

A black and white bird with a yellow patch around its eye is perched on a branch. The branch has several red and yellow flowers. The background is a soft-focus green and brown.

# Mistletoe Propagation in Eastern Australia

A manual for landholders wanting to restore  
keystone species and increase biodiversity and  
landscape health



Box Mistletoe -  
*Amyema miquelii*

Southern  
Large Azure -  
*Oxyris genovera*

Sugar  
Art

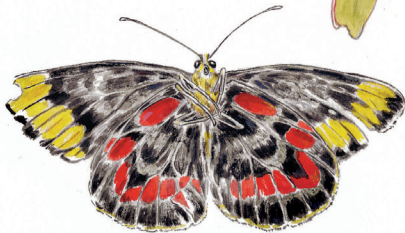
Wasp sp.

Christmas  
Beetle

Eastern  
Rosella

Australian  
Owlet-nightjar

Imperial White -  
*Delias harpalyce*



## Acknowledgement of Country

BirdLife Australia acknowledges the Traditional Owners of the Country on which we live and work, and we pay our respects to their Elders past and present. We recognise and are grateful for the immense contribution of Indigenous people to the knowledge and conservation of Australia's birds.

We thank Mindaribba Local Aboriginal Land Council for partnering with us on an innovative mistletoe restoration and research project, for welcoming us onto their traditional lands on Wonnarua Country and for working with us to share collective knowledge about the cultural and ecological values of the Tomalpin Woodlands, Lower Hunter Valley, NSW.

## Project Partners and Collaborators

BirdLife Australia in partnership with Mindaribba Local Aboriginal Land Council and NSW National Parks & Wildlife Service, and collaborators Dr David Watson of Charles Sturt University, Peter Vaughan, Gio Fitzpatrick, Ross Kendall, and John Moss.

## Funding acknowledgement

This project has been assisted by the New South Wales Government through its Environmental Trust.

Front cover photographs: Regent Honeyeater feeding on Needle-leaf Mistletoe in the Capertee Valley, NSW (Peter Goonan), Needle-leaf Mistletoe fruit (Ross Kendall)



Left: There are many insect species that benefit from the presence of mistletoe.  
Illustration: Fiona Lumsden



# Contents

1	Introducing Native Mistletoe	<b>1</b>
2	Benefits of Mistletoe	<b>3</b>
3	Mistletoe Propagation	<b>5</b>
4	Species Profiles	<b>9</b>
5	Resources Required for Mistletoe Propagation	<b>22</b>
6	Step-by-step Guide to Mistletoe Propagation	<b>23</b>
7	Mistletoe Management	<b>29</b>
8	Monitoring your Mistletoe Seedlings	<b>31</b>
9	Terminology	<b>32</b>
10	Mistletoe Direct Seeding: Case Studies	<b>33</b>
11	References	<b>37</b>

Left: Propagated Creeping Mistletoe on  
an urban tree in Melbourne, Victoria  
Photo: Gio Fitzpatrick

# 1 Introducing Native Mistletoe

Mistletoes are semiparasitic plants that rely on a host (i.e. another plant, such as a Eucalypt or Acacia, on which they grow) for water and minerals but produce their own energy through photosynthesis. Mistletoes are found on every continent except Antarctica. More than 1,500 species are known across the globe: the European mistletoe associated with Christmas kisses is just one. Australia has close to 100 mistletoes, all native. Tropical areas are home to the largest number of species, but different mistletoes occur in habitats that include deserts, heathlands, woodlands, rainforests and even urban environments.

Every ecosystem has certain species, known as keystone species, that are critical to the survival of other species in the system. Mistletoes have been found to act as keystone species. They promote local biodiversity through their flowers, fruit, foliage, leaf litter and dense cover for nest structures of native fauna, including invertebrates, birds, bats and arboreal mammals (e.g. possums, gliders and Koalas).

Because mistletoes can draw on nutrients from their hosts, they flower and fruit reliably, making them a dependable food source for many species during times of drought. Mistletoes also tend to flower and fruit over extended periods; some can flower twice a year.

## Countering Myths About Mistletoes

Mistletoes are spread naturally through an environment by species that consume their fruit. In addition to two mistletoe specialists (Mistletoebird and Painted Honeyeater), other bird species with more generalist diets are known to disperse mistletoe seeds. These include the Spiny-cheeked Honeyeater, Singing Honeyeater, Striped Honeyeater, Olive-backed Oriole and Silveryeye. Sometimes, mistletoe seeds may be dispersed externally; that is, the sticky fruit can adhere to the feathers or fur of a mistletoe visitor and be preened or groomed off onto a new host tree. This is thought to be the main means of mistletoe dispersal to areas lacking them, but it is probably rare. Pollen deposits show Tasmania had mistletoes before the last ice age, but none have been re-established there since then.



Mistletoebird excreting a seed  
Photo: Ray Burton



Box Mistletoe  
*Amyema miquelii* clumps  
growing on an Ironbark  
Photo: Ross Kendall



## 2 Benefits of Mistletoe

Australia has two mistletoe-specialist bird species: the aptly-named **Mistletoebird** and the **Painted Honeyeater** (listed as vulnerable at the Commonwealth and New South Wales level). Both species rely on mistletoe fruit as a primary constituent of their diet. Many other **Australian woodland birds** also depend on mistletoes for nectar, fruit, shelter or nesting places. Thirty-three bird species have been observed feeding on mistletoe fruit and 41 on mistletoe flowers, while 245 species have been recorded nesting regularly or incidentally in mistletoes (Watson, 2001; Cooney et al. 2006). Other species, including invertebrate species and arboreal mammals such as Koalas, gliders and possums also browse on mistletoe.

The density of mistletoe foliage and high water content of the leaves combine to create a cool, humid microclimate (Cooney et al. 2006). For this reason, mistletoe plants are a source of refuge in warmer months and during heat waves; they also provide protection against predators (Sugden and Beyersbergen 1986).

### **Butterfly and Insect Attractors**

Mistletoe species support a diversity of invertebrate species, some of which are mistletoe specialists (i.e. they can only breed on particular mistletoes; Anderson and Braby 2009). Twenty-seven butterfly species are known to rely on mistletoes as a reproductive food source, including many *Jezebel (Delias spp.)* and *Azure (Ogyris spp.)* butterflies that only lay their eggs on particular mistletoes.

**An interesting benefit of mistletoes is that they assist in the management of insect numbers. The presence of mistletoes increases the number of insectivorous birds in an area, and insect numbers are then kept in check!**

### **Nature's Soil Builders**

Mistletoe foliage is richer in nutrients than that of their eucalypt hosts (March and Watson 2007). For this reason, several arboreal mammals, especially Brush-tailed Possums, prefer to browse on mistletoes rather than other available foliage. Other possums, Sugar Gliders and Koalas are also known to feed on mistletoe leaves.







Mistletoe Moth  
*Comocrus behri* Photo: Peter Hendry

Unlike many tree species, mistletoe plants do not recover nutrients from their leaves before dropping them. They also have higher foliage turnover than eucalypts, meaning that a greater volume of biomass is shed. When nutrient-rich mistletoe leaves fall to the ground, they nourish soil microbes. This promotes invertebrate activity, which provides food for a range of mammals and reptiles (Spasojevic and Suding 2011; Ndagurwa et al. 2014, March and Watson 2007). **Ground litter has been found to have over 1,000 more insects per square metre when mistletoe is present than when it is absent (Watson et al. 2022).** Sites with mistletoes were found to have 37% more bird species than sites where mistletoes had been removed; the birds most affected by the loss of mistletoes were ground-foraging invertebrate feeders (Watson 2015).

### A Constant Food Source

Mistletoe plants tend to flower and fruit in such a way that they provide food over extended periods. In contrast, eucalypts do not bloom in a consistent manner, making them a less reliable food source. The presence of mistletoes in an ecosystem increases food availability in periods when food may be scarce, such as in winter (Reid 1986).

### Farm Benefits

Mistletoes have been used as stock feed during drought; their soft, fleshy leaves provide more palatable nourishment than the hard, leathery, toxin-rich foliage of the mistletoe's eucalypt hosts (Barlow 2011).

### Cultural Uses

The fruits of Australian mistletoes are edible and generally sweet. They were consumed by Aboriginal people as an occasional snack (especially by children, who sometimes refer to it as 'snotty gobble'). The foliage was ground into poultices to treat scabies and other skin conditions. The leaves were also steeped in water to make a tonic for the common cold (Watson 2019).



## 3 Mistletoe Propagation

Mistletoe propagation is the intentional seeding or inoculation of ripe mistletoe seeds onto branches of selected trees to germinate and grow into mistletoe plants. Mistletoe propagation can be done by hand or pole (**Section 5**) or by using contracted arborists, cherry-pickers or elevated work platforms if the branches are too high to reach otherwise. Manual planting is an important method of restoring mistletoes to areas where they have become rare or locally extinct. The reintroduction of mistletoes is intended to improve ecosystem function with positive cascading effects on the environment, including increased fauna biodiversity.

### When and why do we plant mistletoe?

#### Recovery after fire

Most mistletoe species are vulnerable to fire and cannot shoot again after they are burned, even if the host tree survives. This is a natural process by which mistletoe abundance is moderated and helps to ensure that host trees do not become overburdened.

However, the frequency and extent of fires has increased significantly in Australia, resulting in large areas of woodland and forest being affected by single fire events or being burnt repeatedly at short intervals. In these areas, mistletoes may become locally extinct.

While natural dispersal of seeds can reintroduce mistletoe into an area, it is not always an effective or efficient process. When large areas of habitat are burned, the closest source population of mistletoes may be some distance away. Even once they are reintroduced, it will take several years for the plant to reach maturity and resume its function in the ecosystem.

**In fire-affected areas, mistletoe inoculation can be undertaken to speed natural recovery by restoring key species to the ecosystem more efficiently.** This will ensure there are more food and shelter resources available to invertebrate and avian species in a post-fire environment typically characterised by limited productivity.



### Recovery after drought or flood

Mistletoes provide a vital lifeline for many woodland birds during times of drought when ecosystem productivity is reduced. Many resource-limited trees fail to flower at these times due to water scarcity. Because the flowering and fruiting patterns of mistletoes are more regular, they provide a reliable source of nectar and fruit (Watson 2019).

However, because mistletoe species rely on their host for the provision of water, they are themselves susceptible to mortality during droughts when water availability is low. A case study is the Needle-leaf Mistletoe (*Amyema cambagei*), which grows on Casuarinas and She-oaks in riparian zones. This habitat provides vital drought refugia for a range of bird species. During the severe drought of 2018 to 2019 in the Hunter Valley, NSW, Needle-leaf Mistletoe mortality approached 100% in some riverside areas, including those in the core breeding habitat of the Regent Honeyeater (Crates et al. 2022). Riparian corridors are often the only vegetated areas left in cleared agricultural landscapes, making their resources even more important. Given the predicted increase in the frequency and severity of droughts under climate change, mistletoes may be susceptible to large-scale die-off, with cascading effects on the resident fauna and the community composition. Equally, mistletoes can be killed by floods, which are likely to become more common under climate change, and may need active propagation during flood recovery.

Dead Long-flowered Mistletoe  
clump killed by fire  
Photo: Kristy Peters



## Enhancement of Re-vegetation or Landscape Restoration

Revegetation commonly involves the replanting or regeneration of indigenous species of grasses, forbs, vines, shrubs and trees. Once trees become sufficiently established, the complexity and diversity of the habitat can be further improved through the introduction of less common vegetation types, such as mistletoe species. This can improve habitat quality, add resources for local fauna and increase biodiversity and ecosystem functioning.

Similarly, in urban areas where introduced tree species have been planted, mistletoe inoculation – for example with Creeping Mistletoe (*Muellerina eucalyptoides*) and Long-flowered Mistletoe (*Dendrophthoe vitellina*) – can be undertaken to supplement resource-poor introduced species and provide more resources for native fauna (**Section 1**). Some mistletoes, such as Paperbark Mistletoe (*Amyema gaudichaudii*), have become rare as paperbark wetlands have been drained or have suffered frequent uncontrolled fires. Some such species now rely on urban areas for their survival, rather than their depleted natural habitat.



Above: Creeping Mistletoe fruit being collected from a street tree in Melbourne, Victoria  
Photo: Gio Fitzpatrick





A cherry-picker can be a useful means for collecting mistletoe fruit for propagation elsewhere, for accessing the canopy for 'planting' collected seeds, or for undertaking selective mistletoe management in heavily infected trees. Photo: David Watson



## 4 Species Profiles

This manual provides information for six widely distributed species in Eastern Australia for which there is ready access to information about propagation and benefits to woodland birds, invertebrates and other fauna in urban, rural and wooded habitats.

### Needle-leaf Mistletoe

*Amyema cambagei*

#### Host Species

Casuarina and Allocasuarina such as River Oak (*Casuarina cunninghamiana*), Swamp Oak (*C. glauca*) and Forest Oak (*Allocasuarina torulosa*).

#### Distribution

Found in sclerophyll forests and woodlands in New South Wales and Queensland.

#### Description

Spreading or pendulous needle-like leaves (6–15 cm); this species can be difficult to distinguish from the host when not in flower. Branches up to 80 cm long. Flowering variable but typically from June to December. Flowers (15–21 mm) are tubular and pink to dark red with white hairs. Fruits (5–6 mm) are globular and pink to red.

#### Similar species

Distinguished from the similar Buloke Mistletoe (*A. linophylla*) by thinner leaves with a pointed tip, drooping foliage, and downward-pointing, slender buds lacking a dense, woolly covering (Watson 2019).

#### Propagation tips

The fruits have quite watery viscin. It is helpful to absorb some liquid on a cloth before planting the seed, helping the viscin bond more strongly. The seeds may take more readily on new host growth of a similar diameter to the seed. They can also be placed on suckers.

#### Wildlife Benefits

Regent Honeyeaters nest in Needle-leaf Mistletoe in River She-oaks throughout their range. This mistletoe also provides a seasonal nectar source for Regent Honeyeaters and is also used as a food source by Painted Honeyeaters (primarily fruit, but occasionally nectar), especially during prolonged droughts inland, when birds move to refuges further east (Watson, 2019).





Mistletoe is an important food source for the critically endangered Regent Honeyeater. It utilises acrobatic skills to source nectar from the flowers of species such as Needle-leaf Mistletoe.



Needle-leaf Mistletoe fruit  
Photo: Ross Kendall  
Regent Honeyeater  
Photo: Peter Goonan



Trident Pencil-blue Butterfly  
*Eirmocides margarita*

## Long-flowered Mistletoe

### *Dendrophthoe vitellina*

#### Host species

Predominantly Angophora, Eucalyptus and Melaleuca species but also Macadamia and Callistemon. Recorded on 66 native species of plant from 16 families as well as introduced trees.

#### Distribution

Found along the eastern coast from Far North Queensland through New South Wales and into Victoria. In New South Wales, extends inland to the Nandewar Range; in Victoria, occurs to the east of Genoa in East Gippsland.

#### Description

Shrubby plant, spreading or pendant habit. Leaves (4–16 cm long, 0.6–3.0 cm wide) are spear- or oval-shaped. New growth is hairy before maturing to smooth branches and foliage. On some hosts, this species forms epicortical runners, a form of external root from which new shoots arise. Flowering occurs mainly in spring and summer. Flowers are clustered in groups of five to 20 and covered in fine hairs. They are usually orange or yellow, although redder variants occur in the northern part of the range. Fruits (1.0–1.5 cm) are egg-shaped and yellow to red.

#### Propagation tips

The seeds of Long-flowered Mistletoe have quite sticky viscin and are generally easy to attach to branches. Pick fruits with stems attached where possible, as they begin germinating immediately once the stem is removed.

#### Similar species

A similar species, Smooth Mistletoe (*Dendrophthoe glabrescens*), occurs in open forest and woodland throughout north-eastern New South Wales, Queensland and the Northern Territory's Top End. The appearance of Long-flowered and Smooth Mistletoe varies, with populations of the two intergrading in southern Queensland (Watson 2019).

#### Wildlife Benefits


Regent Honeyeaters are known to nest in clumps of Long-flowered Mistletoe throughout their range, and it provides a seasonal nectar source. This commonly seen mistletoe supports the reproduction of almost as many butterflies as Box Mistletoe (*Amyema miquelii*), and many species use both (Moss and Kendall 2016).







Long-flowered Mistletoe  
(and Needle-leaf Mistletoe)  
are the principal host plants  
for the Marbled Line-blue  
Butterfly *Jameela palmyra*

A circular inset image in the bottom right corner showing a close-up of mistletoe fruit. The fruit consists of several small, rounded, pinkish-red berries attached to a dark stem. Some green buds are also visible.

Long-flowered Mistletoe  
flowers and fruit  
Photo: Kristy Peters

## Box Mistletoe

*Amyema miquelii*

### Host Species

Mainly Box and Ironbark species (e.g. Red Stringybark, Yellow Gum, Red Ironbark, Pink Gum). Recorded on 110 Eucalypt species and some Acacia species.

### Distribution

Found across the mainland. Most widespread and common mistletoe species in Australia. Recorded on 125 species from eight families, but with Eucalypts as principal hosts.

### Description

Pendulous with flat, shiny leaves and branchlets that are either bronze-yellow or green. Linear to elliptic opposite leaves (35 cm long, 30 mm wide). Flowering and fruiting can occur throughout the year, but predominantly in summer and late winter/spring respectively. The red flowers (15–28 mm) develop in groups of three from a central stem. They have five petals and are oriented downward, with each flower having its own stalk. The cylindrical fruit (8–14 mm long) are yellow or red.

### Similar species

Most similar to Drooping Mistletoe (*Amyema pendula*) but distinguished by the presence of a stalk on the central flower, shiny (rather than matt) foliage and persistent styles at the outer end of the fruit.

### Propagation tips

Higher success in establishment may be achieved by placing seeds on young growth. The host responds to signals from the mistletoe by expanding the water flow channels at the attachment point, and older wood may be less able to remodel to achieve this.


### Wildlife Benefits

Clumps of mature Box Mistletoe are a popular nesting site for many bird species, from tiny thornbills and finches to butcherbirds and large birds of prey (Watson 2019). This mistletoe species is heavily relied on by insects, with 15 butterfly and two moth species recorded using it (Moss and Kendall 2016).





Leaf shape and size vary greatly with this species, often resembling its hosts with small leaves on mallee Eucalypts, and large broad leaves on red gum (Watson, 2019)



Box Mistletoe flowers and fruit  
Photo: Ross Kendall

## Grey Mistletoe

*Amyema quandang*

### Host Species

Acacia species. Principal hosts include Silver Wattle (*Acacia dealbata*), Boree (*Acacia pendula*), Brigalow (*Acacia harpophylla*) and Mulga (*Acacia aneura*).

### Distribution

Widespread on the mainland, especially in arid inland areas. Absent from Cape York and uncommon in Western Australia.

### Description

Pendulous and shrubby, with lance-shaped or elliptical leaves (3–12 cm long, 8–20 mm wide). New foliage is often bronze-green, with mature foliage grey and leathery. Flowers are erect and red, green or grey, typically occurring in clusters of two or three. The central flower lacks a stalk. Flowering most often takes place between April and October but can occur sporadically throughout the year. The globular fruit (6–10 mm long) may be dark red, green, mauve or pink and contains an oily seed.

### Similar Species

Non-flowering plants are best identified by leaf shape. Grey Mistletoe leaves are longer and less rounded than Pale-leaved Mistletoe (Watson, 2019).

### Wildlife Benefits

This species is the most important food plant for the Painted Honeyeater, which times its breeding to coincide with peak fruit availability (Barea and Watson 2007). Recent photographic evidence shows that Regent Honeyeaters also forage on the blossoms.

Many species of *Delias* and *Ogyris* butterflies depend on Grey Mistletoe to complete their life cycle.



Painted Honeyeater  
Photo: Chris Tzaros





The Painted Honeyeater has a strong association with this species of mistletoe, the genera being it's main source of food.

Gray Mistletoe flowers and buds  
Photo: Ross Kendall

## Creeping Mistletoe

*Muellerina eucalyptoides*

### Host species

Eucalypt species. Also grows well on several non-native hosts, such as Oak (*Quercus*), stone fruit (*Prunus*), Birch (*Betula*), Platanus and California Pepper (*Schinus molle*).

### Distribution

Found predominantly along the east coast in New South Wales and throughout Victoria, stretching to the South Australian border. Also occurs in southern parts of Queensland.

### Description

Pendulous or erect, with roots growing along branches. Oblong or lance-shaped, smooth leaves (8–20 cm long, 7–20 mm wide) that are green with contrasting red margins. Usually flowers in summer. Flowers are red or green and occur in three or four pairs of three flowers or singly. Fruit (8–15 mm long) is green to yellow and pear-shaped.

### Propagation tips

The seeds have a large bundle of viscin. This can be pulled out into a long thread and wrapped around the branch to keep the seed firmly in place. Creeping Mistletoe can establish on larger branches and trunks in addition to smaller ones.

### Wildlife Benefits

This species hosts several Jezebel and Azure butterfly species, the Mistletoe Emperor Moth (*Austrocaligula loranthi*) and the Mistletoe Moth (*Comocrus behri*).



Mistletoe Emperor Moth  
*Austrocaligula loranthi*  
Photo: Julian Bentley





The creeping growth habit of this slow-growing species is distinctive and distinguishes it from most mistletoes within its range. It spreads along the trunk and main branches of its host with multiple attachment points (Watson, 2019).

Creeping Mistletoe flowers and buds  
Photo: Ross Kendall

## Wire-leaved Mistletoe

*Amyema preissii*

### Host species

Acacias, She-oaks and occasionally Senna.

### Distribution

Widespread in the mainland states in sclerophyll forests and woodlands. More common in arid areas.

### Description

Erect or spreading shrub with needle-like, hairless leaves (2–8 cm long, 1–2 mm wide). Flowers are orange-red and have four or five petals that curve backwards. They hang down in two or three clusters of three flowers (2–3 cm long). Flowering occurs from late summer to early autumn. Fruits (8–10 mm diameter) are globular and white or pink.

### Similar species

The similar looking Needle-leaf Mistletoe has much longer clustered glaucous leaves and is almost always hosted by casuarinas (Moss and Kendall 2016). The foliage resembles that of some *Lysiana* species that occur in the same area but have a different leaf arrangement, flowers and fruit (Moss and Kendall 2016).

### Wildlife Benefits

The nectar-bearing flowers of this striking mistletoe are visited by a variety of Honeyeaters, including the Painted and Spiny-cheeked Honeyeaters. Wire-leaved Mistletoe is an important reproductive resource for butterfly species including the Spotted Jezebel Butterfly (*Delias aganippe*), the Imperial Jezebel Butterfly (*Delias harpalyce*) and the Satin Azure Butterfly (*Ogyris amaryllis*).



Imperial Jezebel  
*Delias harpalyce*  
Photo: David Cook







One of the most rapidly growing Australian mistletoes which can grow from a seed to a mature, fruiting plant in less than nine months under ideal conditions (Watson, 2019).

A close-up photograph of several small, round, white mistletoe fruits (samaras) clustered together. Each fruit has a dark, circular mark on its surface.

Wire-leaved Mistletoe flowers  
Photo: Kym Nicolson  
Wire-leaved Mistletoe fruit  
Photo: Roger Fryer

## General Guide to Flowering Period

Species	J	F	M	A	M	J	J	A	S	O	N	D
Needle-leaf Mistletoe			Light Pink	Dark Red	Dark Red	Dark Red	Dark Red	Dark Red	Dark Red	Dark Red	Dark Red	
Long-flowered Mistletoe								Light Yellow	Yellow-Green	Yellow-Green	Yellow-Green	Light Yellow
Box Mistletoe	Dark Green	Dark Green	Dark Green	Light Green								Light Green
Grey Mistletoe	Light Blue	Light Blue	Light Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Dark Blue	Light Blue
Creeping Mistletoe	Green	Green										Green
Wire-leaved Mistletoe	Dark Red	Dark Red	Dark Red	Light Red								Dark Red

## General Guide to Fruit Availability

Species	J	F	M	A	M	J	J	A	S	O	N	D
Needle-leaf Mistletoe	Dark Red	Light Pink									Dark Red	Dark Red
Long-flowered Mistletoe	Yellow-Green	Light Yellow									Light Yellow	Yellow-Green
Box Mistletoe					Light Green	Dark Green	Dark Green	Dark Green	Dark Green	Dark Green	Light Green	
Grey Mistletoe	Dark Blue	Dark Blue	Light Blue								Light Blue	Dark Blue
Creeping Mistletoe				Light Green	Green	Green	Green	Green	Light Green			
Wire-leaved Mistletoe			Light Red	Dark Red	Dark Red	Dark Red	Dark Red	Light Red				

**Spot mistletoe?** *Snap, share, save it* on iNaturalist using the app or online portal – your sightings matter! Go to [www.inaturalist.org](http://www.inaturalist.org)



# 5 Resources for Mistletoe Propagation

Mistletoe propagation can be done with minimal resources. Ripe fruit and a suitable host tree are often all you need! However, some additional resources that may be helpful are outlined below.

## Required

*Ripe mistletoe fruit* and suitable collection container.

Appropriate *host tree*.

---

## Optional

### Mistletoe fruit collection

A *long pole* can be used to shake mistletoe plants to release ripe fruit that cannot be reached easily otherwise.

A *tarp* can be placed beneath the mistletoe plant to collect fallen fruits.

A *folding ladder* can be helpful to access fruiting plants.

---

### Mistletoe propagation

*GPS* device to record locations of inoculated trees.

*Spray paint or flagging tape* to mark branches where seeds have been planted.

*Extendable pole* to plant mistletoe in higher branches beyond arms reach.

A *folding ladder* can also be helpful to reach suitable branches in the lower canopy.

---



A tree marked after mistletoe propagation



## 6 Step-by-step Guide to Mistletoe Propagation

### 1 Collect ripe fruit from a host mistletoe plant

- a Where possible, try to keep the stem attached to the fruit. This will ensure the seed stays viable for longer. Air exposure may promote germination and drying and thickening of the viscin layer around the seed, which could impede adhesion.
- b Check under fruiting clumps for easily collectable fallen fruit. Keep the fruit in the fridge until you are ready to plant to minimise deterioration. Ideally, plant within one or two days of collecting the fruit.
- c For many mistletoe species, the seeds are only viable when the fruit is soft to the touch. In most species, the fruit change colour as they ripen (see the species profiles for reference photos). However, for others (e.g. Creeping Mistletoe), the colour may not change. If in doubt, try gently squeezing the fruit at its base. If the seed pops out, the fruit is sufficiently ripe. If the fruit is tough or exudes a white powdery substance when pressure is applied, then it has not yet matured.
- d Where possible, source seeds locally for a higher likelihood of success.



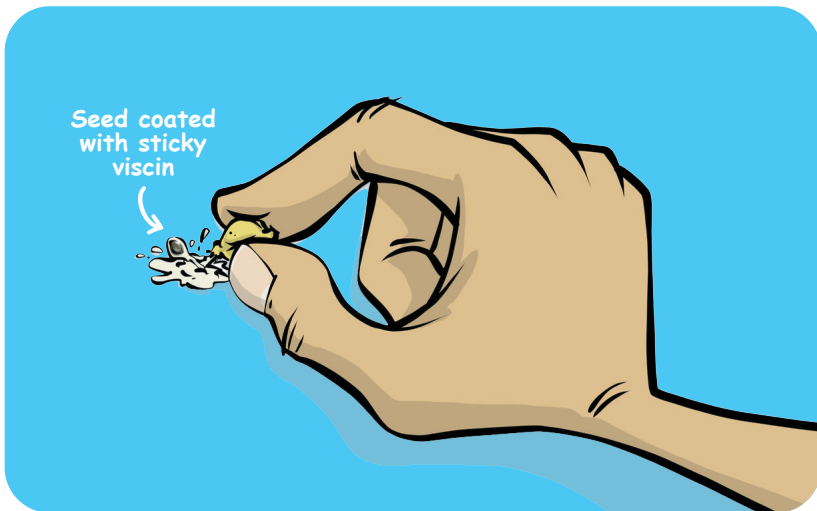
## 2 Find a suitable host tree

- a Often the best host tree will be the same species the parent mistletoe was found on. Although native trees are generally best, some mistletoes will grow on fruit trees, Liquidambar, Oaks, Crepe Myrtles and other exotics, providing an easy opportunity to improve diversity of resources in parks and gardens.
- b Avoid very young trees that could be overly burdened by a mistletoe plant.
- c Avoid lower branches of young trees because they shed branches below about 3 m as they mature.
- d A step ladder or planting pole can be useful for reaching higher branches.
- e If there are many possums in your area, you may have trouble getting mistletoes established. Try using an isolated tree; possums are less likely to cross open space to reach it. Another option is to fit a tree collar until the mistletoe becomes well established.



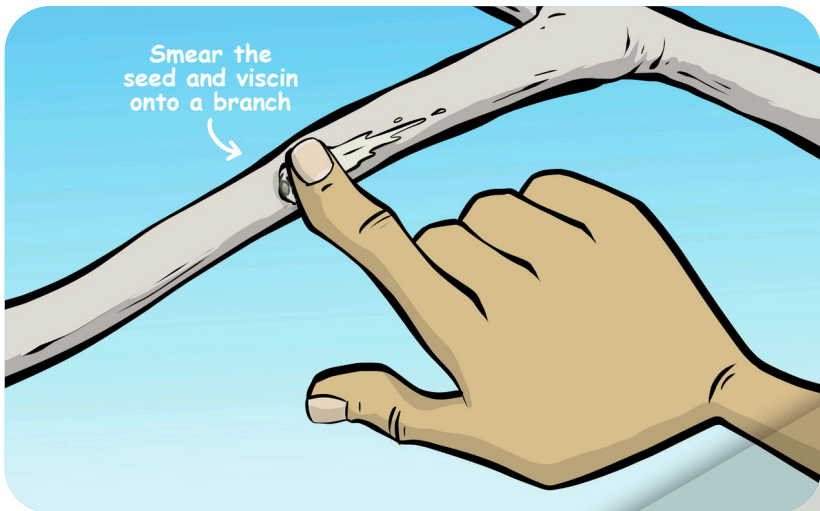
### 3 Gently squeeze the base of the mistletoe fruit until the seed pops out

- a Mistletoe seeds are coated with sticky viscin, which helps the seed adhere to its host. The viscin will slowly dry and harden with exposure to air, so don't wait too long before placing the seed. The viscin acts as a cement that keeps the seed attached to the host tree and provides the seed with moisture while it establishes its connection to its host.
- b The fruits of some species, such as Needle-leaf Mistletoe, have watery viscin, which can make it difficult to wipe seeds securely onto a host. Use a cloth or paper towel to absorb excess moisture before planting the seed.
- c It can be helpful to mark the locations of placed seeds with a spot of spray paint or piece of coloured wool or tape to help you track their progress.



#### 4 Wipe the seed onto a well-lit branch that is no more than pencil thickness

- a For most species, try planting on thin branches (0.3–0.8 mm). Young branches tend not to shed bark for the first two years, increasing the chances of establishment.
- b Wiping the seed onto the underside or side of a branch may increase success because it allows dew to accumulate and provide extra resources to the seedling until it establishes. On the underside of branches, seedlings are also less obvious to possums, which eat them.
- c Orientate the seed lengthwise along the branch, and remove nearby leaves, as the emerging root may otherwise attach to a leaf.
- d Be mindful of seed placement along a branch. If seeds are placed on the far end of a branch, the mistletoe is more likely to break the branch off when it is bigger.
- e Watch out for peeling bark that may shed the seed before it can attach securely to the host. Plant seeds on young bark if possible.
- f Seeds are more likely to germinate if they get enough light, but avoid planting on a western aspect as the seed may dry out in the hot sun.



**Remember that while the mistletoe germination rate is very high, only a few plants are likely to establish and reach maturity. So you can plant 20-30 seeds per tree without concern of overloading the host tree. If there is an over-abundance of mistletoe, these can easily be pruned off later.**

An alternative to planting by hand is using an extendable pole to reach higher branches in a tree. Begin by wiping the seed on the end of the pole, then lift the pole into position and brush the seed against a branch to dislodge it in place.

Creeping mistletoe  
Photo: Gio Fitzpatrick



First Long-flowered Mistletoe seed successfully germinated at Tomalpin Woodlands  
Photo: Mick Roderick



A homemade propagation pole  
Photo: Gio Fitzpatrick



New Needle-leaf Mistletoe plant  
Photo: Peter Vaughan

Attaching rootlet



Forming cotyledons



Separated plantlet



Established plantlet



Epicortical runner



Germination of Brush Mistletoe Photos: John Moss







Ripe fruit ready for propagation and the extendable pole method of propagation  
Photo: Gio Fitzpatrick



## 7 Mistletoe Management

Many landholders express concern that mistletoes can cause tree decline or death and may believe that as parasites, mistletoes must be exotic pests requiring removal.

In fact, close to 100 species of mistletoe occur in Australia, all of which are native. Research over the last 20 years has shown that most host trees (particularly in remnant bushland) remain in a healthy condition despite having a few mistletoe plants attached.

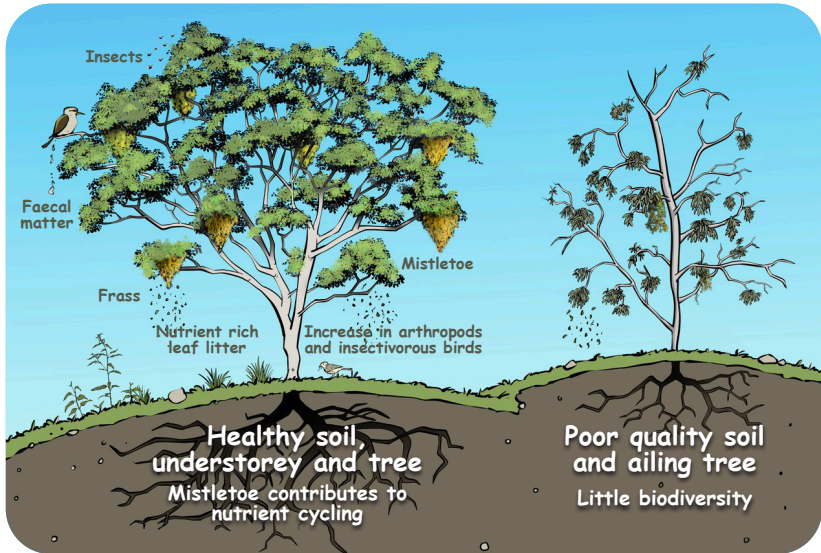
Overabundant mistletoe growth – often seen on isolated paddock trees or on trees along roadsides or in small remnant areas – usually arises from a combination of factors that affect tree health, such as isolation from herbivores, high fertiliser and herbicide use, changed soil nutrient status, soil compaction, changed soil water and fire regimes, increasing salinity and erosion. A tree with many mistletoe plants may eventually succumb, but the abundant mistletoe is rarely the cause; rather, it is a symptom of a tree already in stress.

When a forest is partially cleared to create a landscape of scattered trees with pasture beneath, this breaks the cycle of periodic fires reaching the canopy. It is in these landscapes that we often see individual paddock trees, isolated from crown fires and mistletoe herbivores, covered with an increasing load of mistletoes.

Both over- and underabundance of mistletoe present threats to native fauna. Large paddock trees are vitally important landscape elements for many woodland bird species and native mammals and need to be retained for multiple reasons. Allowing mistletoes to become too abundant in these trees could contribute to their untimely death. On the other hand, a lack of mistletoe in the landscape can negatively affect fauna diversity through the loss of a dependable foraging resource, and safe places to roost and nest.

If you have any isolated paddock trees with overabundant mistletoe, you may consider selective removal, but changes to the tree's environment will likely be required to minimise reinfestation. Advice from relevant government agencies, such as Local Land Services, is recommended if you are considering removing mistletoes. Mistletoes are protected native plant species in many jurisdictions under native vegetation clearance laws and regulations.





As the biology of mistletoes become better understood, experts are urging that they be managed with an eye on the underlying causes of overabundance.

For advice on managing mistletoes contact:

- > Your regional Natural Resource Management office
- > Your local Landcare network
- > A qualified and experienced arborist (Arboriculture Australia [www.trees.org.au](http://www.trees.org.au))



**Australian Government**



**Local Land Services**



An over-abundance of mistletoe on an isolated tree  
Photo: David Watson



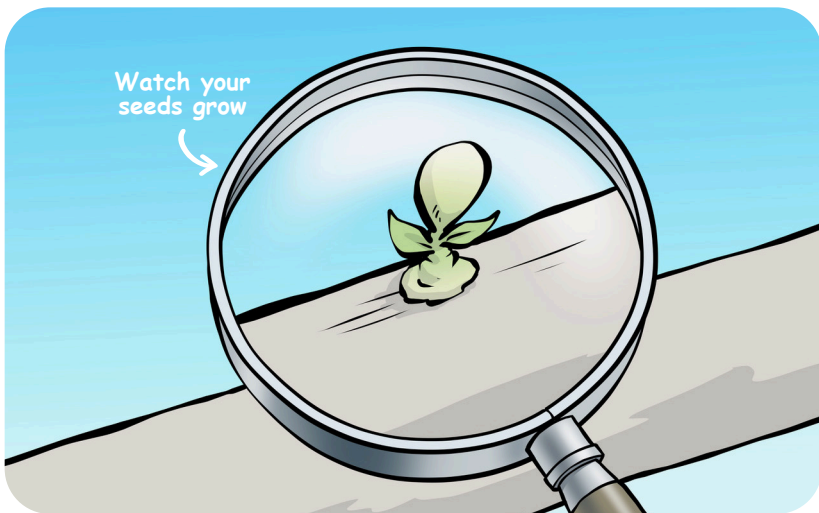
## 8 Monitoring your mistletoe seedlings

If you aim to conduct follow-up monitoring to assess germination and recruitment of the planted seeds, you may consider collecting information on the following:

- Date of mistletoe fruit collection and propagation
- Species and locations of source and recipient (host) tree
- Number of fruits planted per tree and branch
- Orientation of the branch
- Placement of seed (top, side or underside of branch)

You could also consider undertaking photo monitoring of the successfully germinated plants at suitable intervals (e.g. at 1, 3 and 6 months then annually).

To measure the benefits of planting native mistletoe, you could also undertake pre-planting and ongoing bird surveys as the mistletoe matures to see whether bird diversity increases and Mistletoebirds or other dispersers are attracted back to your garden or local patch.



# 9 Terminology

<b>Arthropod</b>	Any member of the phylum Arthropoda, which includes spiders, mites, insects, centipedes and millipedes.
<b>Frass</b>	The excrement of insect larvae.
<b>GPS device</b>	Global Positioning System device: used to determine position and air navigation using a satellite network.
<b>Host</b>	A tree on which a mistletoe plant can grow. The host provides an attachment point for seeds and supplies nutrients and water to the mistletoe.
<b>Inoculation</b>	The process of 'planting' a mistletoe seed on a host.
<b>Insectivore</b>	A species that feeds on insects, worms or other invertebrates.
<b>Invertebrate</b>	An animal that lacks a spine, such as an insect, spider, earthworm or snail.
<b>Keystone species</b>	A species with a disproportionately large impact on an ecosystem relative to its abundance.
<b>Parasitic plant</b>	A plant that acquires some or all of its water and nutrients from another plant. Related terms are semi-parasitic or hemi-parasitic.
<b>Photosynthesis</b>	The process by which plants store energy using sunlight, carbon dioxide and water.
<b>Sclerophyll forest</b>	A forested environment dominated by vegetation that is often hard and short with leathery or spiky leaves that are resistant to desiccation.
<b>Viscin</b>	A clear, sticky substance that surrounds a mistletoe seed. It typically has a gelatine-like consistency. It plays a vital role in facilitating seed adhesion to a host.
<b>Woodlands</b>	Area with sparse (10–30%) tree cover. Open woodland has very sparse tree cover (<10%).





## Case Studies

### Lower Hunter, Capertee Valley and Barraba (NSW)

Long-flowered Mistletoe and Needle-leaf  
Mistletoe propagation

BirdLife Australia in collaboration with  
Mindaribba Local Aboriginal Land Council, Central Tablelands  
and North West Local Land Services

An arborist propagating mistletoe seed  
Photo: Rob Kyte



**BirdLife Australia** has undertaken mistletoe restoration work in the Lower Hunter since 2020. In this region, Long-flowered Mistletoe is a vital resource for the critically endangered Regent Honeyeater, providing a food source (nectar) and safe sites for nests. Multiple bushfires occurred in the preceding years on Wonnarua Country in the Mindaribba Local Aboriginal Land Council owned lands. Most are thought to have been the result of arson, causing a severe loss of over 90% of the mistletoe from the canopy, depleting this vital resource.

In trials, replanting mistletoe has improved habitat quality for the Regent Honeyeater and many other woodland birds and mammals through the provision of foraging and nesting resources. Monitoring of propagation undertaken in the summers of 2021, 2022 and 2023 found survival of 10–20% at 15–17 months after planting, with over 300 new mistletoe plants established. These mistletoe plants will be providing resources for wildlife within three years, compared to a planted tree, which may take 20 years. Over 4,500 Long-flowered Mistletoe seeds have been planted, and with ongoing monitoring, it is hoped that the establishment rate will rise.

BirdLife Australia, in collaboration with NSW Local Land Services, has also undertaken Needle-leaf Mistletoe plantings in the Capertee Valley and Barraba – two historical breeding strongholds of the Regent Honeyeater. Severe drought events in 2018 to 2019 resulted in widespread mortality of Needle-leaf Mistletoe in important riparian corridors where the Regent Honeyeater has been known to breed. The mistletoe inoculation is intended to restore habitat quality in these locations and thus improve breeding success, with the benefits extending to a range of other woodland species that also rely on this critical resource.

### Further reading

<https://site.emrprojectsummaries.org/2024/06/26/restoring-mistletoe-on-wonnarua-country-hunter-valley-nsw/>



A case moth on  
Box Mistletoe  
Photo: Rob Kyte



## City of Melbourne

### Creeping Mistletoe Propagation

#### City of Melbourne Council (in collaboration with Dr David Watson)

In 2017, the City of Melbourne hired arborists to inoculate almost 900 Creeping Mistletoe seeds in 28 introduced London Plane Trees (*Platanus x acerifolius*) located in West Melbourne, Parkville, South Yarra and Southbank (Backhouse 2017). The intention was to boost biodiversity and enhance the productivity of exotic tree species which otherwise offer few resources for native fauna. A follow-up survey conducted a year later indicated that 24 seedlings had survived, resulting in a 3% success rate (which is relatively high for mistletoe!) (City of Melbourne 2018). Five years after inoculation, mistletoes had established on five trees, with two of the plants bearing ripening fruit (Watson et al. 2023). Ongoing monitoring will determine what benefits mistletoe provides for biodiversity in an urban environment.



'Look up and pucker up' Photo: Lee Harrison







## Yalukit William Nature Reserve

### Creeping, Drooping, Grey and Wire-leaved Mistletoe Propagation

#### Gio Fitzpatrick

The Yalukit William Nature Reserve in suburban Melbourne is currently subject to several re-wilding measures that are converting the former golf course into a large-scale biodiversity and habitat sanctuary. This includes the inoculation of trees with several mistletoe species that were historically common in Melbourne but have now become rare or locally extinct. The reserve currently contains 77 established mistletoe plants (Creeping Mistletoe and Wire-leaved Mistletoe), with inoculation of Drooping Mistletoe scheduled for spring 2023. Monthly bird surveys are monitoring the changes to biodiversity following the introduction of mistletoe and other land management practices.

Similar small-scale mistletoe plantings of Creeping Mistletoe have also been trialled within the Bayside City Council, including at the Long Hollow Heathland and George Street Reserve (Weir, 2022).



Creeping Mistletoe Photo: Gio Fitzpatrick



# 11 Bibliography

Anderson, SJ and Braby, MF. (2009). Invertebrate diversity associated with tropical mistletoe in a suburban landscape from northern Australia. *Northern Territory Naturalist* 21, 2-23.

Backhouse, M. (2017, 25 July). **Mistletoe, friend or foe? Melbourne Council arborists embrace a former pest.** *The Sydney Morning Herald*.

Barea, LP. (2008) Nest-site selection by the Painted Honeyeater (*Grantiella picta*), a mistletoe specialist. *Emu: Austral Ornithology* 108, 213-20.

Barea, LP and Watson, DM. (2007). Temporal variation in food resources determines onset of breeding in an Australian mistletoe specialist. *Emu: Austral Ornithology* 107, 203-9.

Barea, LP and Watson, DM. (2013). Trapped between popular fruit and preferred nest location: cafeterias are poor places to raise a family. *Functional Ecology* 27, 766-74.

Barlow, B. (2011). Palatability and vegetative concealment from herbivores. Australian National Herbarium. Available at: <https://www.anbg.gov.au/mistletoe/palatibility-herbivores.html>

City of Melbourne. (2018). **Mistletoe surveys: citizen forester program.** Available at: <https://participate.melbourne.vic.gov.au/citizenforester/mistletoe-survey>

Cooney, SJN and Watson, DM. (2005). Diamond firetails (*Stagonopleura guttata*) preferentially nest in mistletoe. *Emu: Austral Ornithology* 105, 317-22.

Cooney, SJN and Watson, DM. (2008). An experimental approach to understanding the use of mistletoe as a nest substrate for birds: nest predation. *Wildlife Research* 35, 65-71.

Cooney, SJN, Watson, DM and Young, J. (2006). Mistletoe nesting in Australian birds: a review. *Emu: Austral Ornithology* 106, 1-12.

Crates, R, Watson, DM, Albery, GF *et al.* (2022). Mistletoes could moderate drought impacts on birds, but are themselves susceptible to drought-induced dieback. *Proceedings of the Royal Society B* 289, article 20220358. Available at: <https://doi.org/10.1098/rspb.2022.0358>

March, WA and Watson, DM. (2007). Parasites boost productivity: effects of mistletoe on litterfall dynamics in a temperate Australian forest. *Oecologia* 154, 339-47.

Moss, JT and Kendall, R. (2016). *The Mistletoes of Subtropical Queensland, New South Wales and Victoria*. Butterfly & Other Invertebrates Club Inc, Runcorn, Qld.

Ndagurwa, HGT, Dube, JS and Mlambo, D. (2014). The influence of mistletoes on nutrient cycling in a semi-arid savanna, southwest Zimbabwe. *Plant Ecology* 215, 15-26.

Oliver, DL, Ley, AJ and Williams, B. (1998). Breeding success and nest site selection of the Regent Honeyeater *Xanthomyza phrygia* near Armidale, New South Wales. *Emu: Austral Ornithology* 98, 97-103. Available at: <https://doi.org/10.1071/MU98010>



Reid, N. (1986). Pollination and seed dispersal of mistletoes (Loranthaceae) by birds in southern Australia. In ***The Dynamic Partnership: Birds and Plants in Southern Australia*** (eds. HA Ford and DC Paton), pp. 64-84. Government Printer, Adelaide.

Spasojevic, MJ and Suding, KN. (2011). Contrasting effects of hemiparasites on ecosystem processes: can positive litter effects offset the negative effects of parasitism? ***Oecologia*** 165, 193-200.

Start T and Thiele K. (2023). ***Mistletoes of Western Australia***. CSIRO Publishing, Clayton South, Victoria.

Sugden, LG and Beyersbergen, GW. (1986). Effect of density and concealment on American crow predation of simulated duck nests. ***Journal of Wildlife Management*** 50, 9-14.

Watson, D. M. (2001). Mistletoe—a keystone resource in forests and woodlands worldwide. ***Annual Review of Ecology and Systematics***, 32(1), 219-249.

Watson, DM. (2015). Disproportionate declines in ground-foraging insectivorous birds after mistletoe removal. ***PLoS ONE*** 10, article e0142992. Available at: <https://doi.org/10.1371/journal.pone.0142992>

Watson, DM. (2019). ***Mistletoes of Southern Australia***, 2nd ed. CSIRO Publishing, Clayton South, Victoria.

Watson, DM, Cook, M, van de Ree, R and Harrison, L. (2023). Returning mistletoe to an urban forest: a restoration success story. ***Botany*** 102, 168-175. Available at: <https://doi.org/10.1139/cjb-2023-0069>

Watson DM, McLellan RC, Fontúrbel FE. 2022. Functional roles of parasitic plants in a warming world. ***Annual Review of Ecology, Evolution and Systematics*** 53: 25–45. Full text here: <https://www.annualreviews.org/content/journals/10.1146/annurev-ecolsys-102320-115331>

Weir, A. (2022). Restoring mistletoe in Bayside. ***Banksia Bulletin*** (Summer) 12-13. Available at: <https://7c21074d.flowpaper.com/BanksiaBulletinSummer2022/#page=12>





'Blossoming on Wonnarua Country'  
Phyllis Jackson (Wiradjuri)



Mistletoe Propagation in Eastern Australia

For further information email [woodlandbirds@birdlife.org.au](mailto:woodlandbirds@birdlife.org.au)

Produced by Kristy Peters at BirdLife Australia [www.birdlife.org.au](http://www.birdlife.org.au)

Design by [rob@conservationmatters.com.au](mailto:rob@conservationmatters.com.au) 0420 821 460