

BUSH FUTURES

Sustainable Management of Significant Urban and Peri-urban Bushland Areas



Nest Boxes for Wildlife

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There are approximately 300 vertebrate species in Australia that use tree hollows. Many bird species, most arboreal marsupials and over half of the microbat species in Australia are dependant on tree hollows for shelter and breeding sites. Arboreal species play an important part in our ecosystem through pollination of plants, dispersal of seeds and regulating insect population.



Various nest boxes used for birds, microbats and mammals

Land clearing, urbanisation, logging and firewood collection have significantly reduced the availability of tree hollows, impacting on hollow dependant species and the ecosystem services they provide. Loss of hollow bearing trees is a Key Threatening Process listed in the *NSW Threatened Species Conservation Act 1995*. The formation of tree hollows in eucalypt forests is a slow process which generally takes at least 100 years to develop hollows large enough to provide habitat for many animals.

Artificial tree hollows, or 'nest boxes', have been identified as a management tool that can be used by a range of species as a replacement for natural hollows in the landscape. At least 10 mammals, 15 birds and 8 micro-bat species as well as some reptiles have been recorded using nest boxes in Australia.

Although nest boxes are a great way to assist in conservation and to observe local wildlife they are only a stop gap measure to make up for the loss of hollow-bearing old growth trees. When considering the conservation benefits of installing nest boxes the first step is to ensure existing natural hollows are protected and to increase the regeneration of native vegetation that will form new hollows.

The use of fallen hollow bearing timber to construct nest boxes is not encouraged. While this may be done to construct nest boxes that mimic the real thing, the result is a reduction of natural habitat in the landscape. Fallen timber and dead standing trees provide essential habitat for a wide range of species and should be left alone.

Nest box uses

Nest boxes in backyards are a great way to encourage many birds around your house, while boxes in rural areas can provide important habitat for a range of species including birds, arboreal mammals and bats.

There have been many studies carried out in Australia examining nest box use in national parks, rural farms and urban areas for a number of reasons including: detection of species occurring at a site, study of species ecology, support of threatened species and strategic placement (e.g. wildlife corridors). Some studies have even looked at the value of providing bat boxes in farm forestry plantation to provide natural insect control.

These studies have increased knowledge about effective design, placement and use of nest boxes, however current knowledge is not definitive and there are still many questions to answer.

Species known to use nest boxes

In Byron Shire, work by Southern Cross University has recorded the use of nest boxes by; Owlet-nightjars, Eastern rosella, Sugar glider, Antechinus, Northern long eared bat and Brush tailed possums. Some species have been recorded using nest boxes for breeding including Owlet-nightjars, Eastern rosellas and Sugar gliders.

Other Australian research has recorded the following species using nest boxes: Galahs, Corellas, King parrot, Kookaburras, Kingfisher, Tree creeper, Cockatoos, Parrots, Wood ducks, Owls, Pardalotes, Brush-tail and Ringtail possums, Sugar and Squirrel gliders, Feathertail glider, Pygmy possums, Antechinus, Brush-tailed Phascogale and various microbats including: Gould's wattle bat, Gould's long-eared bat, Lesser long-eared bat, Large forest bat, Chocolate forest bat and the White-striped freetail bat.



Squirrel Gliders



Gould's Wattle Bats

Photos G.Beyer

Factors affecting nest box use

Factors that can affect the use of nest boxes:

- Habitat features of nest box location such as feed trees, existing hollows and forest structure
- Box design- entrance size, construction materials, box dimensions
- Box placement- height, aspect
- Temperature of box- related to box design and placement
- Competitive interactions- between individuals and species

Site Selection

A starting point in planning the installation of nest boxes is to identify what hollow-using fauna occur in your area and use this to guide what type of box is appropriate to use. Species can be identified by doing night time spotlighting, online via the National Parks and Wildlife Service 'Wildlife Atlas' or by contacting the councils Natural Resource team.

Consideration must be made of the suitability of the site for nest boxes. It is not recommended to be providing habitat for some species within urban development or adjacent to busy roads. Consider the consequences and potential risk to wildlife from road kill and attacks by domestic pets. In busy urban areas nest boxes located high in trees targeting bird species may be a preferred option.

Features of a suitable location for nest boxes targeting mammals would be:

- an area of native vegetation, ideally connected to other areas of native vegetation
- have the presence of feed trees such as eucalypts and acacias
- pose minimal threats from roads and domestic animals.

Box Design

Nest box design will vary between species and the main design elements influencing use include; entrance size, box volume, hollow depth below entrance and wall thickness.

Entrance size will affect what species will use a nest box. Most species generally prefer an entrance size similar to body width, this will exclude predation by larger species which are unable to fit through the entrance hole. Box designs targeting microbats often consist of an open bottom box; the bats will enter the box from below and climb the interior of the box to roost at the top. Volume and depth of nest boxes can affect use, as well as the suitability of the boxes for breeding. Many species will prefer boxes to be at least 30cm deep below the entrance, however, some birds such as wood ducks, kookaburras and kingfishers prefer entrances level with the floor of the box.

Preferred box volume will vary with species size and whether they nest communally. Boxes targeting large species such as owls and possums will need a volume large enough to accommodate these species and may be as deep as 1m. Many mammals form communal nests which are made up of a family group of many individuals, therefore internal dimension must be large enough to accommodate multiple individuals.

If there is the presence of invasive pest species, such as Indian Mynas or bees, exclusion of these species is possible through appropriate designs. Rear entry boxes will exclude birds while still allowing gliders to use the box, while front entry boxes with baffles across the entrance can be effective in excluding Indian Mynas. Carpet attached under the lids of boxes can discourage bees from taking up residence as it creates a surface unsuitable for them to attach their hive to.

Materials used in construction should provide effective insulating properties to minimise thermal variation in boxes. Some research has indicated that boxes that provide insulation, as provided by natural tree hollows, are more likely to be used. Materials should also be chosen to withstand weathering from rain, sun and heat. Most boxes are constructed using hardwood boards or plywood >1.8cm thick.

There are a number of publications which outline the design and construction of nest boxes, some of these are listed in the end of this fact sheet.

There are also a number of nest box manufacturers in Australia who produce a variety of nest boxes for a range of species that can be found on the internet.



A small micro-bat box (left) and a rear entry glider box (right)

Box Location

Box location is important to consider and will influence the use of the box by wildlife.

After determining a suitable site, target species and box type, consideration should be made of where to locate the box in the tree. It is recommended that nest boxes be placed at a minimum height of four metres. Nest boxes placed higher will have the advantage of being out of reach of most predators. Nest boxes targeting possums and gliders should be placed in areas that are sheltered by foliage. Boxes targeting microbats and birds are best placed in more open areas that provide unobstructed access to the box entrance.

The aspect at which the box is placed will influence the internal temperature of the box. No definitive preference for aspect has been recorded in an Australian study; however a few trends are evident. Boxes placed on the south side of the tree may be

preferred by possums and gliders as they will remain cooler during the day. Microbats thermoregulatory requirements mean that boxes that receive direct sunlight and warm up in the afternoon may be beneficial. This will enable them to save energy by using ambient heat to raise their body temperature before they venture out to feed at night.

Preferably a number of boxes should be installed into an area at various aspects as this will provide a range of boxes with varying microclimates. Box preference may vary throughout the year in response to seasonal variation and a species' breeding cycle and many species will utilise a number of hollows in their home range.

Installation of Boxes

Boxes should be installed at a minimum height of 4 metres. To install these safely you should consider the following:

- Ensure you have a suitable ladder for the job
- Place ladder on upslope of tree if located on a slope
- Ensure ladder, when placed, has a ratio of 4:1 (height:horizontal distance)
- Tie the top of ladder securely to tree
- Appropriate safety equipment should be used when working at heights (i.e. safety harness and strap to attach to tree while working at heights, hard hat and safety glasses for ground crew)
- Ensure the ladder is positioned to ensure worker does not need to overreach.
- Set up sling and pulley system to the trunk in order to raise the nest box into the tree



Nest boxes being installed using a sling and pulley system. Person on the ground can raise the box into position and hold it in place until it can be securely attached to the tree.

Boxes should be attached to the tree using wire or chain inserted into a hose or similar object in order to protect the tree. Putting kinks or bends in the wire will allow the wire to stretch as the tree grows; alternatively a spring can be used to join the wire to the box. Boxes should not be attached to a tree using bolts or screws as this can damage the tree.

It is important to keep a record of boxes that are installed. This will create a valuable resource that can be used to record the environment that the box is placed in. These records can be used to assess the suitability of box placement and design over time and direct the placement of boxes in the future. For each box a record should be kept of: box type, location, tree species attached to and diameter or trunk (cm), height of box, aspect (N,S,E,W), description of vegetation and condition.

Maintenance and Monitoring

Monitoring nest boxes is important to ensure there are no problems that reduce their use as well as recording their use by wildlife. Regular inspection of nest boxes should be undertaken to identify damage to the box, wire getting too tight on the tree or the presence of feral species such as bees or Indian Mynas.

Closer monitoring of your nest boxes should be undertaken to assess usage of the nest boxes, to evaluate the success of box placement and to guide installation of additional boxes. Taking a photo of any animals in your nest box, while ensuring you minimise disturbance, is a great way of recording box use and will aid in accurately identifying animals. Your local Council may be interested in recording the outcomes of your monitoring.

Monitoring of boxes used by birds can be carried out using binoculars from a distance. Identifying use by nocturnal species can be achieved through observing boxes at twilight when inhabitants are leaving boxes, or by looking inside boxes for animals or evidence left in boxes such as scats, leaves or eggs. Some gliders and possums will build leaf nests inside the boxes which provide evidence of usage.

Records could be kept in a spreadsheet or diary and should include details of the time of monitoring, any animals using the boxes or evidence of use such as scats or scratches or chew marks on boxes. This will provide valuable information of the



A data sheet is an ideal way of recording the details of the nest box location as well as installation date, height, aspect, tree species attached to, canopy cover or any other observations.

species living in your area. Be patient though as it may take some time before boxes are used.

Pest Species

Regular monitoring of boxes will also be required to identify and evict pest species such as Indian Myna, Feral Bees and ants. These species will exclude target species using the box and should be removed. This may require having to take the box down and place it in a different location to deter Indian Mynas. Exclusion of these species is possible through appropriate designs such as rear entry boxes for gliders, installing baffles on front entry boxes and placing carpet under the lids of boxes to discourage bees.

Integrated Habitat Restoration

In order to support and conserve hollow dependant wildlife nest box installation should be used in combination with a variety of management techniques including:

- Retaining hollow bearing trees in the landscape
- Planting local tree species that will form hollows in the future
- Plant local feed trees for wildlife
- Conserve and enhance wildlife corridors
- Protect fallen hollow bearing timber from firewood collection
- Reduce clearing of vegetation
- Control domestic and feral animals

References and further reading:

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