



# **TREE HOLLOWS IN TASMANIA – A GUIDE**





*Bats, such as this eastern falsistrelle bat (Falsistrellus tasmaniensis), require multiple hollows to shelter and breed. For more information on bats, see the booklet *Tasmanian bats and their habitat* on the FPA's website.*

*Photo by Lisa Cawthen.*

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#### Disclaimers

This document has been sent for comment to all members of the Hollows Working Group, the Forest Practices Executive Review Team and several Forest Practices Officers. However, the details in this document do not necessarily reflect the opinions of all reviewers.

The information presented is a broad overview of information considered relevant (by the author) to the brief. Coverage of material related to all aspects of the brief may not be complete.

This booklet is not intended to be comprehensive in guiding landowners to manage hollows. It is intended to provide guidance on how to identify the trees most likely to provide habitat for animals.

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# What is a hollow and why is it important?



Swift parrots breed in tree hollows in mature eucalypts within foraging range of Tasmanian blue gum (*Eucalyptus globulus*) and black gum (*Eucalyptus ovata*) flowers. Photo by Matt Webb.

Tree hollows are holes or cavities in trees that provide important shelter and breeding sites for many animals. Hollows used by animals in Tasmania range from less than 2 cm to more than 30 cm in entrance diameter. There are eight bat species, five arboreal marsupials (possums), about 29 bird species (see Appendix I) and an unknown number of invertebrates that use hollows to varying degrees. This includes several species that are listed as threatened.

Many of these hollow-using species are introduced, including serious pests such as the common starling. It is important to consider these introduced species when thinking about hollow demand because they compete with our native hollow-users.

The aim of this guide is to help people interested in tree hollows to identify the trees that are most likely to be used by hollow-dependent animals (see Appendix I).



## Hollow related legislation

The 1997 *Regional Forest Agreement* identified hollow-dependent fauna as priority species. Threatened hollow-using species need to be conserved under the *Threatened Species Protection Act 1995*. This means that the State of Tasmania has a legal obligation to manage habitat for hollow-dependent species.

Production forest areas are subject to the *Forest Practices Act 1985*. The associated *Forest Practices Code* prescribes the manner in which forest practices are to be conducted so as to provide reasonable protection for the environment. As part of this, management of tree hollows is required during planning and implementation of all forest operations.



*A mosaic of modified and retained areas where careful management of hollows is required.*



## How do hollows form?

In Australia, some species of animals (e.g. cockatoos) can help enlarge hollows, but no species builds hollows from scratch. Instead, hollows are produced by environmental processes that take lots of time.

The onset of hollow-formation is dependent on damage to the tree, from fire, from animals (vertebrates or invertebrates), or from branches dropping. Young and healthy trees can quickly heal after damage. As trees age they become slower at healing, allowing hollow-formation to progress. Termites and beetles can bore into the wood and hollow out extensive areas. Wounds provide entry-points for fungal spores that can lead to active decay, that eventually rots out the tree. Fire can help enlarge hollows created by other processes (although fire can also destroy hollows). Trees less than 100 years old are unlikely to contain hollows. Trees with hollows suitable for use by animals are generally more than 150 years old.

Key factors for hollow formation are:

- physical damage
- fire
- fungi
- invertebrates (e.g. termites and beetles)
- time.



*A hollow partially formed by fire (top);  
fruiting fungal bodies near a  
basal hollow (bottom).*

# What makes a good hollow?

Although a large variety of hollows may be used when considering all animals, particular species can be very selective in their choice of hollows.

## HOLLOW DEPTH

Deeper hollows are more likely to be used. The main exception to this is when the entire trunk is hollow, although even these hollows can be used by bats.

*Clockwise from top left: an obviously shallow hollow; a hollow that appears to be deep; a pair of striated pardalotes investigating a hollow; the tail of a brushtail possum poking out of a hollow (the entrance to the hollow is a large opening at the top).*



## ENTRANCE SIZE

Animals usually prefer hollows with an entrance just slightly larger than their body size.



# What makes a good hollow?

## (continued)

### HOLLOW LOCATION

Hollows can be found anywhere from the base of the tree to the small branches near the tree top. Branches need to be large enough to contain a hollow big enough to house an animal. While some animals prefer a certain height above the ground, hollows at any height may be used.



### HOLLOW SHAPE

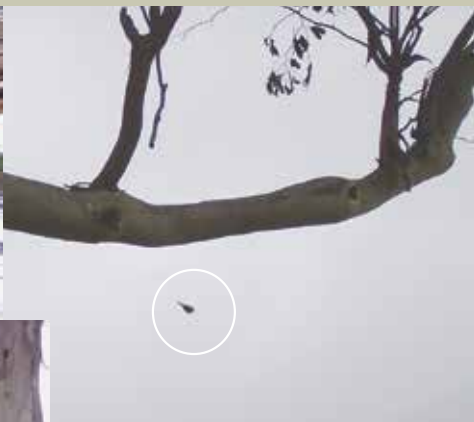
A wide variety of hollow shapes can potentially be used by an animal, if the hollow is of the right size and in the right place. Hollow shapes that can be used include, but are not restricted to:

- large jagged openings in the dead tops of trees
- small round hollows in the trunk
- the broken off end of branches
- big jagged tears
- small cracks.



*From the top of the page going clockwise: circular hollows in the trunk; hollow in a branch end; crack hollow in the trunk; hollow where a branch has torn off.*





A number of hollows known to have been used by animals, showing the range of hollow types and shapes that may be used, including a slender branch hollow with a tree martin flying out (top right).

# Identifying hollows

## FALSE HOLLOW

What can, at first, appear to be a hollow may not actually be one. Common mistakes are thinking that small stains, burns, solid branch ends or shallow cavities are actually hollows.



## POOR VISIBILITY

It is obviously easier to detect hollows in dry open forest than dense wet forest, but hollows will be missed in all forest types. More than half of the hollows occurring in an area may be missed during ground-based surveys. They may be hidden by the surrounding vegetation or by other parts of the same tree or they may be facing upwards and so cannot be seen from the ground. The more time spent looking, the more hollows are likely to be found.



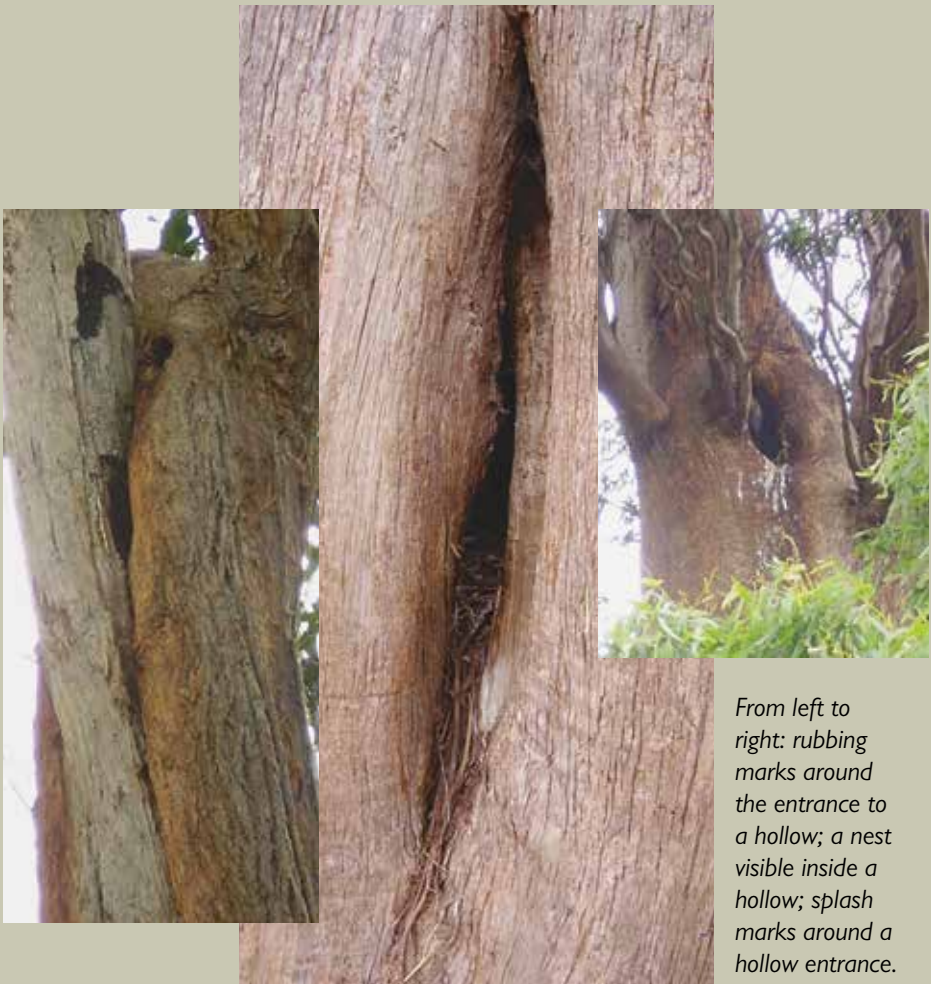
*Clockwise from top left: what appears to be a hollow is actually a shallow fire scar; a spout that is shallow and does not actually contain a hollow; a burnt branch stub that in poor lighting looks like a hollow; a striated pardalote nest where the hollow is not visible because it is facing upwards; the entrance to a green rosella hollow partially obscured by foliage.*



## EVIDENCE OF PREVIOUS USE

One of the best ways of telling if a hollow is a good one is if it has previously been or is currently being used by animals. Evidence of current or previous use includes, but is not limited to:

- rubbing or chewing marks around the hollow entrance
- splash marks or droppings at or near the hollow entrance
- extensive scratch marks leading up to the hollow
- visible nesting material inside the hollow
- an animal observed inside or entering the hollow!



*From left to right: rubbing marks around the entrance to a hollow; a nest visible inside a hollow; splash marks around a hollow entrance.*



# Searching for hollows

Hollow surveys are generally conducted near the base of the tree using binoculars. When doing hollow surveys it is a good idea to:

- use a good pair of binoculars
- do searches in good weather
- move around to find the best vantage point and try to look at the tree from all angles.

Hollow surveys can work well for some trees and in some forest types, but not all hollows will be found. This means that it can be just as important, and in some areas more so, to assess tree attributes as well as searching for hollows.



*A forest researcher uses binoculars to search for hollows (right) and poor light conditions make hollow spotting difficult (above).*



# Selecting habitat trees

A habitat tree is a tree that contains features such as hollows that are likely to be used by animals. Observing hollows is obviously the best way of selecting a habitat tree and of assessing hollow availability. *The more hollows you can see in a tree, the more likely the tree is to contain a hollow suitable for use by animals.*



*A large diameter tree (above) and a medium diameter tree (left). While either may contain a hollow, the larger diameter tree is much more likely to do so.*

## TREE DIAMETER

Given that hollows take so long to form, hollow-bearing trees are typically very old ( $> 150$  years and often much more for trees with large hollows). Within a particular area or forest type, the larger a tree is around the base, the older it is likely to be and the more likely it is that the tree will have a hollow.

# Selecting habitat trees

## DEAD WOOD

Dead wood in the canopy of a tree generally means that the tree has experienced some stress. Stressed trees do not heal as readily as healthy trees and therefore hollow formation is more likely.

*A large, healthy tree with few dead branches (right) and a large tree with lots of large dead branches which is, therefore, more likely to contain hollows (below).*



Dead branches can also be dropped by the tree and a hollow may form where the branch broke off. This means that the more dead branches and the bigger the dead branches you see in the canopy of a tree, the more likely the tree is to have a hollow.

*Opposite page from top left to bottom right: trees with increasing levels of senescence. The crown starts out small, then grows, thins, the number and size of dead branches increases, the tree dies, loses its limbs and will eventually fall over.*

## TREE FORM

As trees age, their growth and senescence typically follows a sequence that affects their form and potential for developing hollows. Trees with very healthy crowns are less likely to have hollows than trees further along this sequence. Dead trees may have a lot of hollows, but these can be lost as branches are dropped. While trees of any form may contain hollows, the best shape for a habitat tree is one which is a live tree with dead wood and a crown of reasonable size.





## Selecting habitat trees (continued)

### FIRE DAMAGE

While fire can destroy hollow-bearing trees and the hollows themselves, it can also help form hollows. Trees that have been damaged by fire are more likely to have hollows.



While burnt bark indicates that a fire has passed through, it may have been a 'cool' fire that didn't actually damage the tree. Fire scars, which are often found at the base of the tree, are a better sign that the fire may have helped form hollows.



*A hollow partially formed by fire (top); a heavily and recently burnt forest that may have hollow-bearing trees in the future (right); burnt bark on a tree indicating a fire has gone through but there is little evidence of fire scarring on these trees (left).*



# Selecting habitat trees

## – summary

While this guide outlines a number of features that should be looked for when selecting habitat trees, not all features will be found in an area or on the same tree.

What is required, then, is some common sense and good judgement. Look at the trees available and see which ones best fit the description or have as many of the key attributes as possible.

Key tree attributes indicating hollow occurrence are:

- visible hollows (the more the better)
- large diameter
- old age
- dead wood in the tree (e.g. dead branches)
- fire scarring.



*Looking for habitat trees.*

# Habitat trees

Optimal habitat trees either have at least one large or several small hollows visible, or they have several other features suggesting they offer prime habitat.



*Visible hollows, large diameter, dead wood, large canopy*



*Large diameter, dead wood, fire scarring*



*Visible hollows, large diameter, dead wood*



*Visible hollows, large diameter, dead wood*

In areas where no trees have visible hollows, habitat trees should be selected from the trees available to contain as many of the features indicating hollow presence as possible.



*Very large tree, but little dead wood and no visible hollows*



*Advanced tree form with dead wood, although small crown*



*Some dead branches but these are small, the canopy is small and there are no visible hollows*



*Tree shape is senescent but tree crown is very healthy and there are no visible hollows*

## Habitat trees (continued)

In some areas there may be little difference between trees in their size, form or senescence. However, keeping the key attributes of habitat trees in mind can still help identify the best trees to retain, even in these areas.



*Large diameter but no dead wood, no visible hollows*



*Large tree but little dead wood, small canopy and no visible hollows*



*The largest tree with the most branching crown in the area, although has no dead wood*



*Fire damage and some dead wood but no visible hollows and the tree is very small in diameter*



## Recruitment trees

Because tree hollows take such a long time to form, it is important to think about how hollow availability will change in our landscape over time. Recruitment trees are trees which may not provide a hollow now, but which will probably do so in the future if retained.

Good recruitment habitat trees are those from the age cohort younger than the hollow-bearing trees, but that are of reasonable size and have the capacity to survive, grow and develop hollows over time. Recruitment trees may be damaged, branchy or open-grown trees. Severely damaged or suppressed young trees are unlikely to grow further or respond to release and so are less important for consideration as recruitment trees.



*Left: no hollows, medium diameter, no dead wood, large canopy.*

*Right: habitat tree on left, recruitment tree on right. Recruitment tree is the next largest tree after the habitat tree. No hollows, medium diameter, little dead wood, large canopy.*

# How many hollows are enough?

The question ‘how many hollows are enough to maintain populations of native hollow-using species?’ is not easily answered. The number required is likely to vary between areas and over time. Hollow-using animals vary in how dependent they are on hollows, how many hollows they will use in a year and the spacing of the trees they use. Hollow-using species live at varying densities in different forest types, and in different areas of Tasmania. Hollow demand in an area can vary from year to year as some species move according to food availability. Available information currently suggests that more hollow-using species are found in the drier forests in eastern Tasmania than the wetter forests in the west.

The number of hollows needed in an area depends on:

- species diversity in the area
- species abundance in the area
- number of hollows used by an individual of each species
- competition for hollows, e.g. with introduced species
- availability of other resources (e.g. food).



*Scattered hollow-bearing trees retained in a highly modified area.*

## Nest-boxes – a practical solution?

Nest-boxes (artificial hollows) can be used to help species conservation efforts in some situations. However, they are not a replacement for naturally occurring hollows.

While nest-boxes can be successfully used by some species, and even help in some species recovery programmes, we do not understand enough about the hollow requirements of many species to ensure their breeding success in nest-boxes. We know animals can be very selective in their choice of hollows. This means that choice of nest-box entrance size, the aspect and height at which the nest-box should be placed all require careful consideration.

The diverse requirements of our hollow-using fauna means nest-boxes are generally not a practical conservation strategy. The costs involved in making and hanging nest-boxes, monitoring, maintaining and replacing them for even a single species, combined with our limited understanding of hollow requirements, mean that nest-boxes should be seen as a last resort for species conservation.

Additional problems with nest-boxes are that they can potentially increase populations of introduced and pest species, there is a risk of disease to the species using them and nest-boxes do not provide the other benefits that natural hollows provide (e.g. habitat for fungi and invertebrates).



*Pygmy possum in nest box,  
photo by Matt Webb.*

# Practical ideas for land managers

The three main principles for good hollow management in any location are:

- retention
- protection
- recruitment.

*Right: firewood being obtained from a young tree rather than from an older tree containing hollows.*



*Mature tree retained within a young plantation.*

## RETENTION

Older trees should be kept in an area whenever possible.

### *Forestry operations:*

Careful consideration should be taken when selecting trees to retain in a harvesting operation to ensure that the best quality trees available (in terms of providing hollows) are being kept.

### *Other land-use practices:*

Instead of targeting older hollow-bearing trees for firewood collection, target younger trees (always ensuring enough recruitment trees are retained). Think twice before removing paddock-trees.



## PROTECTION

Hollow-bearing trees can be structurally less sound than trees without hollows, making them more prone to windthrow. The chances of windthrow can be reduced by retaining other trees around the hollow-bearing trees.

### *Forestry operations:*

Retain hollow-bearing trees in the middle of clumps or strips whenever possible rather than as isolated trees.

### *Other land-use practices:*

Retain other trees, or plant additional trees and shrubs around hollow-bearing trees. Protect trees from livestock (e.g. by fencing).

*Right: stock damage  
preventing regeneration.*



## RECRUITMENT

Because hollows take so long to form, it is important to ensure that new trees are established to provide future hollows.

### *Forestry operations:*

Retain younger recruitment trees as well as older hollow-bearing trees. This can be achieved by retaining trees in clumps and strips.

### *Other land-use practices:*

In addition to retaining and protecting younger trees, planting trees or fencing around established trees can encourage regeneration.

## Additional reading

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# Appendix I: Tasmanian hollow-using vertebrates

Species	Status	Hollow size
<b>BIRDS</b>		
Musk lorikeet	Endemic subspecies	Small
Rainbow lorikeet	Exotic	Small
Swift parrot	Native	Small
Orange-bellied parrot	Native	Small
Blue-winged parrot	Native	Small
Tree martin	Native	Small
Welcome swallow	Native	Small
Australian owlet-nightjar	Endemic subspecies	Small
Dusky robin	Endemic	Small
Flame robin	Native	Small
Forty-spotted pardalote	Endemic	Small
Striated pardalote	Native	Small
Dusky woodswallow	Native	Small
Common starling	Exotic	Small
Southern boobook owl	Endemic subspecies	Medium
Pacific black duck	Native	Medium
Australian shelduck	Native	Medium
Chestnut teal	Native	Medium
Australian wood duck	Native	Medium
Grey teal	Native	Medium
Galah	Exotic	Medium
Long-billed corella	Exotic	Medium
Little corella	Exotic	Medium
Laughing kookaburra	Exotic	Medium
Eastern rosella	Endemic subspecies	Medium
Green rosella	Endemic	Medium
Yellow-tailed black cockatoo	Native	Large
Sulphur-crested cockatoo	Native	Large
Masked owl	Endemic subspecies	Large

Species	Status	Hollow size
<b>POSSUMS and GLIDERS</b>		
Sugar glider	Exotic	Small
Eastern pygmy possum	Endemic subspecies	Small
Little pygmy possum	Native	Small
Common brushtail possum	Endemic subspecies	Medium
Common ringtail possum	Endemic subspecies	Medium
<b>BATS</b>		
Lesser long-eared bat	Native	Small
Greater long-eared bat	Endemic subspecies	Small
Gould's wattled bat	Native	Small
Chocolate wattled bat	Native	Small
Little forest eptesicus	Native	Small
King River vespadelus	Native	Small
Large forest vespadelus	Native	Small
Tasmanian pipistrelle	Native	Small

## Key

### Status:

Endemic = found only in Tasmania

Endemic subspecies = subspecies found only in Tasmania

Native = historically found in Tasmania

Exotic = recently introduced to Tasmania

### Hollow size:

(Minimum width of hollow entrance)

Small = 2–5cm

Medium = 6–10cm

Large = >10cm





This booklet will help you identify the trees that are most likely to be used by hollow-dependent species and provides some practical ideas for managing these valuable trees in the landscape.

