

Biodiversity unit: Terrific trees

Level 3 and 4

May 2022

About this unit

This unit is designed to give students an appreciation for trees and understand the benefits they provide to both humans and wildlife, especially in an urban environment. Students will conduct an audit of trees in the school grounds and learn a simple technique to measure the height of a tree. This data can then be used to choose a tree suitable for the installation of a nest box.

This unit focuses on native tree species, bird species and microbat species.

Students will learn

- How to respect and care for trees
- The benefits trees provide to humans and animals
- How to make observations, describe features and identify native tree species
- To use a range of methods to collect and represent data
- Animal's unique characteristics and habitats

Suggested sequence of activities

- 1. Finding out about trees and why they matter
- 2. Our terrific trees part one
- 3. Our terrific trees part two
- 4. Data representation and interpretation
- 5. Tiny visitors in the night
- 6. Extension: Installing a nest box

Developed by: Gould League for Cardinia Shire Council



Victorian Curriculum links

Domain	Content description
Design Technologies / Creating Designed Solutions / Producing	Select and use materials, components, tools and equipment using safe work practices to produce designed solutions (VCDSCD030)
Design Technologies / Creating Designed Solutions / Evaluating	Evaluate design ideas, processes and solutions based on criteria for success developed with guidance and including care for the environment and communities (VCDSCD031)
Design Technologies / Creating Designed Solutions / Planning and Managing	Plan a sequence of production steps when making designed solutions (VCDSCD032)
Digital Technologies / Data and Information	Collect, access and present different types of data using simple software to create information and solve problems (VCDTDI021)
English / Literacy / Creating texts	Plan, draft and publish imaginative, informative and persuasive texts demonstrating increasing control over text structures and language features and selecting print and multimodal elements appropriate to the audience and purpose (VCELY266)
Geography/ Geographical Knowledge / Diversity and significance of places and environments	Types of natural vegetation and the significance of vegetation to the environment, the importance of environments to animals and people, and different views on how they can be protected; the use and management of natural resources and waste, and different views on how to do this sustainably (VCGGK082)
Geography / Geographical Knowledge / Diversity and significance of places and environments	Similarities and differences in individuals' and groups' feelings and perceptions about places, and how they influence views about the protection of these places (VCGGK083)
Mathematics / Measurement and Geometry / Using units of measurement	Compare objects using familiar metric units of area and volume (VCMMG166) Measure, order and compare objects using familiar metric units of length, area, mass and capacity (VCMMG140)
Mathematics / Statistics and Probability / Data representation & interpretation	Construct suitable data displays, with and without the use of digital technologies, from given or collected data. Include tables, column graphs and picture graphs where one picture can represent many data values (VCMSP179)
Personal and Social Capability / Social Awareness Management / Relationships and diversity	Identify the importance of including others in activities, groups and games (VCPSCS0022)
Personal and Social Capability / Social Awareness and Management / Collaboration	Demonstrate skills for effective participation in group tasks and use criteria provided to reflect on the effectiveness of the teams in which they participate (VCPSCS0023) Identify conflicts that may occur in peer groups and suggest possible causes and resolutions (VCPSCS0024)
Science /Science Understanding / Science as a human endeavour	Science knowledge helps people to understand the effects of their actions (VCSSU056)

Domain	Content description
Science / Science Understanding / Biological sciences	Different living things have different life cycles and depend on each other and the environment to survive (VCSSU058)
Science /Science Inquiry Skills / Planning and conducting	Safely use appropriate materials, tools, equipment and technologies (VCSIS067)
Science / Science Inquiry Skills / Recording and processing	Use formal measurements in the collection and recording of observations (VCSISO68) Use a range of methods including tables and column graphs to represent data and to identify patterns and trends (VCSISO69)
Science / Science Inquiry Skills / Analysing and evaluating	Compare results with predictions, suggesting possible reasons for findings (VCSIS070) Reflect on an investigation, including whether a test was fair or not (VCSIS071)
Science / Science Inquiry Skills / Communicating	Represent and communicate observations, ideas and findings to show patterns and relationships using formal and informal scientific language (VCSIS072)

Activity 1: Finding out about trees and why they matter

Learning outcomes

Students will learn about tree species and the significance of trees to the environment, the importance of trees to humans and animals and how they are perceived and managed by different people.

Brainstorm- The value of trees

Ask students to brainstorm on the following:

- What is the value of trees to people?
- How might other living things value trees?
- What value do you place on the trees in your school grounds?
- Do some have more value than others?



Teachers note

Research shows that there are significant benefits that urban trees provide to health, cognition and well-being.

Table 1.Benefits of urban trees1

Benefits of urban trees	Scientific benefits of trees			
Health and social well-being				
Trees promote physical and mental health for urban residents. They support community ties and reduced crime rates	 Reduce pollution Improves physical and mental health Strengthens social ties Increases physical activity Decreases aggression and violence Reduces crime 			
Cognitive development and education				
Trees increase a student's ability to succeed in school	 Improve student performance Reduce stress Increase in concentration Reduce symptoms of ADD/ADHD Increase in attention Increase in self-discipline 			
Climate change mitigation and habitat				
Trees mitigate the Urban Heat Island Effect and store and sequester carbon. They are important for habitat	 Reduce urban heat island effect Store and sequester carbon Provide critical habitat 			



Photo: Spotted pardalote by Don Petty

¹ Source: Turner-Skoff and Cavender, 2019

Activity 2: Our terrific trees – part one

Learning outcomes

Students will conduct a tree survey in small groups, demonstrating their ability to collect and record data from their observations.

Resources

- Paper A4, plus graph paper optional
- Writing materials
- Clipboard desirable outside
- Terrific trees indigenous tree list
- Terrific trees fact sheet

Instructions

Depending on the number of trees at the school, either assign small groups to different areas of the school or each student can survey the entire grounds if there are few trees.

Walk around the school grounds and ask students to record the following observations:



- Location students can create a map of school grounds and include tree locations; graph paper could be used.
- Tree species to establish whether the tree is native to Australia².
 Observe and note the following:
- Colour, smell, shape and size of leaves and how they are arranged on each branch.
- Look and feel of the bark.
- Evidence of any flowers, fruits or seeds?

If you can determine the species of the tree, use the supplied Indigenous tree list to see whether your tree is indigenous to the area. This is an important consideration because indigenous trees offer much better habitat for local native birds, insects and animals.





A native tree is a plant that is native to anywhere in Australia.

But indigenous means that it comes from a certain area, like the Grampians or even more specific such as a valley.

² It may be difficult to determine the identity of tree species without some expertise. You may be able to seek advice from grounds staff or parents with specialist knowledge. The critical factor is to determine whether the tree is a native species.

The PlantNet App. Is useful for tree ID using photos taken using a phone or Ipad. The App can be downloaded free and is suitable for children aged 4+. A photo of the tree is taken using the App and it identifies the likely species using leaves, flowers or fruits, whatever is available. It is possible to use this without providing personal information, but it does use location data to assist with identification. It is simple to use and provides links to further information once ID is established

- Is there evidence that any animals i.e., birds or insects live in this tree?
 Look for scratches, spider webs, nests, evidence of leaves being eaten and scats (poo).
- 4. Students may also like to include in their survey, information about how trees are used by students for play/recreation or shade in summer.

Note: The information gathered by the students can help to decide whether the trees in the school grounds are providing useful habitat for birds, animals and insects. All this data and observation about trees can give the students a new appreciation for them.

Studies show that trees also have a significant cooling effect in urban environments

Activity 3: Our terrific trees – part two

Learning outcomes

Students will understand how to measure the girth and height of a tree using metric units of length and other mathematical equations.

Resources

- Paper A4, plus graph paper optional
- Writing materials
- Clipboard desirable outside
- Tape measure 10m
- Piece of string (optional for tree girth measurement)
- Appendix 1: How to estimate the height of a tree



Instructions

In 'Our terrific trees - part one', students were asked to conduct a tree survey on the school grounds and record their observations, including the location and species of the trees. In part two, the students will be asked to measure the trees that were recorded in part one.

Note: This activity uses some mathematical principles in a practical application. The data obtained about the height of trees in the school grounds can then be used to decide whether any of the trees could be suitable for the installation of a nest box (see Resources Page 9).

Walk around the school grounds and ask students to record the following measurements of the trees that were identified in their survey:

1. Girth of the tree – measure the circumference of the tree at a height of 1.3m from the ground (you can use a piece of string to wrap around the tree and then measure the length of the string)



Teachers note

There are many methods that can be used to determine the height of a tree. This one is based on the concept of an equilateral triangle and doesn't require any specialist equipment. The length of the opposite sides of an equilateral triangle are equal.

This video shows how to measure a tree. This method was used to help people in LA measure trees for their city. Unfortunately, it uses imperial measurements which may confuse students, but give you as the teacher a clear step by step guide. <u>https://www.youtube.com/watch?v=fw70nimBtpE</u> (run time 5:37min)

There is an instruction sheet in Appendix 1 which can be printed. Students can work in pairs.

- Measure your stride.
- Use a square piece of paper to create an equilateral, right-angle triangle or use an A4 piece of paper and cut off the excess.
- Use a tape measure to record the height from the ground to your eye, note this number (measurement A).
- Stand in front of the tree that you want to measure. Hold the triangle to your eye so that you can look along the longest side of the triangle. The bottom edge should be held parallel to the ground.
- Line up the top point of the triangle with the topmost point of the tree. You may need to move either away from the tree or toward the tree to line this up, correctly.
- Get someone to measure from your feet to the base of the tree and record (measurement B).
- To calculate the height of the tree, add these two figures together. This number represents the approximate height of the tree (height of tree = A + B)

• Students can compare their results to check accuracy.

Trees provide a valuable store of carbon which is important in the mitigation of climate change. Carbon in the atmosphere causes global warming, so the more trees the better. The bigger a tree is, the more carbon it will store.

To estimate the carbon stored in a tree the circumference of the trunk is measured at a height of 1.3m and this information is used to approximate the weight of wood and hence carbon that is stored in the tree. Students can use this measure to decide which tree stores the most carbon at your school.





Activity 4: Data representation and interpretation

Learning outcomes

Students will use a variety of methods including tables and graphs to represent data to identify patterns and trends that will indicate the suitability of trees for installing nest boxes.

Resources

- Poster paper
- Graph paper
- Butcher's paper
- Colour pencils/markers

Instructions

Students can choose one of the following ways (or any other idea) to analyse and display the data collected by the groups or the whole class:

 Students could make a poster about their favourite tree and use the data gathered as justification for their choice. For example, my tree is indigenous and shades the playground. My tree is 5m tall and because of its height could be a good roosting site for larger birds.



- Students could create a bar graph showing the different tree species and their abundance.
- Students could develop a rating system for trees. The score could include components of how much shade is provided, whether the tree provides habitat and whether it is used by students for play.

The information gathered may also lead the class to think about providing a nest box in the school grounds to enhance the habitat values.

Activity 5: Tiny visitors in the night – Microbats

Learning outcomes

Students will discover how science contributes to understanding and problem-solving issues related to human impacts on native wildlife. They will learn how animals interact with the environment and understand the importance of their survival.

Most people have never heard of or seen a microbat because of their nocturnal habits and their size. Some species are so tiny that they could fit on the end of your finger and weigh between 3 and 30grams. Microbats make a high-pitched sound, inaudible by the human ear which helps them to navigate using sonar echolocation.. Many microbats inhabit our cities and regular microbat surveys are conducted in the Royal Botanic Gardens in the heart of Melbourne. These cute little mammals do us a great service by catching thousands of insects each night



Photo: Goulds wattled bat by Chris Lindorff³



Photo: Little forest bat by Chris Lindoff

Our parks provide critical habitat and food for bats but schools can also help by creating habitat in their playgrounds, such as leaving dead branches and loose bark on trees when it's safe to do so, or by installing bat boxes.

Bats are an essential part of the world's ecosystems. Microbats are particularly important to agriculture because they control a range of insects including weevils, caterpillars, beetles and flying termites. One microbat can eat as many as 600 mosquitoes in an hour.

There are 7 microbats found in Cardinia Council and some of them are endangered which means they are at risk of becoming extinct. What can we do to help?

The following video shows footage of a colony of microbat babies that were rescued and hand reared. <u>https://www.youtube.com/watch?v=NQS7eLhgnVI</u> (run time 2min 11 sec)

The following list includes the microbat species, commonly found in Cardinia Shire. Students can find more information using the Victorian Museum or Australian Museum websites.

³ Photos sources from <u>www.natureshare.org</u>

Resources

Access to the internet

Instructions

Ask students to choose one species from the list and find 3 interesting facts to share with the class. For example, students can research what the bat eats, how it navigates and where it roosts.

Table 2. Microbat species commonly found in Cardinia Shire

Microbat Common Name	Species Name
Little Forest Bat	Vespadelus vulturnus
Chocolate wattled bat	Chalinolobus morio
Gould's wattled bat	Chalinolobus gouldii
Large forest bat	Vespadelus darlingtoni
Lesser long-eared bat	Nyctophillus geoffroyi
White stripped free tailed bat	Austronomus australis
Gould's Long-eared Bat	Nyctophillus gouldi

Why nest boxes?

Natural tree hollows provide important nesting sites and homes for a range of native birds and animals. They offer refuge from the weather and predators and are essential for breeding and the survival of many native species.

As trees age, they are subject to the natural forces of wind, rain, lightening, heat, fire and insect attack. The inside of the tree can also be subject to attack from fungi and bacteria. It is these aging processes that form hollows, and this is why hollows are only found in old trees. Also in Australia, we don't have animals such as woodpeckers that can form hollows in trees. For example, it can take 100 years to form a hollow of the size suitable for a sugar glider to live in. A medium sized hollow which would be a suitable nesting site for small parrots such as a Cockatiel or Rosella, may take 200 years to form. A nesting site for a large parrot such as a Sulphur-crested Cockatoo or an Owl can take more than 200 years to form.

As we have developed our cities and suburbs many of these large old trees have been lost and with them goes the vital nesting hollows for so many birds and animals. That's why building nesting boxes is an important way that we can support our native wildlife.

Reflect on the brainstorming activity about the value of trees.

- How do we value our school trees? Do we value the trees in the same way i.e. human, animal or environmental benefits?
- Compare findings and discuss any suitable trees for the installation of a nest box.



Activity 6: Extension - Installing a nest-box at your school

Learning outcomes

Students will select and use materials, components, tools and equipment using safe work practices to produce designed solutions to care for the environment.

Nesting boxes can be great fun. They provide an opportunity to observe wildlife behaviour in your own school yard. If you are lucky, birds may nest and raise young using the box that you provide, or possums could take up residence. This is a great opportunity to observe the behaviour and habits of native birds and animals and gives them an opportunity to breed which they may not have otherwise had. The nest box that you provide within the school ground can also form an important link to other natural places within the suburbs such as parks, golf courses and areas along water courses. These links are known as habitat corridors and are vital for feeding, breeding and dispersal of native species.

Note: There are many ways to go about this project. The data students have already collected on the heights of trees will help with the selection of the most suitable tree. For most species, the nest box will need to be ideally, about 4m off the ground, so check that you have a tree suitable using the height data calculated by students.

Instructions

Ask students to do some research to decide which tree could be suitable for a nest box and which animal they would like to accommodate.

As an extension ask students to map the local area and see where birds and animals could come from.

Nest boxes design and construction

You can either build the nest box as a class activity or purchase a ready built box. Think about which species you would like to accommodate as this will determine the design of the box. Gould League sells some preconstructed nest boxes. La Trobe University however sell boxes that are flat packed so there is some construction required but it's much easier than starting from scratch.

La Trobe University also makes a useful list of things to consider when installing a nest box.

- Choose an easily accessible spot away from bright lights.
- The box should be at least three metres from the ground.
- The box should be facing east and be shaded through the hottest part of the day. This is because most cold weather comes from the south.
- Generally, you should only put one box per tree (there are some exceptions).
- We recommend having a professionally trained person install boxes at height, eg. an arborist or some environmental consultants should be able to do this.







Photo: Nest box installed in a tree



Photo: different size and shape nest boxes

Citizen science

Your students might be inspired to get involved with the Atlas of Living Australia https://inaturalist.ala.org.au/. There is a downloadable app and an opportunity to be involved as "Citizen Scientists" by contributing to data about animals observed in trees or in nest boxes in your local area. This could be done as a class, with an excursion to a local park, or students can even do it from their own back yards with their family members.



Additional resources

The benefits of trees for liveable and sustainable communities by Jessica B. Turner-Skoff, Nicole Cavender Published 8/7/2019 - Journal of People Plants Planet

Museums Victoria - Field Guide to Victorian Fauna App https://museumsvictoria.com.au/apps/field-guide-app-to-victorian-fauna/

Australian Bats – Australian Museum https://australian.museum/learn/animals/bats/

Swifft – Insectivorous bats of Victoria https://www.swifft.net.au/cb_pages/insectivorous_bats_of_victoria.php

Tree MapLA: How to measure the height of a tree You Tube https://www.youtube.com/watch?v=fw70nimBtpE

The Nest Box Book by Gould League. <u>https://www.gould.org.au/product/https-www-gould-org-au-wp-content-uploads-2019-11-nestbox-book-png/</u> This book is FREE for schools in a PDF format.

Birds in Backyards, nest box plans https://www.birdsinbackyards.net/Nest-Box-Plans-O

La Trobe University – Purchasing Nesting Boxes https://www.latrobe.edu.au/wildlife/nesting-boxes

Kuranga Native Nursery, Mt Evelyn, Purchasing nest-boxes https://www.kuranga.com.au/

Wildlife Victoria, working with The Men's Shed organisation <u>https://www.wildlifevictoria.org.au/wildlife-information/buy-a-possum-box</u>

Birdlife Australia, nest boxes technical information https://www.birdlife.org.au/images/uploads/education_sheets/INFO-Nestbox-technical.pdf

List of local indigenous plant nurseries <u>https://www.cardinia.vic.gov.au/downloads/download/359/local_indigenous_plant_nurseries_</u><u>cardinia_shire_council</u>

Appendix 1: How to estimate the height of a tree

1. Use a piece of paper to fold a triangle



- 2. Head outside and select a tree to measure. Ask your partner to measure the height from your eye to the ground. Write this number down = A (record in metres)
- 3. Hold the triangle to your eye so that you can look along the longest edge. Make sure that the bottom edge is parallel to the ground



4. Look along the longest edge of the triangle and line this up with the top-most point of the tree. You may need to move back or forward to get the two points to line-up.



- Record the distance from the base of the tree to the feet of the observer. Measurement = B (record in metres)
- 6. N
- To calculate the height of your tree, add the two numbers together.
 A + B = tree height (metre m)

Appendix 2: Cardinia Shire indigenous tree list

Note: Not all trees are suitable for backyards/school grounds, so chose your trees carefully.

Common name	Scientific name
Brown stringybark	Eucalyptus baxteri
River Red gum	Eucalyptus camaldulensis
Silver-leaf Stringybark	Eucalyptus cephalocarpa
Mountain Grey Gum	Eucalyptus cypellocarpa
Broad-leaf peppermint	Eucalyptus dives
Green centbark	Eucalyptus fulgens
White Stringybark	Eucalyptus globoidea
Long-leaf Box	Eucalyptus goniocalyx
Yellow Box	Eucalyptus melliodora
Messmate	Eucalyptus obliqua
Swamp Gum	Eucalyptus ovata var. ovata
Snow gum	Eucalyptus pauciflora ssp. pauciflora
Narrow-leaf peppermint	Eucalyptus radiata ssp. radiata
Mountain Ash	Eucalyptus regnans
Candlebark	Eucalyptus rubida
Silver-top Ash	Eucalyptus sieberi
Coastal Manna Gum	Eucalyptus viminalis ssp. pryoriana
Manna gum	Eucalyptus viminalis ssp. viminalis
Yellow stringybark	Eucalyptus muelleriana
Strzeleckii gum	Eucalyptus strzeleckii
Hickory wattle	Acacia implexa
Black wattle	Acacia mearnsii
Blackwood	Acacia melanoxylon
Silver wattle	Acacia dealbata
Black she-oak	Allocasuarina littoralis
Drooping she-oak	Allocasuarina verticillata
Cherry Ballart	Exocarpos cupressiformis
Swamp paperbark	Melaleuca ericifolia
Scented paperbark	Melaleuca squarrosa

Common name	Scientific name
Silver banksia	Banksia marginata
Coastal banksia	Banksia integrifolia
Hairpin banksia	Banksia spinulosa