such climatic conditions do not exist and yet rates of participation are remarkably high, ranging from 25% to 57% of surveyed households<sup>(13, 15, 18, 19)</sup> with food being supplied year round<sup>(18)</sup>. The birds that appear to benefit from feeding are those that are already common members of the urban bird community such as the Australian Magpie (*Gymnorhina tibicen*), Grey and Pied Butcherbirds (*Cracticus torquatus* and *Cracticus nigrogularis*), Laughing Kookaburras (*Dacelo novaeguineae*), Noisy Miners (*Manorina melanocephala*), Rainbow (*Trichoglossus haematodus*) and Scaly-breasted Lorikeets (*Trichoglossus chlorolepidotus*), as well as introduced birds such as the Spotted Turtle-dove (*Streptopelia chinensis*) and Rock Dove (*Columba livia*)<sup>(12, 14)</sup>.

**Therefore supplementary feeding may be promoting the dominance of these already abundant species rather than sustaining populations of small insectivorous or granivorous birds and may in fact be contributing to the decline of small native birds.**

In addition, the types of food provided by Australian feeders are often inappropriate for many of the birds being fed. Bread has been associated with digestive and intestinal problems in birds<sup>(11)</sup>, yet was the most common food provided in several Brisbane studies<sup>(7, 16, 18)</sup>. When used as the primary part of a bird's diet, low-grade meat with high fat content has been shown to cause calcium deficiencies<sup>(17)</sup> and cause changes to the blood chemistry of Australian Magpies<sup>(8)</sup>. Seed rarely forms a significant part of the natural diet of many of the native birds that are fed in urban areas, and thus may advantage introduced birds such as Rock Doves, Spotted Turtle-doves and House Sparrows (*Passer domesticus*)<sup>(16)</sup>. Finally, honey and water (and often bread) is frequently used to attract lorikeets<sup>(16)</sup>. This mix does not provide all of the requirements necessary for the health of nectarivores, as the complex sugars found in native flowers are missing<sup>(4)</sup>. There is also some evidence that the availability of a permanent food source has promoted some degree of sedentary behaviour in Rainbow and Scaly-breasted Lorikeets<sup>(5)</sup>. It is not only the food itself that may be harmful to birds; in North America, unhygienic food stations have been shown to encourage the spread of psittacine beak and feather disease and psittacosis<sup>(3)</sup>.

Close contact between birds aggregating in high densities at feed stations has also been implicated in the spread of disease<sup>(1, 12)</sup>. For example the spread of mycoplasmal conjunctivitis among House Finches (*Carpodacus mexicanus*) in eastern North America appears to be associated with bird feeders<sup>(2)</sup>. This concern is important for Australia as unhygienic practices such as feeding waste seed from aviaries to wild birds and feeding on unclean stations have been found to be common practices among suburban feeders<sup>(7)</sup>. Finally, there is concern that feeding birds can result in these birds becoming dependent on the supplementary food source. Most people that feed birds do so on a regular basis, with many feeding daily<sup>(7, 9, 13, 16)</sup>. However, while this is a major concern among both opponents and proponents of feeding<sup>(3, 7, 15)</sup>, there has been remarkably little research examining this topic; currently, no evidence of dependency has been found<sup>(7, 14)</sup>. A bird-friendly garden can provide food that is natural and beneficial for a diverse bird community. We would therefore recommend that creating such a garden be conducted,

rather than supplementary feeding, as any potential benefits to the birds are outweighed by the damage done by feeding larger and aggressive birds, feeding incorrectly and using unhygienic practices. Often householders want to feel connected to their local wildlife and feel that they can gain a greater understanding of wildlife through feeding <sup>(7)</sup>. Education is needed to inform people of the potential harm of feeding and highlight the benefits that can be gained through garden design.

## **Supplementary Feeding Recommendations**

**The Birds in Backyards Program considers that creating suitable habitat is the preferred way of maintaining native birds in urban areas. We do not consider that providing artificial food sources is necessary or even desirable, but we recognise that some people derive great fulfillment from feeding wildlife. There are issues with feeding the incorrect food, encouraging the dominance of large and aggressive species and the spread of disease. If you choose to provide food for birds we encourage you to take the following steps to minimise threats to the health of individual birds as well as to the broad bird community:**

- Ensure that the feeding station is cleaned daily and is located out of reach of potential predators such as cats.
- Provide high quality food. Do not provide bread, fatty meat or honey and water mixes. Instead use nectar mixes, good quality seed or meat with a low fat content.
- Vary the type of food provided and when it is available. Alternate between nectar mixes and seed for example. Set it out at different times and not every day.
- Monitor the types of birds using the feeder. If introduced birds are becoming more common or populations that are visiting the feeder are becoming very large, then take a break from feeding for a while and then recommence with a different food type.
- Provide a bird bath (See the next section).

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## 7.6 Water and Bird Baths

Providing fresh water for birds in a garden is a better alternative to feeding. While not examined in the scientific literature, using a bird bath is not generally considered to be detrimental to the bird community provided steps are taken to ensure that the bird bath is safe and hygienic.



Photograph: Birds including an Eastern Yellow Robin (right) (*Eopsaltria australis*) using a pedestal bird bath. Photographer: Jeff Eller.

### Water and Bird Bath Recommendations

- The bath should be in a relatively open space such as suspended from a tree branch with a perching spot nearby so birds can observe the bath before using it and be able to see approaching threats.
- Pedestal bird baths should be stable and high off the ground.
- The bath should be in dappled shade so the water does not become too hot during the day
- Water must be replaced daily and the bath scrubbed out regularly (however detergent should not be used).
- Dense shrubs should be available nearby in the garden to allow the birds to escape if threatened.
- The bath should be shallow (generally < 5 cm) with a rough base so birds are not at risk of drowning.

## 7.7 Domestic Pets

The common perception is that cats and dogs harm wildlife. Cats harm wildlife by hunting and dogs by either catching and killing birds or chasing birds out of yards. Surprisingly there has not been a lot of literature in Australia that examines these potential impacts, especially in the case of domestic dog impacts. However, dog and cat urine has been shown to damage newly planted vegetation and therefore may cause issues for bush regeneration sites as well as domestic gardens <sup>(5)</sup>.

It is undeniable that many cats kill birds, and with over 1.5 million domestic cats living in Australian capital cities alone, there is the potential for them to cause major damage. While not all cats hunt and most do so very infrequently, it is estimated that only 50% of kills are brought home <sup>(3, 7, 8)</sup>, and therefore cats may be having more of an impact than is realised.

There is much debate about just how big this impact is. While some believe that cats are damaging bird communities <sup>(7, 13)</sup>, others suggest that cats simply remove excess birds, and may in fact control populations of some of the very common species and that the impact of predation is exaggerated <sup>(1, 4, 6, 9)</sup>. This is an area of research that requires much closer inspection before the impact of cat predation can be dismissed.

Cats are opportunistic hunters, so, where they live may predict what damage the cat could do <sup>(1)</sup>. If, for example, they live in a suburb close to a remnant of native vegetation the household may be lucky enough to have a very diverse range of bird species including some rarer natives. Cats could pose a significant risk to this bird community both in the suburb and in the remnant <sup>(1, 2, 10)</sup>. However, in an inner city suburb, where the bird community consists of large numbers of introduced birds and the more abundant natives, cat predation would have less of an impact.

Birds are not actually the most common prey taken by domestic cats, with rats and mice being more prevalent in the diet <sup>(1)</sup>. However the numbers of birds taken is greatest in spring and early summer. This is when most birds are breeding and the young are leaving the nest.

### 7.7.1 Cat Misconceptions

- Cats are happiest outdoors – but if provided with plenty of stimulation and attention, cats can, and do, live very happily indoors. Ideally a kitten should be raised indoors. However, given enough time to adjust, cats that have spent their entire life outdoors can live happily inside. Cats that are allowed to roam are also more likely to be killed by cars, dogs or by fighting <sup>(11, 12)</sup>.
- Bells on collars stop predation – but cats can learn quickly how to move silently with a bell or bells attached <sup>(2)</sup>.
- Keeping a cat well fed will stop it from hunting – there is no evidence to support this <sup>(2, 3, 7, 10)</sup>.
- A night time curfew stops predation – this no doubt stops night time captures, especially of nocturnal animals such as possums and other mammals, and keeps the cat safe from

potential dangers. However, birds are usually hunted during the day especially dawn and dusk so it is important that cat curfews include the early morning and evening period <sup>(1)</sup>.

- Desexing limits a cat's desire to hunt – whilst desexing a cat does not curb hunting behaviour, it nevertheless should be encouraged. As well as stopping unwanted litters, it also lessens your cat's likelihood of being injured in a fight <sup>(2)</sup>.

### **Cats In the Suburbs Recommendations**

- Keep cats indoors and/or create a cat-proof outdoor enclosure –not allowing a cat access to potential prey is the only way to completely stop it hunting. This also keeps the cat safe from potential dangers <sup>(11, 12)</sup>. Special cat netting placed on fences and walls can also stop the cat escaping from the yard but will not stop it taking prey.
- Provide refuge in the yard for birds and reptiles– create locations in the garden for animals to retreat to that are out of reach of cats.
- Dense natives are good hiding spots for small birds. These should be planted in thickets of several shrubs.
- Nest boxes should be high in trees inaccessible to cats with metal collars placed around the base of trees.
- Bird baths should be beyond the reach of cats – hanging from a tree is ideal. They should have good visibility all around it and a perch nearby so birds can observe the area before using the bath and also be able to retreat quickly.
- Prevent neighbouring cats from spending time in the garden - a spray of water from a water bottle is a great deterrent and will not harm the cat.

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## 7.8 Nest Boxes

The effectiveness of nest boxes has not been examined in Australian suburban gardens. Hollows are in short supply in urban habitats due to the removal of decayed trees and limbs (for public safety) and the suppression of factors that promote hollow development, such as fire <sup>(2)</sup>. Therefore, there is the potential for nest boxes to be useful, at least where natural hollows have become rare. While nest boxes are generally aimed at native mammals (primarily possums and bats) and birds such as pardalotes, kookaburras, owls and a range of parrots, introduced species like the Common Myna (*Acridotheres tristis*), the Common Starling (*Sturnus vulgaris*) and feral bees also use them readily <sup>(1,3)</sup>. On private property, householders can monitor the usage of the nest box and remove nesting material of undesirable species. Introduced species are persistent, however, and constant vigilance is required. Such monitoring may be more difficult in remnants or parks where the boxes may be harder to access, widely dispersed and greater in number. While there is some suggestion that the creation of a baffle at the entrance may stop introduced birds from using nest boxes, there is little scientific evidence to support it.

The design of the nest box depends largely upon the bird targeted. Some, like Laughing Kookaburras (*Dacelo novaeguineae*), need the floor of the nest chamber to be the same height as the entrance and attached horizontally, while most parrots require deep boxes attached vertically. Specific dimensions for a range of native fauna can be found at [http://www.birdsaustralia.com.au/infosheets/05\\_nestboxes.pdf](http://www.birdsaustralia.com.au/infosheets/05_nestboxes.pdf). Some private companies and councils sell ready assembled boxes. Regardless of the type constructed, nest boxes should be placed away from prevailing winds and sheltered from midday heat. They also should have drainage holes and be attached securely. A metal collar around the base of the tree or branches may make the nest box inaccessible to predators such as cats and rats.



Photo: Nest boxes can be used by a variety of hollow-nesting species in suburban gardens such as these Pale-headed Rosellas (*Platycercus adscitus*). Photographer: Jeff Eller.

## Nest Box Recommendations

- Nest boxes also provide another opportunity for households to connect with the birds that visit their garden.
- Nest boxes need to be correctly managed so as not to simply provide a nest site for introduced birds or allow mammalian predators access to the birds.
- Create or erect nest boxes according to the shape and dimensions required by the individual species.
- Keep records of what species are using the nest boxes over the long term, households can contribute to our knowledge about how successful nest boxes are in suburban gardens .

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