

Among the Gum Trees



This text has current scientific claims for you to consider. You can also see different types of texts and diagrams. Words that are **bold** can be found in the scientific glossary at the back.



**EUCALYPT
AUSTRALIA**

Among the gum trees Information text was developed in collaboration with Eucalypt Australia.

Eucalypt Australia is a philanthropic fund established by a bequest from Bjarne K Dahl to focus on the iconic Australian trees 'the eucalypts'.

We envisage a public inspired by and appreciative of eucalypts. We direct our resources including small and multiyear grants towards areas that have the greatest potential for impact, in order to promote, establish, cultivate and conserve eucalypts, and educate the public in these matters.

Please view our website for more information: www.eucalyptaustralia.org.au

We partnered with Primary**Connections** to develop resources to bring eucalypts to life in the classroom, including:

- The *Among the gum trees* curriculum unit for teachers, which provides background information and clear lesson steps to deliver practical, hands-on lessons that develop the Year 4 Science Understanding through a 5Es approach. The unit links science with literacy and is fully aligned the Australian Curriculum:Science.
- A set of Student ID cards that help students identify some common eucalypt species, their features and attributes.
- This Information text, designed to be useful for students to develop both their science understanding and their literacy skills.

For more information about these resources visit: www.primaryconnections.org.au

Among the Gum Trees

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1

Many gum trees

Gum trees, or **eucalypts**, are well-known **plants** of Australia. They have a **life cycle**, like all living things. They depend on certain **animals**, and on their **environment**, to survive. Eucalypts also provide essential food and places for animals to live. Humans have long used parts of eucalypts for various purposes.

Eucalyptus tea with honey.



A kookaburra sits in an old gum tree.

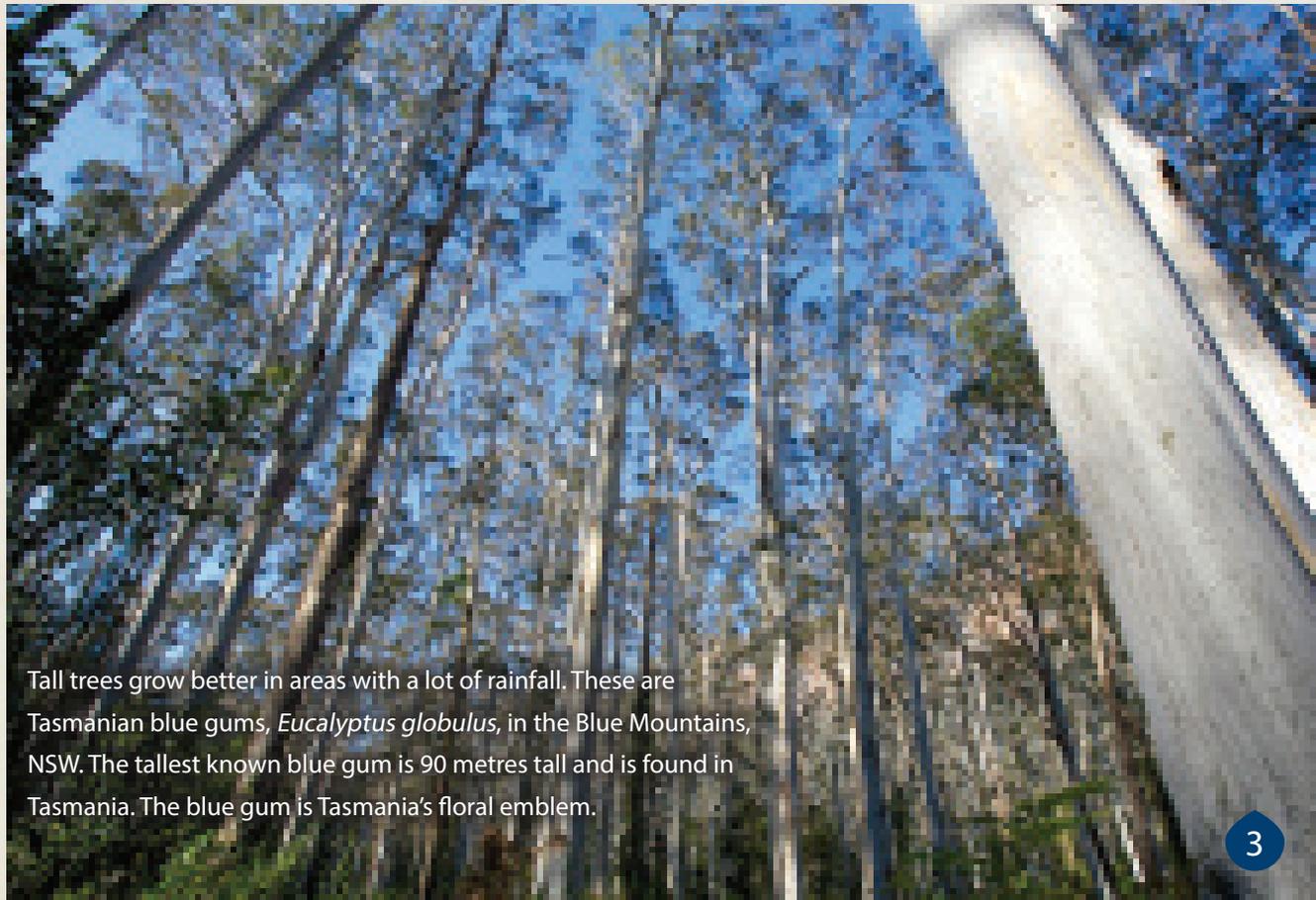
2

Lots of different species

There are almost 900 **species** of eucalypts in Australia. They can be found all across the country. Some have yellow **flowers**; others have red, white, pink, green or purple flowers. Eucalypts can be as short as a **shrub** or as tall as a giant mountain **tree**. The smallest eucalypt is the varnished gum, *Eucalyptus vernicosa*. This is a stunted shrub, sometimes less than half a metre tall. It grows in the coldest, wettest mountains of Tasmania.



This course-leaved mallee shrub is called *Eucalyptus grossa*. It is found in southern Western Australia and grows to about 2 metres high.



Tall trees grow better in areas with a lot of rainfall. These are Tasmanian blue gums, *Eucalyptus globulus*, in the Blue Mountains, NSW. The tallest known blue gum is 90 metres tall and is found in Tasmania. The blue gum is Tasmania's floral emblem.



Hanging leaves
of a eucalypt.

DID YOU KNOW?

Scientific names are written in italics. The first name (genus) indicates a group of related **species** and the second name identifies the species within the group. Eucalypts have three different first names (genera): *Eucalyptus*, *Corymbia* and *Angophora*.



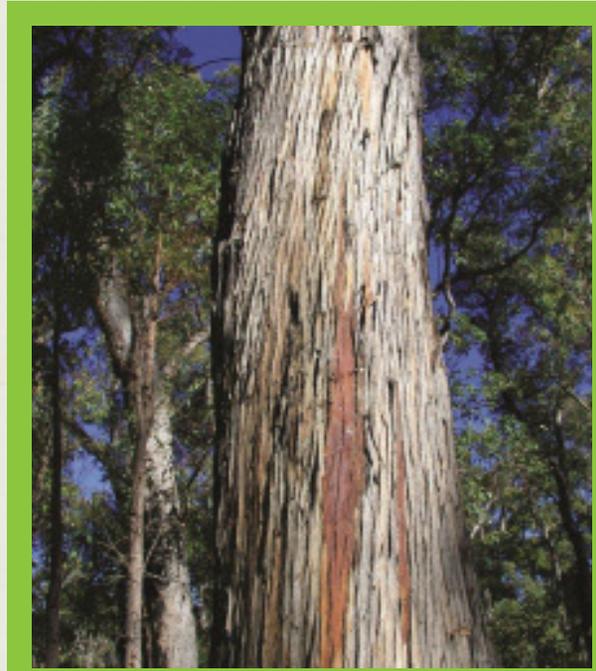
Adapted to Australia

Eucalypts have adapted to survive the low-**nutrient** soils, dry climates, droughts and bushfires that are common in Australia. Most eucalypts have **leaves** that hang down to avoid direct sunlight. The leaves are coated in a **waxy** layer to protect them from drying out.

Eucalypts also protect themselves with a layer of dead, dry **bark**. This helps the **tree** conserve water. Sometimes you can see the oldest bark peeling off the **branches** and **trunk** of the tree.

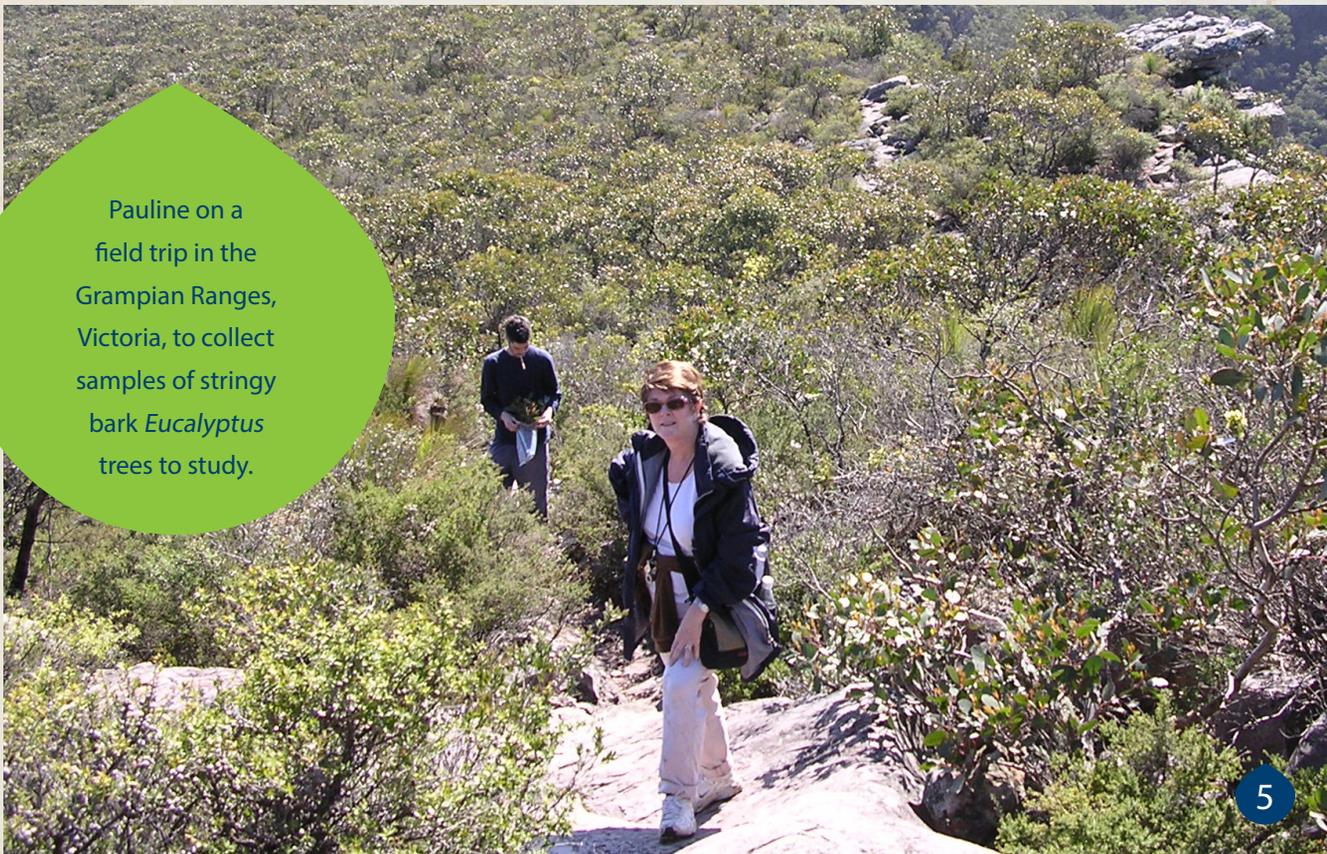
Identifying eucalypts

Professor Pauline Ladiges is a researcher and teacher looking at the evolution of eucalypts. According to **fossil** and **DNA** samples, the eucalypt group of trees is about 60 million years old.



Peeling bark of *Eucalyptus marginata*.

Pauline on a field trip in the Grampian Ranges, Victoria, to collect samples of stringy bark *Eucalyptus* trees to study.



Pauline, why study eucalypts?

"Eucalypts are very important species in most of our forests and woodlands. Many other living things rely on them to survive, including insects, birds, mammals, mistletoe parasitic plants and fungi.

My work helps many different people who need to know about eucalypts, including environmental managers, conservationists, foresters, plant research scientists, plant ecologists and wildlife ecologists."

What do you want to find out?

- * Where and when did eucalypts first evolve?
- * Why are there so many different species?
- * How can we best group the species, and give them scientific names, to help everyone who manages and uses eucalypts?



Pauline, how do you identify eucalypts?

"I crush a leaf and smell the distinctive oils. I look at the height of the tree, and the bark on the trunk: is it smooth, rough-based or rough all the way to the branches? Is it stringy or ironbark?"

The key to identifying a species is to examine the shape and number of flower buds and gumnuts. The size and shape of the flowers and leaves, both young and adult, are also very important."



Leaves, flowers and buds of *Eucalyptus miniata*.

Pauline's work takes her across the country. "One of my favourite **species** is the manna gum, *Eucalyptus viminalis*," she says. "It is also the favourite food of the **koala**!"

2

A plant life cycle

Seeds

Every **plant** with **flowers** starts life as a **seed**. Seeds come in many shapes, colours and sizes. Apples, coconuts, avocados, peanuts, walnuts and poppies all have seeds that look quite different from each other.



Seeds come in all shapes and sizes. Do you recognise these ones?

Clue: They are named on this page.



The shell of a peanut is a fruit. There are generally two seeds inside with thin outer seed coats.



A seed has an outer coat (a testa). It can be hard like an avocado pit or papery thin like on a walnut. Sometimes the seed is also inside a hard shell made from a part of, or from, an entire **fruit**.

Inside the seed coat is a young plant and stores of food to help it grow. Sometimes the young plant uses the stores while it is inside the seed coat. Its first **leaves** (the cotyledons) then become very large. The two halves of a peanut or a bean are two large leaves. You can see the young plant at the bottom of one if you look carefully.



When a gumnut opens it releases both seeds and chaff. The *Eucalyptus luehmanniana* seeds shown here are thick and black. The chaff are the smaller red-brown ones: they weren't fertilised and don't have a plant inside.

Germination

When a **seed** starts to grow into a **plant**, it is said to be germinating. Seeds usually need light, warmth, **oxygen**, **nutrients** and moisture to **germinate**. Even then, some seeds may remain **dormant** until they are ready.

Seeds from the snow gum (*Eucalyptus pauciflora*) tend to germinate after the seed has been through a cold period, such as winter. This means the young plants start growing in spring, and have a better chance of becoming big and strong before the snows of the next winter.

Young plants
grow best in
spring.

DID YOU KNOW

In 2005, Israeli researchers successfully germinated a plant from a 2,000-year-old date palm seed. Scientists have even managed to grow plants from 32,000-year-old *Silene stenophylla* seeds found deep in ice in Siberia.

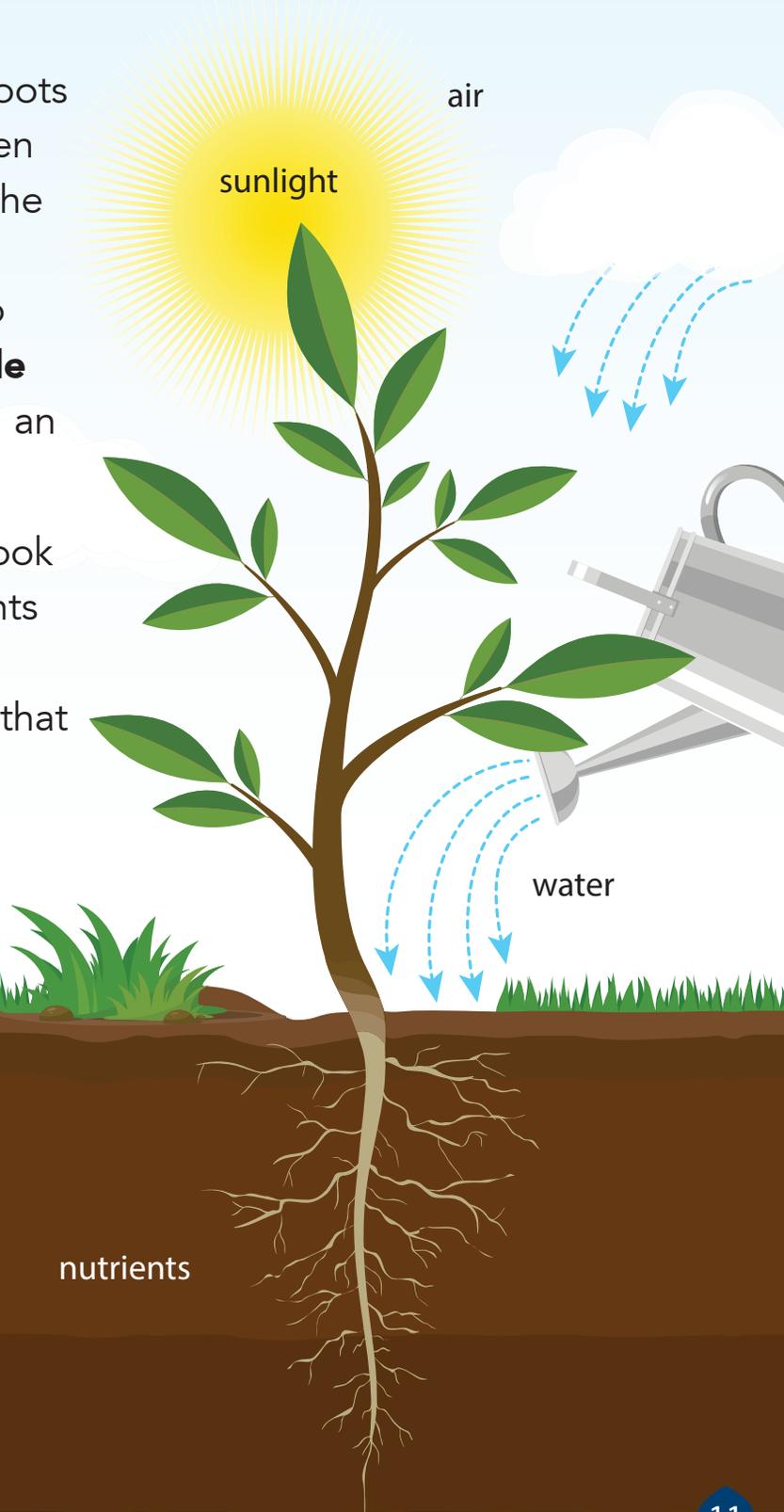


Growth

When a seed starts to germinate, it first grows roots down into the soil. A green shoot grows up towards the sunlight. If the plant has enough light it grows into a **seedling**, then a **juvenile plant**, and eventually into an adult plant.

Juvenile plants may not look like the adults. When plants are young, they are more vulnerable to **herbivores** that eat them. They also need to grow quickly to reach available sunlight before other plants.

What plants need to grow



Flowering

Once a plant has grown into an adult, or matured, it can produce **flowers**. Eucalypts need to be a few years old before that can happen.



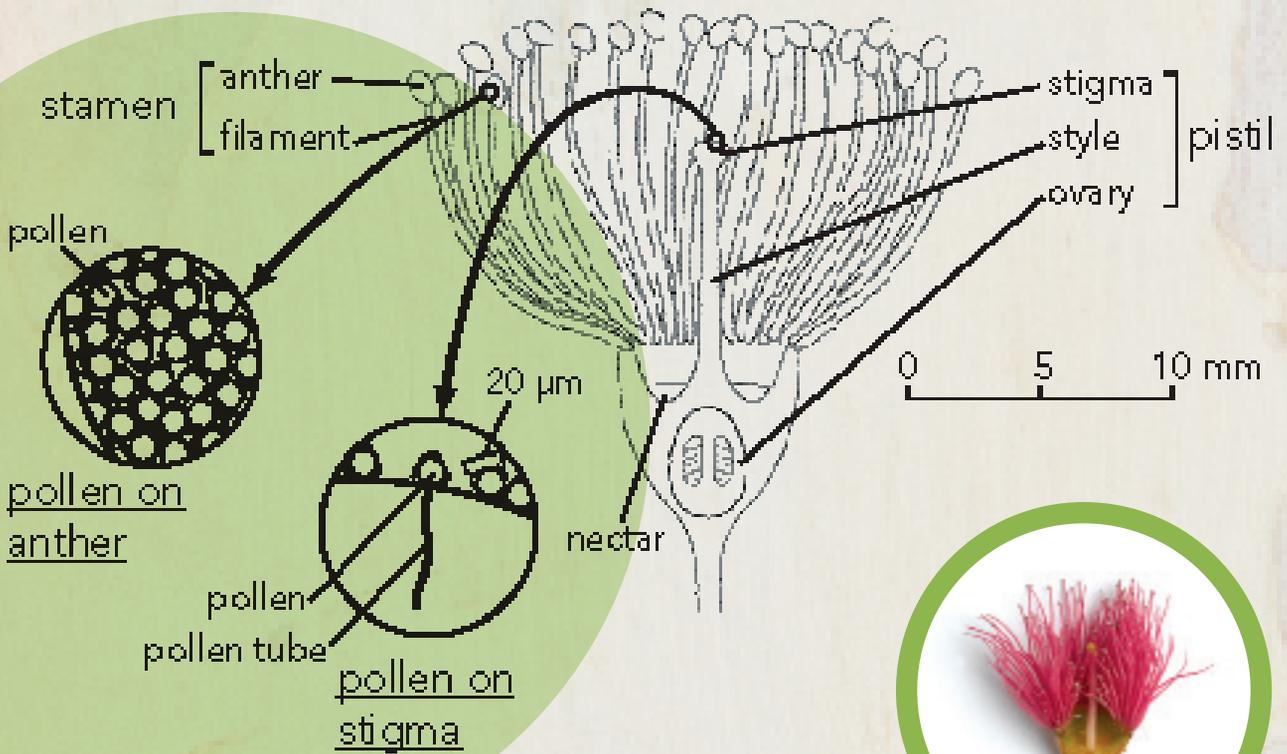
Stages of
floral
development
of *Eucalyptus
caesia*.

Eucalypts have flowers that are unlike many flowers you might see in gardens: there are no petals to be found! The gum blossom is instead a **cap** with a fluffy brush of coloured, string-like strands known as the **stamens** of the flower. Once the flowers are shed, woody **capsules** (**gumnuts**) develop. They are the **fruit** of the eucalypt.

Pollination and fertilisation

A flower needs to be **fertilised** before it can change into a fruit. Pollen is a powder-like substance found on the **anthers** of a flower. The **pollen** contains the male cells of the plant. Pollen needs to get to the **stigma** on the female part of the plant. Pollination is the process of these two parts of the flower meeting. The flower is fertilised when this process is complete, and then fruit can develop.

Labelled diagram of a cut flower of Eucalyptus leucoxylon



Many **plants**, including **eucalypts**, rely on **animals** to **pollinate** them. They attract animals to them with colourful **flowers** and the promise of food inside them (nectar).

Insects, **birds** and **mammals**, such as bats and honey possums, pollinate eucalypts. These animals collect **pollen** on their bodies as they feed on the **nectar** in the flower. As they move between flowers, the pollen travels with them.

DID YOU KNOW

Plants don't just use flowers and nectar to attract pollinators. They also use scents. But not all these scents are pleasant to humans! There are some plants in the world that have 'carrion flowers'. These flowers smell like rotten meat and attract flies and beetles.



A fruit bat drinking some sugary water, which is almost as good as nectar.

A photograph of a eucalypt branch with green leaves, a yellow flower head, and several brown, woody gumnuts. A green circular callout box is positioned above the gumnuts.

A eucalypt
branch with
maturing fruits
(gumnuts).

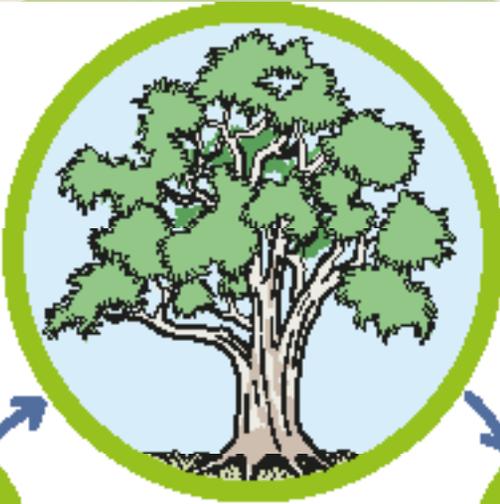


A dandelion with many tiny dry fruits
built to float on the wind and carry
the seeds inside them far away.

Seed release

Fruit is the part of a plant that contains **seeds**. You've probably seen seeds in some of the **fruit** that you eat. But not all fruit is edible! The woody **capsules** of eucalypts and peanut shells are just two examples of fruit that humans cannot eat.

As the eucalypt capsule (**gumnut**) matures it changes from green to brown. It also becomes hard and dry, like **wood**. Once it is hard and woody, the capsule releases its seeds. Some capsules need fire to open them. If the seeds fall in the right place at the right time, the **life cycle** can start again.

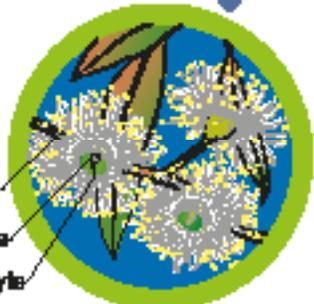


A juvenile plant (sapling) grows into a mature tree that can produce flowers.

Flowering



Unopened flower buds with operculum (cap) develop.



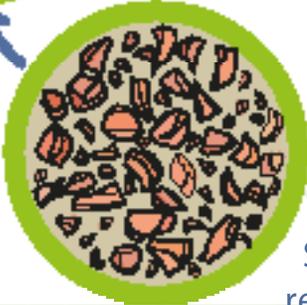
Operculum is shed. Flowers display white stamens with anthers that release pollen.

Pollination and fertilisation



Woody fruit (a capsule) develops from the ovary of fertilised flowers. It contains the seeds.

Seed release



Fertile seeds contain a young plant and are larger. The smaller, brown structures are sterile chaff.

Life cycle of a River Red Gum (*Eucalyptus camaldulensis*).

Growth



A seedling grows into a juvenile plant (sapling).



A seed germinates to grow into a seedling.

Germination

Try this!

To grow a eucalypt tree yourself:

1. Dry out the brown woody fruits (gumnuts) in a dark place, for example, a paper bag.
2. Collect the seeds that have fallen out of the fruits. This may take a week.
3. Sprinkle the seeds over some soil in a container and cover them with a little more soil.
4. Leave in a sunny spot and water the seeds every day. The seeds may take two weeks to start growing.
5. When the eucalypt needs more space, plant it outside. During spring is best.

SAFETY NOTE

If you want to use potting mix, ask an adult for help. The potting mix might have bacteria that could make you very sick if you do not handle it correctly.

DID YOU KNOW?

An 'Old Jarrah tree' (*Eucalyptus marginata*) in Armadale, WA, is believed to be at least 400 years old.



3

Friends or foes

Many things live in and around **eucalypts**. Some help the **plant** and some hurt it. Some don't seem to affect the plant at all.

Competing with other plants

Eucalypts, like most plants, get their energy from sunlight rather than from eating other living things. To grow and stay healthy they need enough water, sunlight and **nutrients**. But there is only a certain amount of water in the soil or sunlight to be captured. So, plants compete for access to these resources.

Once a tree is taller than other plants it can access all the sunlight it needs.

DID YOU KNOW

In West Africa, the *Barteria fistulosa* tree produces a nectar that attracts vicious *Tetraponera* ants. The ants live on the tree and defend its leaves and branches from being eaten. These ants give a very painful bite—strong enough to sting an elephant!





Hungry herbivores

Herbivores are **animals** that eat parts of plants. If they eat **leaves** then the plant has less ability to capture sunlight. If the herbivores eat **flowers** then the plant cannot create seeds. It takes extra energy and nutrients from the plant to replace what was eaten. The plant also needs to heal the wounds created, which can be attacked by **fungi** or **bacteria**.

If a large eucalypt **tree** loses a few leaves it will probably survive. If a **seedling** with only four leaves loses two of them it might not recover. Herbivores prefer young leaves because they are less tough to eat.

A grey-strike thrush, *Colluricincla harmonica*, eats sawfly larvae. Animals that eat or chase away herbivores help the plant.



Koalas only eat the leaves of certain eucalypts.

DID YOU KNOW?

The word 'koala' is a combination of several Australian Aboriginal words for the animal.



Spotlight on koalas

There are three **mammals** that eat **eucalypt** leaves: the greater glider, the ringtail possum and the **koala**.

Koalas usually get all the food and water they need from eucalypt **leaves**. They only drink water if they are sick or if the leaves are too dry in times of drought.

Koalas live in eucalypt forests so they can be near other koalas. Each koala has a "home tree" that they shelter in. They eat the leaves of their home **tree**, in particular, the young leaves.

The koala is a **mammal** that gives birth to live young. It is also a **marsupial**, meaning that the babies live in their mother's pouch to feed on her milk after being born. Koalas start to live on their mother's back once they are about a year old. Eventually they leave to find their own home tree.



Koalas need to sleep most of the day, so they can digest the eucalypt leaves.

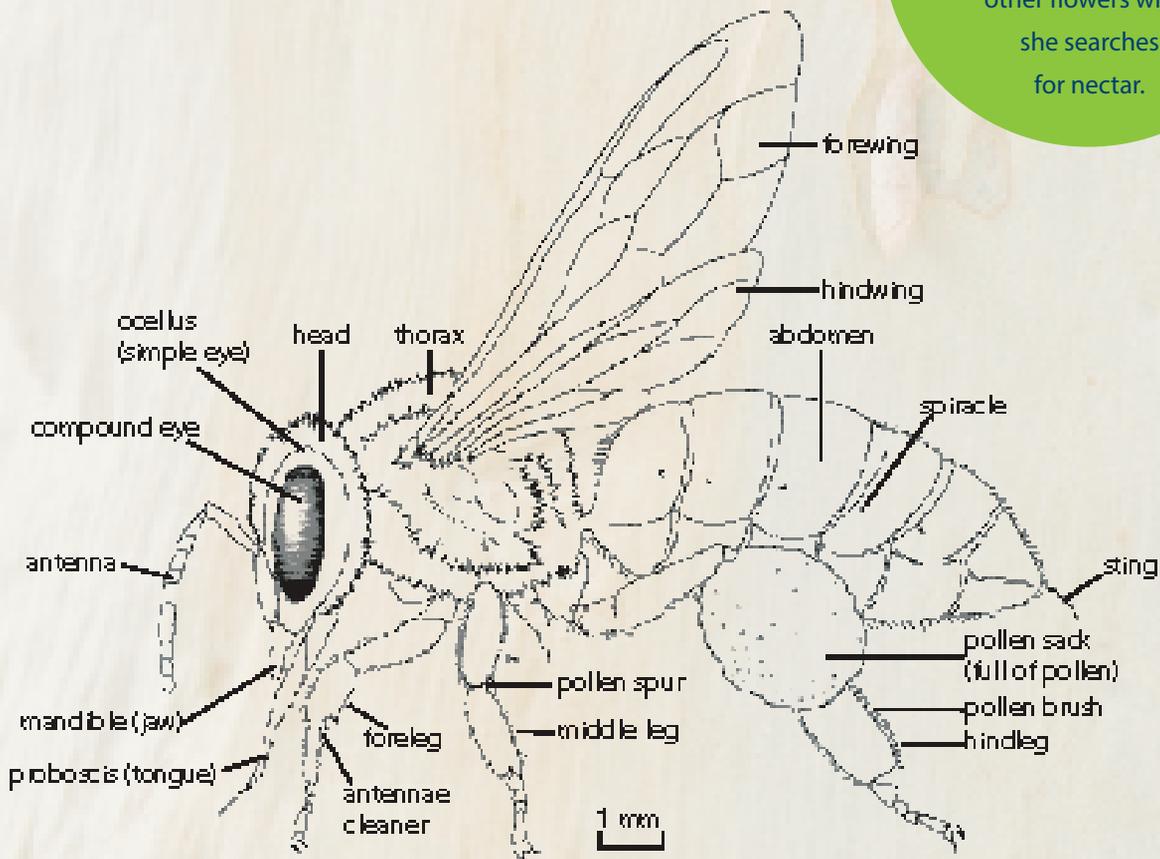


A mother koala with a young joey.

Helpful pollinators

Eucalypts need the help of **animals** to pollinate their **flowers**. Today, many eucalypts are pollinated by European honeybees. Early European settlers brought the bees to Australia to help **pollinate** their European crop plants. They also wanted to eat the **honey** that these bees produce.

A European honeybee on a eucalypt flower. She carries pollen to other flowers while she searches for nectar.



Labelled diagram of a European honey bee (*Apis mellifera*)



DID YOU KNOW

Most of the honey made in Australia is made from the nectar of eucalypt trees. The name and taste of the honey usually depends on the flower from which the nectar was collected. You may see River red gum, Ironbark and Blue gum honey at the supermarket.



Australia also has its own native bees—there are more than 1,600 native species! They are usually **solitary** and can be almost any colour.

The blue-banded bee, *Amegilla*, is one type of native bee. It is able to buzz its body to shake the pollen off flowers. The males live above ground, on twigs, while the females burrow into the ground with their young.



There are also around 14 species of stingless bees in Australia. They live in small **colonies** in the hollows of trees, or in burrows in the ground. They produce a unique **honey** called **sugarbag**, but only enough for about one or two jars a year per **hive**. These stingless bees are smaller than European honeybees. Stingless bees are generally black in colour and look like flying ants. They do not sting but, watch out, they do bite!



Sugarbag bee (*Tetragonula clypearis*)
with full pollen sacks on her legs.

DID YOU KNOW

Some Australian Aboriginal people know how to find wild sugarbag. Australians are also learning to keep stingless bees, and therefore have a reliable supply of the special treat. Sugarbag tastes of lemon and Eucalyptus.





Both friends and foes

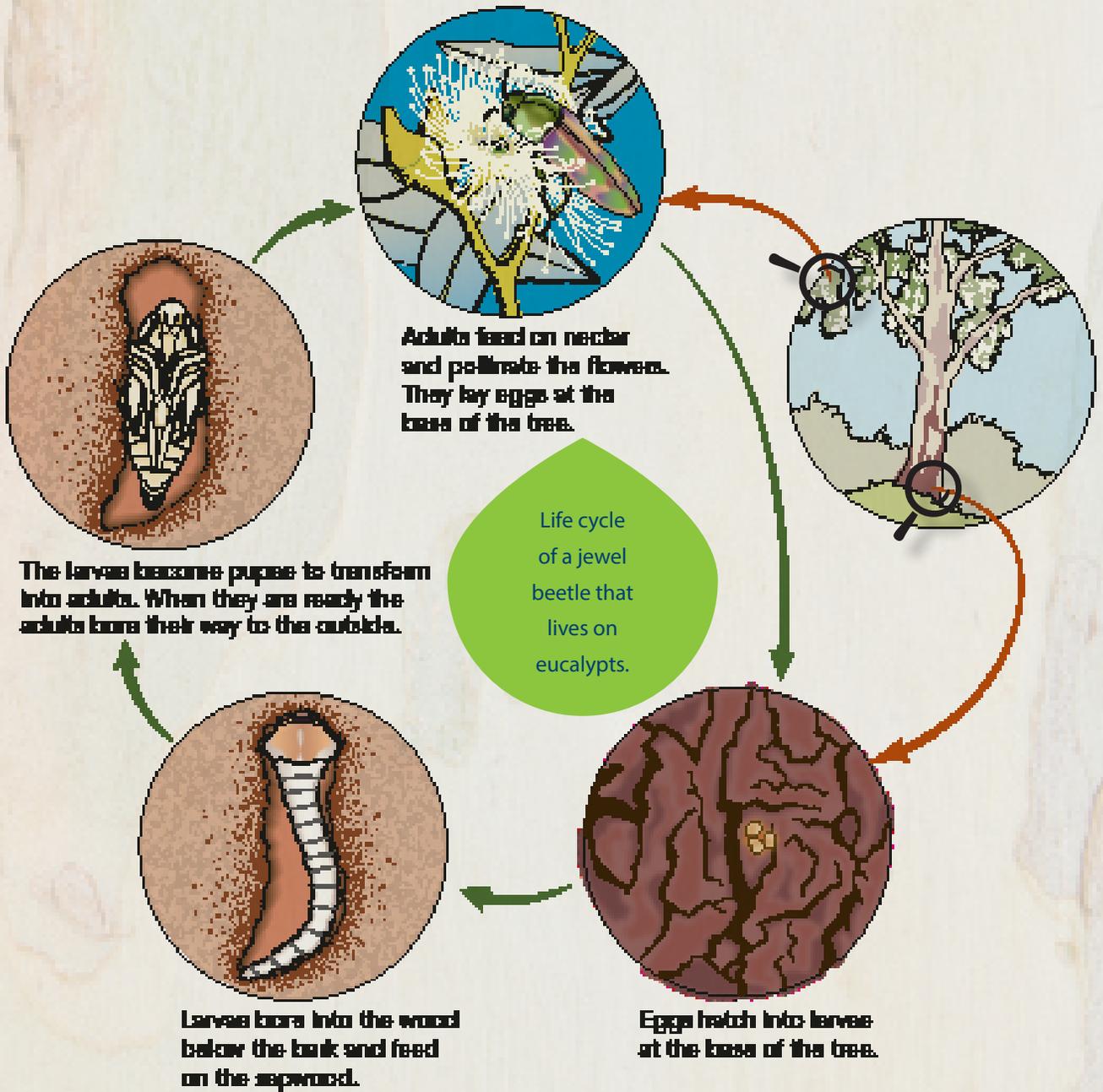
The same **animal** can both help and harm a **eucalypt**. For example, a cockatoo might not only destroy some **flowers** but also remove some caterpillars that are eating the tree's **leaves**.

The effect an animal has on a eucalypt can depend on the animal's stage in its **life cycle**. Young Jewel beetles are larvae that bore into eucalypt **trunks**. This harms the tree.



Adult Jewel beetles visit eucalypt flowers to drink their **nectar**. While doing this they **pollinate** the flowers, which helps the eucalypt to produce **fruit** and **seeds**.

Animals, such as cockatoos and bees, nest in eucalypt hollows. The nesting does not generally affect the tree, but the other activities of the animal can.



The effect of another living thing on a eucalypt can also depend on the plant's life stage. For example, pollinators can only help plants that are flowering.



Eucalypts and fire

Eucalypts have evolved tough features to live and thrive in bushfires. The **fruits**, or **gumnuts**, of eucalypts are hard, woody capsules. The woody **capsule** protects the **seeds** inside it during a fire.

Some eucalypts also have a thick **bark** to protect the **trunk** of the tree from getting burned. The bark protects any **buds** on the trunk and **branches**, so that they can then grow after a fire.



Epicormic buds sprout from under the tough bark of a eucalypt after a fire.



Eucalypts standing tall and regrowing leaves after a bushfire.



Ash from a fire is full of nutrients that help eucalypt trees to grow after a fire.

Many other **plants** cannot cope with fire the way eucalypts can. Neither can many **animals** that depend on the eucalypts for food.

The ash left over from a fire is usually rich in **nutrients**. After a fire, the fruits (gumnuts) dry out and open, releasing their seeds onto the nutrient-rich ground below the eucalypt.

This is a good time for eucalypts to **germinate** and grow. There are fewer **herbivores**, such as caterpillars, to eat them. There are also fewer plants around competing for resources, such as sunlight and water.

5

Uses for eucalypts

Eucalypt wood

Eucalypts are grown around the world for their **wood**. The wood is used to make many different things, including furniture, fence posts and ornaments. It can be chopped for firewood or burnt to create charcoal. Sometimes it is pulped and used to create good-quality paper and soft tissues.

The Wurundjeri people removed eucalypt bark to make canoes, shields, food and water

containers, baby carriers and many other items. This tree in the Fitzroy Gardens, Melbourne, still bears a scar.



Eucalypt plantations can be found throughout the world.

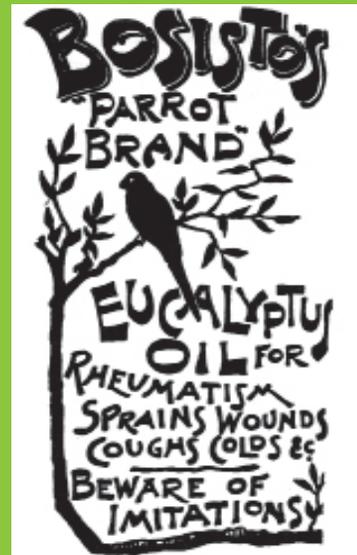


Eucalyptus oil

When you crush a **Eucalyptus leaf**, it releases a certain smell, which is the smell of its oil.

People use this unique oil for cold and flu remedies, as well as for cleaning.

Some **animals**, like the **koala**, have evolved to eat Eucalyptus leaves as part of their diet. However, the smell of the oil usually stops many other animals from eating any part of the **plant**. The oil can poison some animals that eat it!



Bosisto's was the first company to start producing Eucalyptus oil.

Eucalyptus oil is extracted from the leaves.

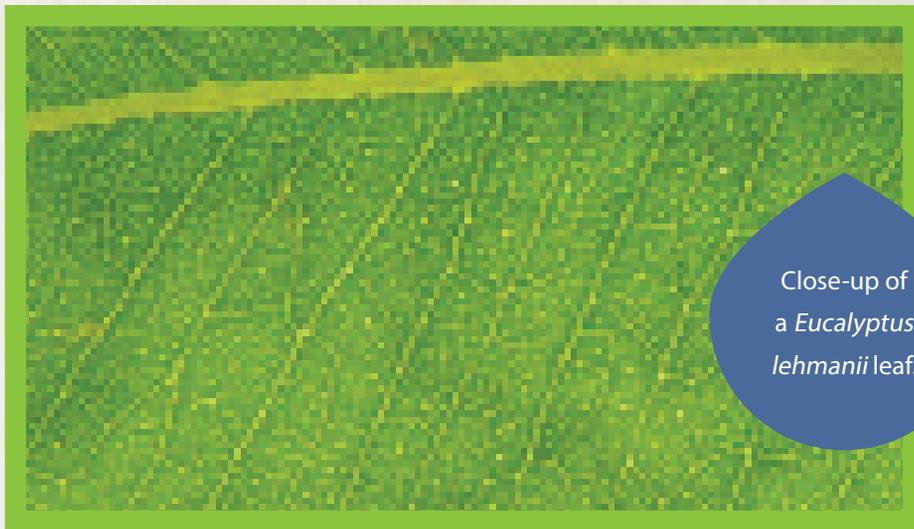




Bush medicine

Medical treatments were the earliest and most common use of **eucalypts**. Different parts of eucalypts can be used to treat different illnesses, for example:

- ï A healing ointment can be made by mixing crushed **leaves** with **animal** fat.
- ï Leaves can be heated over a fire to produce a steam to help with headaches.
- ï A tea can be made out of the leaves or **bark** to treat body pains, diarrhoea and fevers.
- ï The **sap** can be mixed and boiled in water to rub onto sores and cuts.



Close-up of
a *Eucalyptus*
lehmanii leaf.

You can see oil glands by holding a leaf in front of a strong source of light, such as the Sun. A fresh leaf will have white, yellowish or pale green structures inside it. The oil glands are harder to see in dried leaves, and look like black dots. The patterns of oil glands can help to identify a eucalypt.



Early settlers used the knowledge of local Aboriginal peoples to treat and heal wounds by wrapping cuts or sores in a bandage of eucalypt leaves. The oil within the leaves act as an antiseptic.

Samples of the oil were sent to England for testing when Australia was first colonised by the British. The tests found that the oil was a better medical remedy than the English peppermint plant.



The name of Peppermint Tree has been given to this plant by Mr. White on account of the very great resemblance between the essential oil drawn from its leaves and that obtained from the Peppermint (*Mentha piperita*) which grows in England. This oil was found by Mr. White to be more efficacious in removing all cholicky complaints than that of the English Peppermint, which he attributes to its being less pungent and more aromatic. A quart of the oil has been sent by him to Mr. Wilson.

Excerpt from 'Journal of a Voyage to New South Wales' by John White. Sourced from Project Gutenberg of Australia:
<http://gutenberg.net.au/ebooks03/0301531h.html>

Eucalypts in the future

Eucalypts thrive in the harsh conditions of Australia. Many **animals**, including humans, depend on them. **Plants** support **insect** populations, such as bees, which are useful for farmers since the insects can help to **pollinate** their crop plants. But eucalypts are increasingly under threat from extreme weather events, such as severe droughts, and from human activity. About 150 **species** of eucalypt are highly endangered today.

So, what can we do to help?

Professor Pauline Ladiges says we need to make sure enough eucalypt trees are protected in nature reserves and national parks. We can plant rare species in botanic gardens. We can replant land that has been cleared. We can also plant native species along roadsides.



Planting
more eucalypts
will help them
survive.

Glossary

animal a type of living thing that eats plants, fungi and/or other animals. They have a range of senses, including smell, taste, sight, hearing and touch.

anther the part of the stamen that has the pollen. It is usually on top of a long stalk that looks like a fine hair.

bacteria tiny living things (micro-organisms) that have only one simple cell. Some bacteria cause diseases in other living things.

bark the tough outer cover of the woody parts of trees.

bird a warm-blooded animal with wings, a beak and feathers.

branch a woody arm of a tree, connected to the trunk.

bud a small swelling on a plant, which can grow into a stem, leaf or flower. Some buds lie underneath the bark of a tree (epicormic buds).

capsule a hard, dry fruit with valves on top that open when it is ripe to let the seeds fall out.

colony members of the same species living together, generally to help each other.

DNA a molecule found in cells that carries the information (genes) about how living things develop.

dormant in, or as if in, a deep sleep.

environment the non-living surroundings (physical features) and living surroundings (other species) of a living thing.

eucalypt a type of shrub or tree that is native to Australia with green leaves that produce oil, flowers with no petals but colourful stamens, and fruit that are woody capsules (gumnuts).

fertilise when male and female parts of a living thing come together. When a flower is fertilised, a plant can produce seeds and fruit.

flower the part of a plant that makes seeds when it is fertilised and becomes a fruit.

fossil the remains or impression of a living thing embedded in rock.

fruit the part of a plant that grows from a flower and contains seeds.

fungi a group of living things that are neither plants or animals. Many digest dead or dying things. Some can also cause infections in other living things.

germinate when the plant inside a seed starts to grow into a seedling.

gumnut the common name for the hard seed container, or fruit, of eucalypts.

herbivore an animal that only eats plants.

hive the home of a group of bees.

honey a sweet, sticky fluid made by bees out of nectar.

insect a small animal with six legs and one or two sets of wings.

juvenile plant a young plant, not yet an adult.

koala an Australian marsupial with thick grey fur.

leaf a flat, blade-like part of a plant, usually found on the stems or stalks.

life cycle the stages in the life of a living thing.

mammal a warm-blooded animal with hair or fur. Babies drink milk made by the mother.

marsupial a mammal that is carried as a baby in its mother's pouch.

nectar a sweet liquid made by some flowers. It attracts bees and other animals to the flower to help with pollination.

nutrient a part of food that is needed to help living things grow and stay healthy.

oxygen a gas found in the air that plants and animals need to live.

plant a type of living thing that gets its energy from sunlight and grows in one spot. This includes trees and shrubs.

pollen the male part of the flower that can be transported to a female flower part (stigma) to fertilise it. Pollen is usually a powdery-like coating found near the top parts of a flower.

pollinate to transfer pollen (male part of the flower) to the stigma (female part of the flower).

sap a fluid that transports nutrients and water within a plant.

seed a baby plant (embryo) with stores of food to help it grow, inside an outer coat.

seedling a young plant, usually grown from seed.

settler a person that settles in another country or area. European settlers (British) first came to Australia in 1788.

shrub a woody plant which is smaller than a tree. It has stems that branch out close to the ground.

solitary living alone

species living things that are grouped together because they can reproduce with one another, i.e. make babies (embryos) like themselves.

stamen the male part of the flower that produces pollen.

stigma the female part of the flower that catches pollen. It is usually a sticky bulb.

sugarbag a unique honey made by stingless bees in Australia.

tree a tall plant with a woody trunk that supports branches and leaves.

trunk the main body of a woody plant.

waxy looks and/or feels like wax.

wood a strong plant tissue that supports plants to grow tall. It contains small tubes to transport water and nutrients.

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Gum trees, or eucalypts, can be found throughout Australia. They have adapted to dry climates and frequent bushfires. Insects, birds and mammals, including humans, depend on eucalypts for food. But eucalypts also need animals in order to make seeds and fruits.

Learn more about these Australian plants, and how they depend on animals and the environment to survive, with this illustrated book.



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