

Sunshine Coast Council

# Those Magnificent Flying Mammals!

## *Bat Education Kit*



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### Disclaimer

The information contained in this  
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## Preface

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## Acknowledgement of country

Sunshine Coast Council acknowledges the Sunshine Coast Country, home of the Kabi Kabi peoples and the Jinibara peoples, the Traditional Custodians, whose lands and waters we all now share.

We recognise that these have always been places of cultural, spiritual, social and economic significance. The Traditional Custodians' unique values, and ancient and enduring cultures, deepen and enrich the life of our community.

We commit to working in partnership with the Traditional Custodians and the broader First Nations (Aboriginal and Torres Strait Islander) communities to support self-determination through economic and community development.

Truth telling is a significant part of our journey. We are committed to better understanding the collective histories of the Sunshine Coast and the experiences of First Nations peoples. Legacy issues resulting from colonisation are still experienced by Traditional Custodians and First Nations peoples.

We recognise our shared history and will continue to work in partnership to provide a foundation for building a shared future with the Kabi Kabi peoples and the Jinibara peoples.

We wish to pay respect to their Elders – past, present and emerging, and acknowledge the important role First Nations peoples continue to play within the Sunshine Coast community.

Together, we are all stronger.

Flying Fox illustration credit, BJ Murphy



Flying-foxes and micro-bats may carry bacteria and viruses which can be harmful to humans. People who are not trained and vaccinated should not handle bats. If you find an injured micro-bat or flying-fox, do not attempt to help the animal yourself or touch it in any way. Contact the RSPCA hotline (1300 264 625) for assistance.

# Those Magnificent Flying Mammals!

## Bat Education Kit

Explore the captivating world of flying-foxes with our comprehensive 'Those Magnificent Flying Mammals' education materials, consisting of three essential documents: a Teacher's Guide, engaging Units of Study, and invaluable Flying-fox Roost Field Trip information.



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# Introduction

Flying-foxes are the largest flying mammals in Australia, playing a crucial role as keystone pollinator species. Their significance extends to ensuring the survival of our forests and maintaining the overall health of our local ecosystems. While their presence in urban areas can be a source of contention, with some community members recognising their value and offering support, many others highlight negative impacts stemming from their roosting and foraging behaviours.



Hi, my name is Frankie!

Follow me as I fly through the forest and learn about how important Flying-Foxes are to our whole ecosystem. I'll be your guide through this information kit.

Navigating this complexity requires a strategic focus on education and engagement. By fostering awareness, understanding, and community capacity, we can pave the way for coexistence with these remarkable creatures. As the threats facing flying-foxes escalate, community education becomes paramount. Informing the public about flying-fox behaviours, seasonal movements, ecological and cultural connections, as well as management decisions and practices, is a pivotal step. This comprehensive approach not only promotes long-term tolerance but also inspires increased conservation actions, ensuring a harmonious relationship between communities and these vital members of our ecosystem.

The Sunshine Coast Council's Regional Flying-fox Management Plan (RFFMP) recognises the importance of education and has an ongoing commitment to educating and engaging the community. This program is an outcome of the RFFMP. Its primary objective is to deliver a curriculum-aligned learning experience to local schools on the Sunshine Coast. This program aims to actively engage students in understanding various aspects of flying-fox species, involving them in the observation and collection of data related to these species, and fostering their contribution towards positive and constructive outcomes for crucial flying-fox management practices.

Aligned with the goal of striking a balance between reducing conflicts associated with flying-fox roosting in urban areas and ensuring the conservation and welfare of these essential native species, this initiative emphasises knowledge transfer, heightened awareness, active engagement, and tangible actions within schools and among students. The ultimate aim is to extend this knowledge and commitment beyond the school environment, reaching into the wider community and students' homes.

The program comprises a carefully structured sequence of learning activities, carefully aligned with the Australian Curriculum. Designed to be accessible to school teachers across the Sunshine Coast, these learning sequences and accompanying resources serve as a comprehensive guide. They equip teachers with ideas, concepts, research methodologies, investigative approaches, and actionable items concerning the three species of flying-foxes that frequent the Sunshine Coast. Topics covered include their distinctive features, life cycles, behaviours, habitat requirements, ecosystem and seasonal connections, potential threats, cultural perspectives, conservation values and ethics, as well as pertinent management considerations. Through these activities, the program not only imparts valuable knowledge but also encourages a sense of responsibility and active involvement in the conservation of these remarkable native species.



Learning activity materials and resources will focus on preparing for the field trip (pre-visit activities), being in the field (field activities), and consolidating learnings after the field trip (post-visit activities). This follows a K-W-L strategy approach, where K focuses on what students know about the topic, W supports students in determining what they want to or need to learn, and the knowledge and experiences they gain from the field work, and L consolidates their learning through K and W expanding into critical thinking and learning opportunities and active custodianship/citizenship experiences.

# Learning at the roost

## Flying-fox roosts as education sites

Welcome to our engaging learning units of study that will take students on an exciting journey into the fascinating world of flying-foxes. In these units, our focus will be on visiting a local flying-fox roost site, providing a unique opportunity for immersive exploration and discovery.

By delving into the intricacies of these roosts, students will gain firsthand insights into the habitats, behaviours, and ecological importance of these remarkable creatures. Through a carefully designed curriculum, the aim is to not only enhance their understanding of bat biology but also foster a deep appreciation for the critical role bats, and flying-fox in particular, play in the broader ecosystem. Get ready for an immersive learning experience that brings the classroom outdoors and opens the door to the captivating world of local flying-fox roosts.



## What is a flying-fox roost?

**Flying-foxes are nocturnal—sleeping in trees throughout the day, flying out at dusk to search for food and returning to the trees again near dawn. The trees that flying-foxes sleep in and use for breeding are known as roosts.**

A flying-fox roost is a designated location where flying-foxes, which are large fruit bats, congregate to rest, sleep, and socialise. These roost sites can vary and usually include trees. Roosts are essential for their daily activities, providing a secure environment for rest and shelter. These sites are particularly crucial during the daytime when flying-foxes are not actively foraging. Roosts serve as communal spaces where these bats gather, contributing to social interactions and supporting the various needs of the colony, including the care of young bats. Understanding flying-fox roosts is vital for appreciating their ecological role and promoting conservation efforts for these important pollinators.

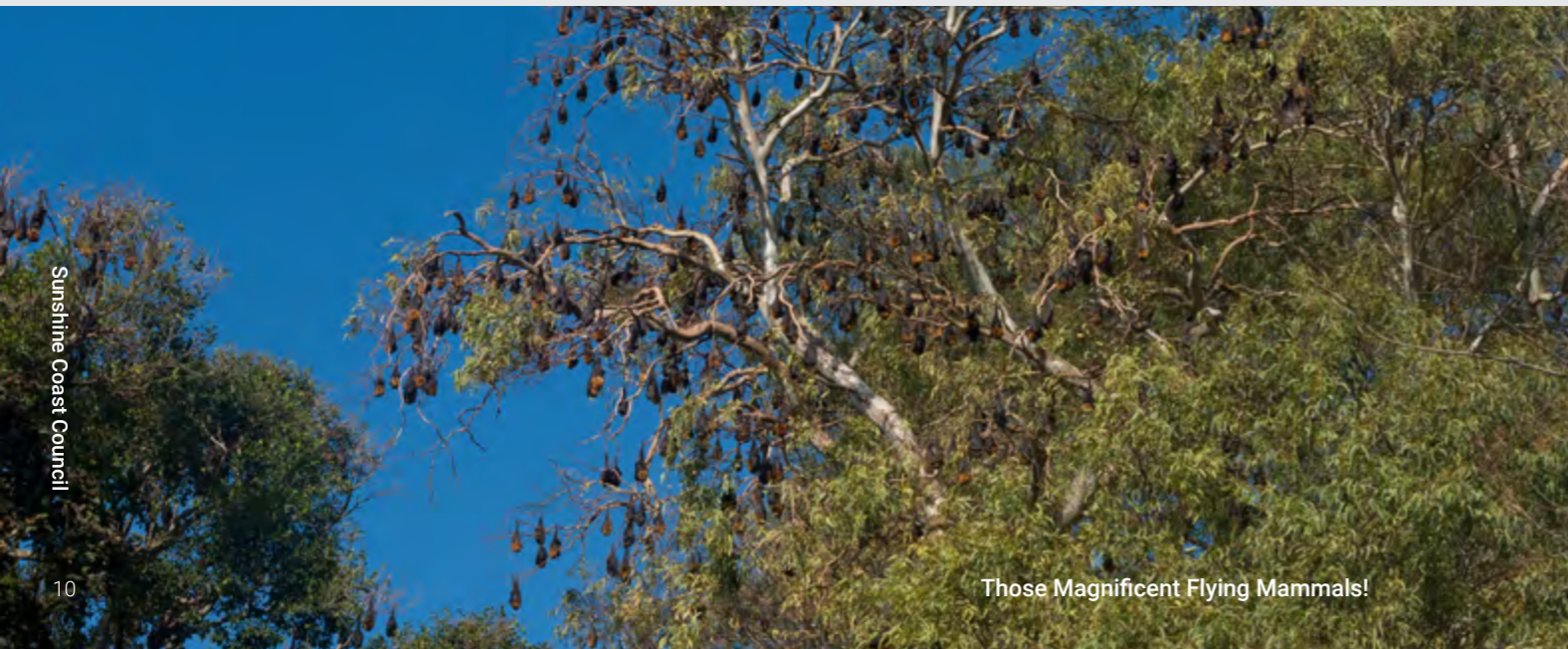
Flying-foxes appear to have an affinity to particular locations and will tend to return to certain locations (sometimes referred to as camps) for rest and sleep during the day, over an extended period or in seasonal cycles. These congregations of flying-foxes can be relatively static, in terms of size and spatial distribution, or they may vary over time – ebbing and flowing due to changing seasons, surrounding vegetation, or micro climatic structures.

Over the past century, there has been a notable decline in flying-fox numbers, primarily attributed to widespread habitat loss resulting from extensive clearing for agriculture and urban development. The gradual reduction in foraging and roosting habitats has led flying-foxes to seek refuge in areas that were once their original habitats but have now become predominantly residential. This transition raises concerns about potential conflicts between the natural behaviours of flying-foxes, the original inhabitants, and the human-populated environments they now share. Addressing this issue is complex for land managers, as they strive to strike a balance between conserving threatened native species and managing potential conflicts arising from their proximity to residential areas.

The Sunshine Coast Local Government Area (LGA) currently hosts over forty- officially acknowledged flying-fox roosts. These sites are situated across various land tenures, comprising of privately owned land, State-owned land, Council-owned land, and land jointly owned by private individuals and the Council (SCC Regional Flying-fox Management Plan, December 2022).



Encouraging local students to observe flying-fox roosts is crucial in fostering an understanding of their ecological significance. By witnessing these unique habitats firsthand, children can develop a deep appreciation for the vital role flying-foxes play in maintaining the balance of our ecosystems. The experience not only sparks curiosity but also empowers them to become champions in caring for these remarkable flying mammals. Through observation and education, children gain valuable insights into the challenges faced by flying-foxes, enabling them to contribute to conservation efforts and advocate for the coexistence of these important pollinators in our urbanised landscapes.



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# First nations stories

“Visiting a Flying Fox roost site is a unique and educational experience for school groups. As we explore these natural habitats, it is important to recognize and honour the Aboriginal and Torres Strait Islander cultures and traditions that have existed on this land for thousands of years.”

“BarrBarr”  
(Flying Fox)  
– Jinibarra dialect



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## Acknowledgement to country at roost site visits.

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Visiting a Flying Fox roost site is a unique and educational experience for school groups. As we explore these natural habitats, it is important to recognize and honour the Aboriginal and Torres Strait Islander cultures and traditions that have existed on this land for thousands of years. One way to do this is by performing an Acknowledgement to Country.

### What is an acknowledgement to country?

An Acknowledgement to Country is a way to show respect and recognition for the Aboriginal and Torres Strait Islander custodians of the land you are visiting. It is a practice of acknowledging the ongoing connection of First Nations peoples to the land and the value they place on its protection and preservation.

### Why acknowledge the country at roost sites?

**Cultural Respect:** Acknowledging the traditional custodians demonstrates cultural respect and appreciation for the land’s original inhabitants

**Environmental Awareness:** It reinforces the message of environmental stewardship, recognizing that Indigenous knowledge and practices often align with nature conservation.

**Educational Opportunity:** It provides an educational opportunity for students to learn about the rich history and culture of the local Aboriginal and Torres Strait Islander people.

### Tips for a meaningful acknowledgement:

Speak slowly and clearly to ensure everyone can hear and understand.

Maintain a respectful and solemn tone.

Encourage students to reflect on the meaning of the Acknowledgement and its connection to the environment.

Performing an **Acknowledgement to Country** at Flying-fox roost sites is a powerful way to connect with the land, honour Aboriginal and Torres Strait Islander cultures, and instil in students the importance of respecting and protecting the natural world. It is a small but significant step towards reconciliation and understanding, and it enriches our educational experiences.

FUN FACT

## How to perform an acknowledgement to country:

### 1. Research:

Before your visit, research and find out which Aboriginal and Torres Strait Islander group or groups are the traditional custodians of the land where the roost site is located. Learn about their culture, traditions, and any specific protocols related to Acknowledgement to Country.

### 2. Prepare a Script:

Create a simple script that acknowledges the traditional custodians and expresses respect for their land. An example might be: “We acknowledge the Jinibarra/Kabi Kabi people as the traditional custodians of the land we stand on today. We pay our respects to their Elders, past and present.”

### 3. Timing:

Choose an appropriate time during your visit to perform the Acknowledgement. It could be at the beginning of the trip or before any formal activities.

### 4. Delivery:

The Acknowledgement can be spoken aloud by a student or teacher. It’s important to do so with sincerity and respect. Encourage students to participate if they feel comfortable.



Flying Fox illustration credit, BJ Murphy



# The story of Girraman

As told by Oodgeroo Noonuccal

Now Girraman's tribes were the fruit eaters. They slept by day and hunted by night.

They kept to themselves, making no contact with any of the other tribes.

They would always travel together. When the sun slipped below the western horizon they would awake and travel in search of honey and fruit trees.

They were very quarrelsome tribes, and they would fill the night with their shrieks and cries. They were also very destructive.

What fruit they couldn't eat, they threw to the ground and made a very untidy mess.

When the dawn lit up the eastern sky, they would return to their camp and hang with giant cocoons from their camping place, in the darkest part of the land.

Folding their arms across their chests they slept the days away.

Their hearing was very sensitive, they never ever got lost, for they had a special type of radar system in their bodies. Never would this system fail them, and it would guide them home to their camps every time.

They never liked the sun for their eyes would be blinded by sun's brilliant light. So, they only travelled after the sun had left the sky.

The other tribes would wait until they slept and then they would capture them and eat them.

They would take the sleeping Girraman back to their own camps and their burning fires. There they would kill and cook Girraman on the hot coals, for they were very tender and good to eat.



They would eat only the chest of Girraman, for they knew if they ate any other part of him, they could get sick and even die.

Girraman's tribes could turn themselves into birds by night and into animals by day.

In the new Dreamtime, Girraman's tribes are called Flying Fox.

**SOURCE: Oodgeroo Noonuccal, (1988) Kath Walker in China**

**Permission sought through QYAC and Josh & Raymond Walker**

# How bats and shags were made

Buthera, a strong, proud warrior who possessed magical powers, was travelling up the coast of Queensland. He had not gone far on his way, and was resting early in the day, when a man walked into the glade where he was sitting.

'Who are you?' asked Buthera.

'My name is Mudichera. I am the leader of Bats. What are you doing in my land?'

Buthera sprang to his feet, his brows drawn down in a frown. 'This is still my territory. I allow no man to intrude on it.

'The stranger took his waddy from his belt.

'Good!' Buthera said. 'I am glad to see you are a man and not something blown here by the west wind.

'They circled round each other warily. Buthera did not deign to use his waddy or war spear, but held a flint knife in his hand. Mudichera swung his waddy lustily, but Buthera avoided it, jumping from side to side, and throwing himself flat on the ground as it whistled over him. Mudichera began to grow tired. His blows lost their force and he had difficulty in raising his weapon over his head. Buthera gathered himself together and swung his knife so viciously that Mudichera was cut in two pieces, the upper part of his body falling in one place and his legs in another.

There was a flapping of leathery wings, the two parts of his body rose in the air, and two bats escaped from under Buthera's hand. The chief grinned, picked up his weapon and resumed his journey. He covered many miles that day, but the sun grew hotter and the sweat trickled down his back. He felt sick, and when he came to a fertile valley with many water holes, where a large tribe was camped, he stopped.

'Here comes Buthera', the people cried.

'How do you know my name?'

'Oh, we know all about you. We know how you fought with Mudichera, how you cut him in two, and how he changed into a bat.'

'Two bats. But how do you know all this?'

'Willy wagtail told us.'

Buthera was angry to think that they knew so much about him. He took his magic spear and pointed it in front of him. A long tongue of flame shot from the point and set fire to the scrub. He swung it round him until he was in the centre of the fire, which spread rapidly outwards, driving the screaming people in front of it. The only places where they could escape the flames were in the water holes. Buthera looked across the smouldering bushes and saw them peering apprehensively at him, with their bodies submerged in the water. He grinned again, pointed another spear at them, and had the satisfaction of seeing them all transformed into shags.

Shortly afterwards he met another warrior, but this time he met his match. Larna was young and vigorous, and before long Buthera lay dead at his feet. He picked Buthera up, lifted him above his head, and was on the point of throwing him into a lake, when the Bats who had once been Mudichera flew down and beat their wings round Larna's head, until he was forced to lower the body. Some of the power that had belonged to Mudichera when he was a warrior lingered in the Bats, and they turned Larna into a stone which they left by the side of the lake as a memorial to Buthera the warrior.

**A.W. Reed – Aboriginal Fables and Legendary Tales (1998)**



# Balayang

In the mythology of the Aboriginal people of south-eastern Australia (specifically, the Kulin nation), Balayang or Pallian the bat was a brother of Bunjil the eaglehawk, but lived apart from him. Once, Bunjil asked him to come and live with him, but Balayang replied that Bunjil's country was too dry and that Bunjil ought to come and live with him instead. This upset Bunjil, who sent his two helpers, Djurt-djurt the nankeen kestrel and Thara the quail hawk, after Balayang. They set fire to the bat's country and Balayang and his family were scorched and turned permanently black. Another story says that Balayang formed the oceans, rivers, and creeks.

Because of his black colouring, Balayang was associated with Crow, and thus belonged to the moiety in opposition to Eaglehawk. Another story credits him with creating or finding Crow women (and thus marriage partners for the Eaglehawk moiety). One day Balayang was amusing himself by thumping the surface of the water, causing it to thicken into mud. Something stirred underneath the mud and, probing with a branch, he found two women. He called one Kunnawarra ("black swan") and the other Kururuk ("broilga"). He took them to Bunjil, who gave them as wives to the men he had created. Balayang was represented in the night sky by the star Antares.

**Wikipedia – Source: Mudrooroo (1994) Aboriginal mythology**



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# Bat information

Australia is home to a diverse array of bats, playing integral roles in the country's ecosystems.

## Flying-fox taxonomy

**FUN FACT**

Kingdom – Animalia

Phylum – Chordata

Class – Mammalia

Order – Chiroptera

Family – Pteropodidae

Genus – Pteropus

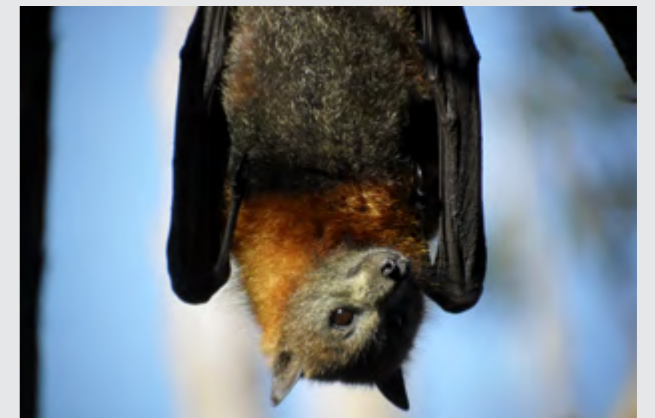
Pteropus  
- new Latin from Ancient Greek  
"pteron" - wing & "pous" - foot.

## Bats in Australia

The largest are known as Flying-fox or megabats, which contribute significantly to pollination and seed dispersal. The microbat category boasts a variety of species with unique characteristics, such as the insect-eating Bent-winged Bat and the Ghost Bat, a carnivorous bat found in arid regions. These fascinating animals, which make up about a quarter of all Australian mammal species, are distributed across diverse habitats, ranging from rainforests and woodlands to urban areas. Despite facing threats such as habitat loss and climate change, Australian bats continue to captivate researchers and enthusiasts alike, emphasizing the importance of conservation efforts to safeguard these remarkable and ecologically significant creatures.

Australia is home to around 80 species of microbats. These microbats belong to the families *Rhinolophidae*, *Vespertilionidae*, *Molossidae*, and *Emballonuridae*, among others. Each species has unique adaptations and ecological roles, contributing to the rich biodiversity of Australia's bat population.

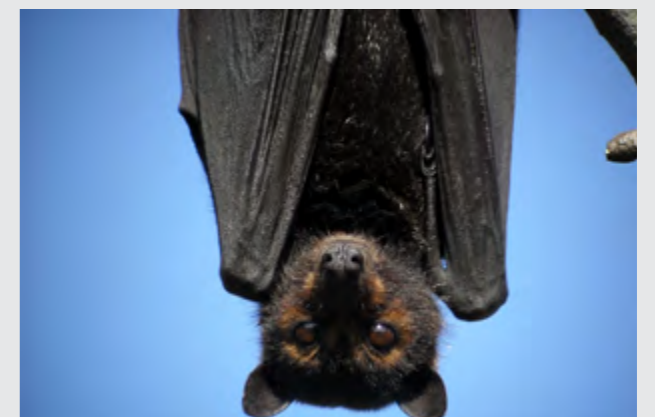
There are four species of megabats, also known as flying-foxes or fruit bats. They are the Black Flying-fox (*Pteropus alecto*), Grey-headed Flying-fox (*Pteropus poliocephalus*), Little Red Flying-fox (*Pteropus scapulatus*) and the Spectacled Flying-fox (*Pteropus conspicillatus*). These flying-foxes play crucial roles in pollination, seed dispersal, and maintaining the ecological balance in Australian ecosystems.



Grey-headed Flying-fox



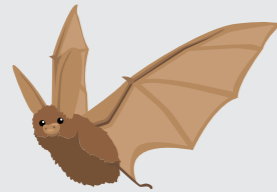
Little Red Flying-fox



Black Flying-fox

## What are the differences between microbats and megabats?

Microbats and megabats (flying-foxes) in Australia exhibit several differences in terms of size, behaviour, ecology, and anatomy. Here's an outline of some key distinctions between these two groups of bats:



### Microbats

**Size** Generally smaller in size, with wingspans ranging from a few centimetres to around 40 centimetres.

**Diet** Primarily insectivores, feeding on insects like moths, mosquitoes, and beetles.

**Roosting Behaviour** Tend to roost in small groups in diverse locations, including caves, tree hollows, and man-made structures.

**Echolocation** Use echolocation, emitting high-frequency sounds to navigate and locate prey in the dark.

**Anatomy** Often have a more streamlined and agile physique, suitable for their insect-hunting lifestyle. Some may have specialised features like a nose leaf.

**Reproduction** Typically have a faster reproductive rate, with shorter gestation periods and multiple offspring in a single breeding season.

**Behaviour** Often display more solitary or small group behaviour, depending on the species.



### Megabats

Larger in size, with wingspans that can exceed one metre in some species.

Mainly frugivores, consuming fruits, nectar, and pollen. They play a significant role in pollination and seed dispersal.

Form large colonies and roost in trees, particularly during the day. Some species may also use caves.

Generally, lack sophisticated echolocation abilities; instead, they rely on their keen eyesight and sense of smell to navigate.

Have larger eyes and a more robust build, adapted for their fruit-eating habits. They lack the intricate nose leaf structures common in microbats.

Generally, have longer gestation periods and give birth to a single offspring per breeding season.

Exhibit strong social behaviour, forming large colonies that can consist of thousands of individuals.

## Local flying-fox species

The Sunshine Coast biosphere region is home to three distinct species of Flying-fox: the Black Flying-fox (*Pteropus alecto*), the Grey-headed Flying-fox (*Pteropus poliocephalus*), and the Little Red Flying-fox (*Pteropus scapulatus*).

All three species benefit from protection under the *Nature Conservation Act 1992*. While the Black and Little Red flying-foxes are listed with a conservation status of "Least Concern", the Grey-headed flying-fox holds a "Vulnerable" status under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*. These protective designations underscore the importance of preserving their habitats and fostering coexistence for the well-being of these significant pollinators.

Due to the decreasing availability of natural habitat as a result of urbanisation and destruction of historic habitat, these species are coming into increasing contact with humans.

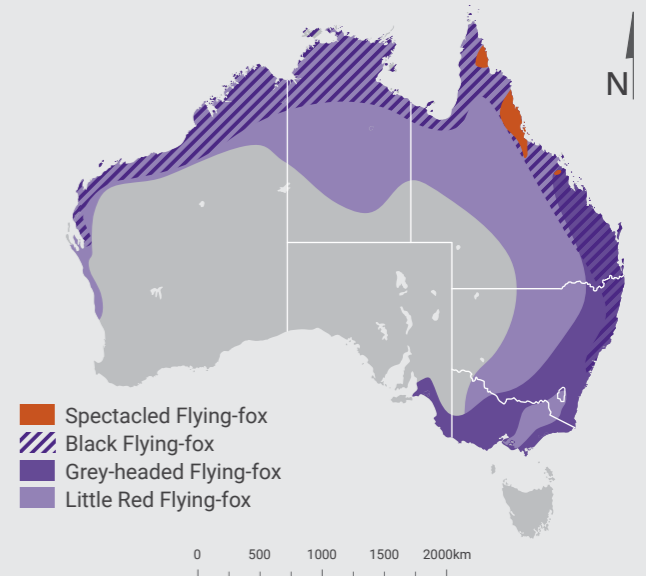


Fig 1. Distribution of Australia's four main Flying-fox species (map by Pia Lentini 2018)

## Flying-fox Reproduction Cycle

Although a wild animal, flying-foxes do follow a familiar pattern of behaviour. The table below indicates the typical breeding cycles for flying-foxes seen in South East Queensland. Note, these timeframes may vary considerably in response to changes in the weather and other conditions.

Species	J	F	M	A	M	J	J	A	S	O	N	D
Grey-headed Flying-fox	●	●	●	■				■	●	●	●	●
Black Flying-fox	●	●	●	■				■	●	●	●	●
Little Red Flying-fox			■	●	●	●	●	●	●	●	■	■

■ Peak Conception/ Mating     
 ■ Final trimester of pregnancy     
 ● Lactation - milk production for pups  
■ Creching - young left at roost     
■ Birthing of pups

## Local flying-fox species — Quick Facts



### Little Red Flying-fox

*Pteropus scapulatus*

- Smallest species of flying-fox
- Reddish brown to dark brown short fur
- Fur on the neck, shoulders, around eyes and under the wing varies from brown to yellow. Top of the head is usually greyish.
- Little to no fur on legs and ears are prominent.
- Cluster together in camps, unlike other species that hang with space between individuals.
- Distinguishable from other common flying-foxes by its small size, forearm length 125-156mm, head and body length 195 - 235mm.



### Black Flying-fox

*Pteropus alecto*

- Short black fur with a slight silver frosting in older individuals
- Brown rings around the eyes are found on some individuals who usually have dark grey-brown hind neck and shoulder fur.
- Collar, if present, rarely fully encircles the neck.
- No fur on the lower leg.
- Largest of the Australian flying-foxes with a forearm length of 150-191 mm and head and body length of 240-280mm.
- Weigh between 600-1000 gms and wingspan of up to 1500 mm
- Feeds mainly in tropical and subtropical forests and woodlands
- Females will use mangroves and floodplains for maternity roosts
- Can travel up to 50 kms from roost in search of food
- Preferred food is fleshy fruits and blossoms from *Eucalyptus*, *Melaleuca* and a variety of native and introduced species
- Females give birth early spring to late autumn
- Predators/threats - sea eagles, carpet pythons, wildfire, barbed wire fences, powerlines, habitat loss from tree clearing and prolonged drought



### Grey-headed Flying-fox

*Pteropus poliocephalus*

- Head and shoulders covered in thick grey fur, belly fur is greyish, long and shaggy
- Orange/reddish/yellow collar completely encircling the neck
- Fur extends to the ankle
- Large species with a forearm length of 138-180 mm and head and body length is 230-289 mm
- Usually found hanging in the lower part of the vegetation within the colony

## Threats to flying-foxes

Flying-foxes face several threats that impact their populations and overall well-being.



Habitat loss due to urbanization, agriculture, and deforestation is a significant concern, disrupting their foraging and roosting sites.



Increased human-wildlife conflict arises from the encroachment of urban areas into their natural habitats, leading to disturbances, habitat destruction, and concerns over potential disease transmission.



Climate change and extreme weather events also pose threats, affecting the availability of food resources and disrupting the timing of flowering and fruiting seasons.



Usage of barbed wire, netting, and other hazards in urban areas can result in injuries and fatalities among flying-foxes.

## Threats

Conservation efforts are crucial to mitigate these threats and ensure the survival of these vital pollinators in the Australian ecosystem.

### Community concerns about flying-fox (& the facts)

Living in close proximity to flying-fox roost sites has raised valid concerns within the community. Residents often express worries about potential issues such as excessive odour and noise generated by the roosting colonies. The mess created by the droppings, staining walls, driveways, and even affecting parked cars and laundry, is a consistent source of frustration. Concerns extend to potential impacts on property values, with fears that the presence of roosts may deter potential buyers or renters. The persistent exposure to the sights, sounds, and smells associated with roosting sites can also take a toll on the psychological well-being of residents. Additionally, there are worries about the transmission of diseases, although Queensland Health has advised that this risk is very low. Addressing these concerns requires a balanced approach that considers both the ecological importance of flying-foxes and the well-being of the communities they share spaces with.

The challenges of humans and flying-foxes sharing the same backyard go both ways - habitat loss means we have no choice but to move closer to humans. Can you think of some other ways that human activity might affect flying-foxes?

If you're curious to know more, check out **BatPod**, Sunshine Coast Council's interactive choose-your-own-adventure style podcast.



# Threats to flying-foxes

## Flying-fox management strategies by Sunshine Coast Council

Due to the decreasing availability of natural habitat as a result of urbanisation and destruction of historic habitat, these species are coming into increasing contact with humans.

The Sunshine Coast Council has a diverse set of options for managing flying-fox roosts on public and council-managed land. While not every option may be suitable for every scenario, a variety of choices are outlined below. Importantly, all the management options listed align with the Code of Practice for the Ecologically Sustainable Management of Flying-fox Roosts.

- Deliver environmental/flying-fox community education.
- Modify habitat with vegetation trimming or removal to render roosts unattractive to flying-fox to remain
- Offer financial benefits to residents seriously affected by proximity to flying-fox roosts e.g. cleaning services, sound and odour barriers, covers for outdoor living areas.
- Construct artificial structures within roosts to provide additional roosting opportunities away from residents.
- Identify and enhance alternative habitat to encourage flying-fox to roost there instead.
- Incorporate appropriate buffers around known roosts for future residential development.



## National flying-fox monitoring program

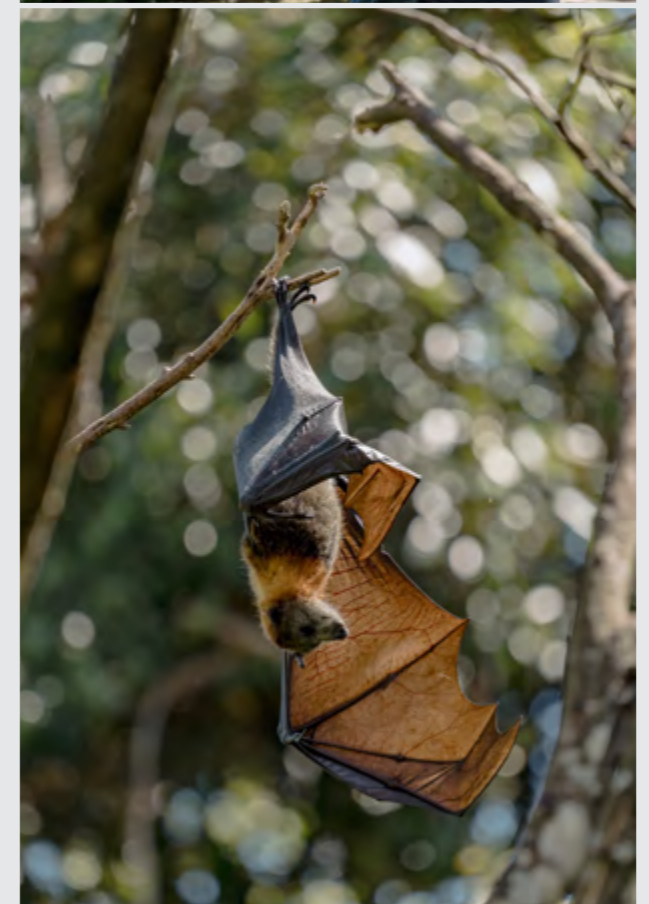
The National Flying-fox Monitoring Program (NFFMP) is a collaboration between the Australian Government, CSIRO, South Australian, Victorian, New South Wales, Australian Capital Territory and Queensland governments, and local governments and volunteers.

This monitoring program collects information on:

- Flying-fox congregations including their seasonal use and areas of occupancy
- The number of flying-foxes in a congregation on the dates monitored
- The breeding status of flying-foxes and whether young are present
- The species which are present



<http://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf>

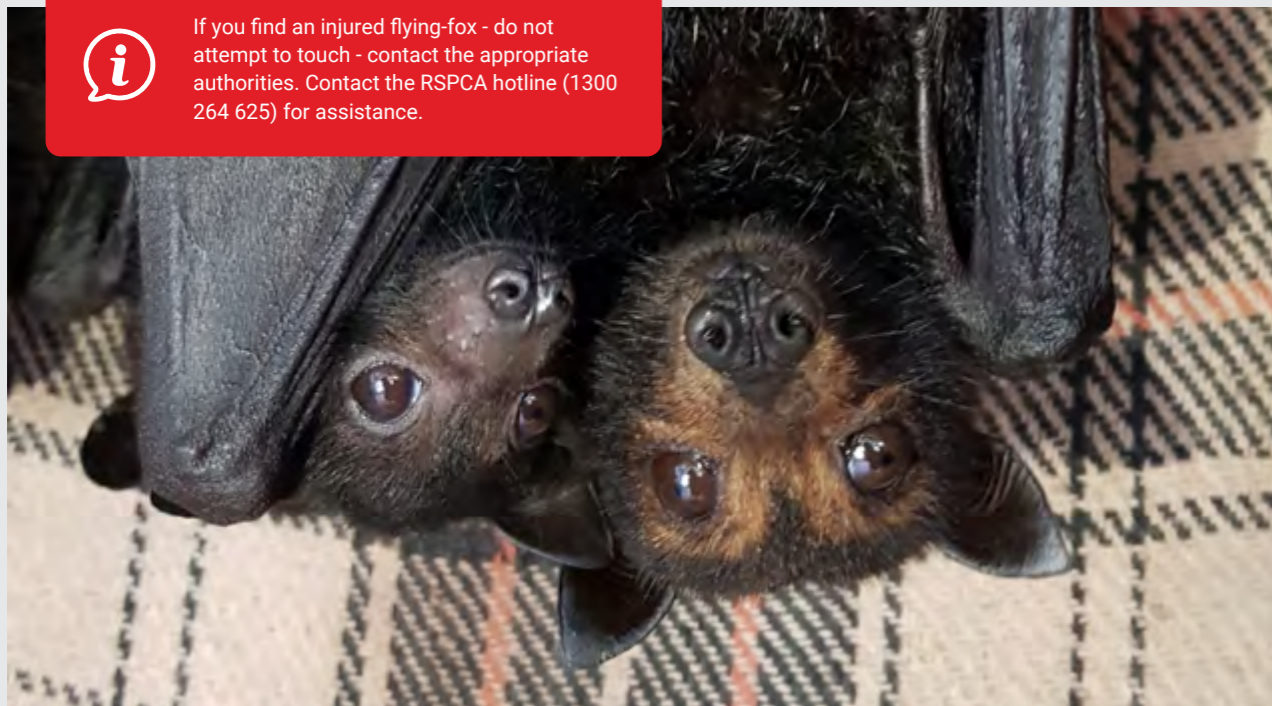


## What you can do to help

- Welcome flying-fox if they visit your garden, school ground or neighbouring park.
- Educate others on the importance of flying-foxes.
- Plant food trees for wildlife, but only those which are found naturally in your area – ask your local council.
- Don't cut down native flowering trees in agricultural lands otherwise more animals will gravitate to urban settings.
- Join or support local wildlife rehabilitation groups.
- Follow guidelines to safely-net backyard fruit trees and avoid using barbed wire.
- Protect remnant native vegetation on your own property or on your school grounds.
- Improve bushland and habitat quality by joining a local BushCare group – check with your local council.
- Minimise flying-fox camp disturbance, especially during breeding season.
- Encourage and support humane, non-lethal crop protection.
- Flying-foxes are very vulnerable to heat stress and sadly die in extreme heat. On days that soar above 40 degrees, do not disturb the animals, as any increased movement or flying can exacerbate any stress the animals feel.



If you find an injured flying-fox - do not attempt to touch - contact the appropriate authorities. Contact the RSPCA hotline (1300 264 625) for assistance.



## What is your “promise to Frankie”?

Meet Frankie, the charismatic flying-fox mascot from Sunshine Coast Council, on a mission to inspire positive change! Make a promise to Frankie and join the movement for environmental stewardship.

Pledge to protect our unique flying-fox friends and their habitats and embark on a journey of discovery and responsibility. Your commitment to Frankie's cause not only nurtures a deeper understanding of our natural world but also contributes to the collective effort in safeguarding the Sunshine Coast's ecological treasures.

Together, let's soar towards a future where every promise to Frankie becomes a powerful act of conservation and a step towards a sustainable, harmonious environment.

Change is made possible by communities working together – every individual action adds up to making a difference.

Us Flying-foxes pitch in to help the broader ecosystem, so you should too!

Check out our Factsheet on Creative Projects to share Flying-Fox Information for even more inspiration.



## My Promise to Frankie

- I will welcome you when you visit.
- I will be quiet in your home.
- I am grateful for the important role you do in pollinating forests.
- I will spread the word by telling people about you.
- I will help protect your home by protecting and planting trees and forests.
- I will ask people to use only wildlife-friendly fruit-tree netting.
- I will support a local animal rescue group.

Signed .....



# Education Materials

Embark on an enthralling exploration of flying-foxes with our comprehensive 'Those Magnificent Flying Mammals' education materials. This unique tool not only provides schools with the opportunity to delve into the study of local flying-foxes within the classroom but also invites students to become citizen-scientists, collecting data at a nearby flying-fox roost, all aligned with the current Australian Curriculum.

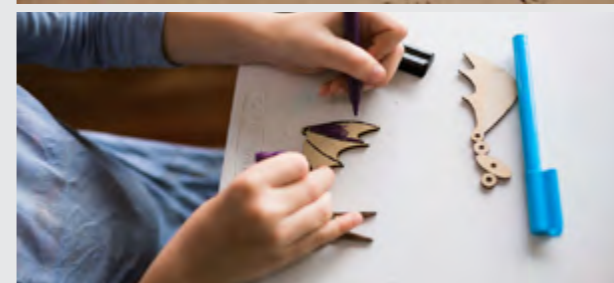


Comprising three essential documents – a Teacher's Guide, engaging Units of Study, and invaluable Flying-fox Roost Field Trip information – this program is designed to offer a flexible and enriching learning experience.

The three comprehensive Units of Study present a diverse array of activities, empowering educators to tailor their approach, whether revisiting activities designed for Years 3&4 or delving into those crafted for Years 7&8.

A primary emphasis of these resources is to facilitate a class excursion to a local Flying-fox roost, allowing students to make firsthand observations in their natural habitat and collect relevant data. A detailed Flying-fox Roost Field Trip booklet provides important information on four roosts suitable for exploration.

To ensure a dynamic learning experience, the Teacher's Guide incorporates and recommends various learning media, from podcasts and printed materials to PowerPoint presentations, factsheets, YouTube videos, and activity cards. Additionally, general information about Australian bats and the three local flying-fox species is included, creating a comprehensive and engaging educational package.



## Overview of units of study

YEAR level	Overview of Concepts Covered
<b>Yrs 3 &amp; 4</b>	<ul style="list-style-type: none"> <li>characteristics of living and non-living things</li> <li>life cycles of plants and animals - in particular flying-fox and associated plant species</li> <li>roles and interactions in food chains</li> <li>collection of data to develop scientific explanations</li> <li>record observations and represent these to share with others</li> </ul>
<b>Yrs 5 &amp; 6</b>	<ul style="list-style-type: none"> <li>structural features and behaviours of living things enable survival in specific habitats</li> <li>explore physical conditions of habitats</li> <li>use of scientific knowledge to make decisions</li> <li>use equipment to measure and record data</li> </ul>
<b>Yrs 7 &amp; 8</b>	<ul style="list-style-type: none"> <li>role of classification</li> <li>functions of cells as basic units of living things</li> <li>structure and function of cells for species survival</li> <li>use of food webs to explore flow of matter and energy in ecosystems</li> <li>scientific knowledge has an impact on society through ethical, environmental, social and economic considerations</li> <li>construction of evidence-based arguments to support conclusions</li> </ul>
<b>Across all Units of Study</b>	<ul style="list-style-type: none"> <li>First Nations peoples have a deep connection to land, waters, skies and community</li> <li>flying-fox are vital for forest pollination and play an important role in local ecosystems</li> <li>we can all be active stewards for the environment and the plants, animals &amp; fungi that live within it</li> <li>flying-fox roost sites are important to species survival</li> <li>due to the decreasing availability of natural habitat as a result of urbanisation and destruction of historic habitat, flying-fox are coming into increasing contact with humans.</li> <li>flying-fox have unique physical features and behaviours</li> <li>we live in a biosphere</li> </ul>

## Curriculum links

The 'Those Magnificent Flying Mammals' Education Package is intricately aligned with the Australian National Curriculum v.9, encompassing key Learning Areas tailored for students in Year 3 through Year 8.

The Curriculum links primarily emphasize Science, Humanities and Social Sciences (HASS), and the Cross Curriculum Priorities of Aboriginal and Torres Strait Islander Histories and Cultures, along with CCP of Sustainability.

### Science (version 9.0)

Year Level	Content Descriptions		
<b>Year 3</b>	Science Understanding	Biological Sciences	Compare characteristics of living and non-living things and examine the differences between the life cycles of plants and animals.
	Science as a Human Endeavour	Nature and development of Science	Examine how people use data to develop scientific explanations.
		Use and influence of science	Consider how people use scientific explanations to meet a need or solve a problem.
	Science Inquiry Skills	Questioning and predicting	Pose questions to explore observed patterns and relationships and make predictions based on observations.
		Planning and conducting	Use provided scaffolds to plan and conduct investigations to answer questions or test predictions, including identifying the elements of fair tests, and considering the safe use of materials and equipment.
		Planning and conducting	Follow procedures to make and record observations, including making formal measurements using familiar scaled instruments and using digital tools as appropriate.
		Processing, modelling and analysing	Construct and use representations, including tables, simple column graphs and visual or physical models, to organise data and information, show simple relationships and identify patterns.
		Evaluating	Compare findings with those of others, consider if investigations were fair, identify questions for further investigation and draw conclusions.
		Communicating	Write and create texts to communicate findings and ideas for identified purposes and audiences, using scientific vocabulary and digital tools as appropriate.



**Year Level Content Descriptions**

Year Level	Content Descriptions		
<b>Year 4</b>	Science Understanding	Biological Sciences	Explain the roles and interactions of consumers, producers and decomposers within a habitat and how food chains represent feeding relationships.
	Science as a Human Endeavour	Nature and development of Science	Examine how people use data to develop scientific explanations.
		Use and influence of science	Consider how people use scientific explanations to meet a need or solve a problem.
	Science Inquiry Skills	Questioning and predicting	Pose questions to explore observed patterns and relationships and make predictions based on observations.
		Planning and conducting	Use provided scaffolds to plan and conduct investigations to answer questions or test predictions, including identifying the elements of fair tests, and considering the safe use of materials and equipment.
		Processing, modelling and analysing	Construct and use representations, including tables, simple column graphs and visual or physical models, to organise data and information, show simple relationships and identify patterns.
		Evaluating	Compare findings with those of others, consider if investigations were fair, identify questions for further investigation and draw conclusions.
		Communicating	Write and create texts to communicate findings and ideas for identified purposes and audiences, using scientific vocabulary and digital tools as appropriate.

**Year Level Content Descriptions**

Year Level	Content Descriptions		
<b>Year 5</b>	Science Understanding	Biological Sciences	Examine how particular structural features and behaviours of living things enable their survival in specific habitats.
	Science as a Human Endeavour	Use and influence of science	Investigate how scientific knowledge is used by individuals and communities to identify problems, consider responses and make decisions.
	Science Inquiry	Planning and conducting	Use equipment to observe, measure and record data with reasonable precision, using digital tools as appropriate.
		Processing, modelling and analysing	Construct and use appropriate representations, including tables, graphs and visual or physical models, to organise and process data and information and describe patterns, trends and relationships.
		Communicating	Write and create texts to communicate findings and ideas for identified purposes and audiences, using scientific vocabulary and digital tools as appropriate.

**Year Level Content Descriptions**

Year Level	Content Descriptions		
<b>Year 6</b>	Science Understanding	Biological Sciences	Investigate the physical conditions of a habitat and analyse how the growth and survival of living things is affected by changing physical conditions.
	Science as a Human Endeavour	Use and influence of science	Investigate how scientific knowledge is used by individuals and communities to identify problems, consider responses and make decisions.
	Science Inquiry	Processing, modelling and analysing	Construct and use appropriate representations, including tables, graphs and visual or physical models, to organise and process data and information and describe patterns, trends and relationships.
		Evaluating	Compare methods and findings with those of others, recognise possible sources of error, pose questions for further investigation and select evidence to draw reasoned conclusions.
		Communicating	Write and create texts to communicate findings and ideas for identified purposes and audiences, using scientific vocabulary and digital tools as appropriate.

**Year Level**    **Content Descriptions**

Year Level	Content Descriptions		
<b>Year 7</b>	Science Understanding	Biological Sciences	Investigate the role of classification in ordering and organising the diversity of life on Earth and use and develop classification tools including dichotomous keys.
		Biological Sciences	Use models, including food webs, to represent matter and energy flow in ecosystems and predict the impact of changing abiotic and biotic factors on populations.
	Science as a Human Endeavour	Nature and development of Science	Investigate how cultural perspectives and world views influence the development of scientific knowledge.
		Use and influence of science	Examine how proposed scientific responses to contemporary issues may impact on society and explore ethical, environmental, social and economic considerations.
		Use and influence of science	Explore the role of science communication in informing individual viewpoints and community policies and regulations.
	Science Inquiry Skills	Processing, modelling and analysing	Select and construct appropriate representations, including tables, graphs, models and mathematical relationships, to organise and process data and information.
		Evaluating	Construct evidence-based arguments to support conclusions or evaluate claims and consider any ethical issues and cultural protocols associated with using or citing secondary data or information.
		Communicating	Write and create texts to communicate findings and ideas for identified purposes and audiences, using scientific vocabulary and digital tools as appropriate.

**Year Level**    **Content Descriptions**

Year Level	Content Descriptions		
<b>Year 8</b>	Science Understanding	Biological Sciences	Recognise cells as the basic units of living things, compare plant and animal cells, and describe the functions of specialised cell structures and organelles.
		Biological Sciences	Analyse the relationship between structure and function of cells, tissues and organs in a plant and an animal organ system and explain how these systems enable survival of the individual.
	Science as a Human Endeavour	Nature and development of Science	Investigate how cultural perspectives and world views influence the development of scientific knowledge.
		Use and influence of science	Examine how proposed scientific responses to contemporary issues may impact on society and explore ethical, environmental, social and economic considerations.
		Use and influence of science	Explore the role of science communication in informing individual viewpoints and community policies and regulations.
	Science Inquiry Skills	Planning and conducting	Select and use equipment to generate and record data with precision, using digital tools as appropriate.
		Processing, modelling and analysing	Select and construct appropriate representations, including tables, graphs, models and mathematical relationships, to organise and process data and information.
		Evaluating	Construct evidence-based arguments to support conclusions or evaluate claims and consider any ethical issues and cultural protocols associated with using or citing secondary data or information.
		Communicating	Write and create texts to communicate ideas, findings and arguments for specific purposes and audiences, including selection of appropriate language and text features, using digital tools as appropriate.

## Cross-curriculum priority

### Aboriginal and Torres Strait Islander histories and cultures (version 9.0)

A\_TSICP1. First Nations communities of Australia maintain a deep connection to, and responsibility for, Country/Place and have holistic values and belief systems that are connected to the land, sea, sky and waterways.

A\_TSICP3. The First Peoples of Australia are the traditional owners of Country/Place, protected in Australian Law by the Native Title Act 1993 which recognises pre-existing sovereignty, continuing systems of law and customs, and connection to Country/Place. This recognised legal right provides for economic sustainability and a voice into the development and management of Country/Place.

A\_TSIC2. First Nations Australians' ways of life reflect unique ways of being, knowing, thinking and doing.

### Sustainability (version 9.0)

SS1. All life forms, including human life, are connected through Earth's systems (geosphere, biosphere, hydrosphere and atmosphere) on which they depend for their wellbeing and survival.

SS2. Sustainable patterns of living require the responsible use of resources, maintenance of clean air, water and soils, and preservation or restoration of healthy environments.

SS3. Social, economic and political systems influence the sustainability of Earth's systems.



# HASS

Year 5	Knowledge and Understanding	History	The impact of the development of British colonies in Australia on the lives of First Nations Australians, the colonists and convicts, and on the natural environment.
Year 3	Knowledge and Understanding	Geography	The ways First Nations Australians in different parts of Australia are interconnected with Country/Place.
Year 4			The importance of environments, including natural vegetation and water sources, to people and animals in Australia and on another continent.
Year 5			Sustainable use and management of renewable and non-renewable resources, including the custodial responsibility First Nations Australians have for Country/Place.
			The management of Australian environments, including managing severe weather events such as bushfires, floods, droughts or cyclones, and their consequences.
			The influence of people, including First Nations Australians and people in other countries, on the characteristics of a place.
Year 3	Knowledge and Understanding	Civics and Citizenship	Who makes rules, why rules are important in the school and/or the local community, and the consequences of rules not being followed.
Year 4			The differences between “rules” and “laws”, why laws are important and how they affect the lives of people.
			The roles of local government and how members of the community use and contribute to local services.

Years 3 and 4	HASS Skills	Questioning and Researching	Develop questions to guide investigations about people, events, places and issues.
			Locate, collect and record information and data from a range of sources, including annotated timelines and maps.
Years 5 and 6			Develop questions to investigate people, events, developments, places and systems.
			Locate, collect and organise information and data from primary and secondary sources in a range of formats.
Years 3 and 4	HASS Skills	Interpreting, analysing and evaluating	Interpret information and data displayed in different formats.
			Analyse information and data, and identify perspectives.
Years 5 and 6		Evaluate information and data in a range of formats to identify and describe patterns and trends, or to infer relationships.	
Years 3 and 4		Concluding and decision-making	Draw conclusions based on analysis of information.
	Propose actions or responses to an issue or challenge that consider possible effects of actions.		
Years 5 and 6	Develop evidence-based conclusions.		
			Propose actions or responses to issues or challenges and use criteria to assess the possible effects.
Years 3 and 4	HASS Skills	Communicating	Present descriptions and explanations, using ideas from sources and relevant subject-specific terms.
Years 5 and 6			Present descriptions and explanations, drawing ideas, findings and viewpoints from sources, and using relevant terms and conventions.

# Appendices

This section is your bible for all additional flying-fox resources, including factsheets and activities. For more online resources, check the Sunshine Coast Council website.



## Glossary of bat related terms

**Aerial intercept** – a style of feeding by fast flying bats, where they don't deviate from their flight path.

**Camp** – during the day, flying-foxes congregate to roost in trees. These locations are known as camps or roosts.

**Carnivorous** – feeding on animals.

**Chordata** – a large phylum of animals that includes vertebrates

**Communal** – living in groups.

**Climate** – the average weather conditions over a long time (normally 30 years or more)

**Climate Change** – long term changes to the climate

**Creche** – group of young flying-fox left at roost

**Echolocation** – locating objects by determining the time for an echo to return and the direction from which it returns.

**Ecological** – relating to or concerned with the relation of living organisms to one another and to their physical surroundings.

**Ecosystem services** – the beneficial role of animals in their environment, such as pollination or seed dispersal

**Endangered** – likely at some stage to become extinct if conservation is not considered.

**Endemic** – a plant or animal that is native and restricted to a certain place.

**Extinct** – no more individuals of a species alive anywhere in the world

**Flying-fox** – a type of megabat (large bat)

**Folivores** – animals that eat foliage.

**Frugivores** – animals that eat fruit.

**Gleaning** – a feeding behaviour where insects are caught while they are on the surface of bark or water.

**Gregarious** – roosting in social groups

**Guano** – bat (or seabird) faeces

**Habitat** – the place where an animal lives. It provides the animal with food, water, shelter and a place to raise young.

**Heat stress event** – a mass die-off of flying-foxes that occurs when temperatures rise above 42°C and the animals' thermoregulatory mechanisms become overwhelmed and they die.

**Hibernation** – passing the winter in a deep sleep, surviving on fat reserves.

**Insectivores** – animals that eat insects.

**Keystone Species** – an organism that helps define an entire ecosystem. Without its keystone species, the ecosystem would be dramatically different or cease to exist altogether.

**Lactation** – the production of milk to feed young.

**Mammal** – a warm-blooded vertebrate animal of a class that is distinguished by the possession of hair or fur, females that secrete milk for the nourishment of the young, and (typically) the birth of live young.

**Maternity roost** – a special type of roost that is suitable for raising young.

**Megabat** – belonging to the Order Megachiroptera (fruit bats). A type of large bat that is vegetarian, eating fruit and drinking nectar from plants. They use smell and great eyesight and can travel long distances (more than 50km a night) to find food.

**Microbat** – belonging to the Order Microchiroptera (insectivorous bats). A type of small bat that tends to eat insects, sleep in dark places (such as caves, mines, tree hollows and under bark). Uses echolocation to find food and their way around. Many don't travel long distances in search of food but rather hibernate when supplies are low.

**Migration** – the seasonal movement of animals from one habitat to another in search of food, better conditions or reproductive needs.

**Native** – plants and animals that come from, and normally live in, a particular region.

**Nectar** – a sugar-rich liquid produced by plants. Found in the flowers.

**Nectarivores** – animals that feed on nectar.

**Niche** – an ecological term indicating a place that an animal favours.

**Nocturnal** – active at night

**Nomadic** – animals that regularly move to and from the same areas within a well-defined range.

**Pollen** – a fine powder (often like dust) produced by the flowers of some plants.

**Pollinate** – to fertilise a flower by transferring pollen to its reproductive organ, either in the same flower or a different one.

**Pollinator** – an animal that pollinates a flower.

**Pteropus** – the genus of Pteropodidae comprising the common fruit bats

**Pteropodidae** – a family of fruit bats coextensive with the suborder Megachiroptera

**Riparian vegetation** – the plant communities that grow along the banks of rivers, streams, creeks, or other water bodies. This specialised type of vegetation plays a crucial role in stabilising riverbanks, preventing erosion, filtering pollutants, providing habitat for wildlife, and contributing to the overall health of aquatic ecosystems.

**Remnant** – a small portion of habitat, surviving after the surrounding area was cleared.

**Roost** – The trees that flying-foxes sleep in and use for breeding are known as roosts.

**Rostrum** – the snout area of an animal, the part between the nostril area and the eyes

**Seed disperser** – an animal that spreads seeds away from the parent tree.

**Taxonomy** – the classification of organisms into their scientific orders

**Terrestrial** – belonging to or using the ground.

**Threatened** – when a living species could become extinct in the wild

**Torpor** – a state of dormancy, perhaps not as deep as hibernation

**Tragus** – a projection of skin-covered cartilage in front of the outside of the ear canal

**Ultrasound** – sound frequency that are above the level of

human hearing.

**Understorey** – the vegetation beneath the tree canopy of a forest or woodland

**Uropatagium** – a membrane of skin and elastin located between the hind legs, enclosing the tail if one is present.

**Vegetation** – the collection of plant life or the types of plants that grow in a particular area or region. It encompasses various forms of plant life, including trees, shrubs, grasses, herbs, and other types of vegetation, collectively contributing to the overall plant cover and ecological diversity of a habitat or ecosystem

**Vulnerable** – likely at some stage to become extinct if conservation is not considered.

**Wattle (on bats)** – a lobe of skin at the corner of the mouth (function unknown)

**Wingspan** – the maximum extent across the wings of an aircraft, bird or other flying animal, measured from tip to tip.

# Fact Sheets



## Flying-fox myths

Explore these 10 common myths about flying-foxes in Australia, along with the correct information to dispel these misconceptions:

**Myth 1** Flying-foxes are a type of large bird.

**Correct Information:** Flying-foxes are not birds; they are large fruit bats belonging to the Pteropodidae family. They are mammals, not birds.

**Myth 2** Flying-foxes are vampires that suck blood.

**Correct Information:** Flying-foxes are not vampires. They are herbivorous and primarily feed on nectar, pollen, and fruit. They do not suck blood.

**Myth 3** Flying-foxes are pests that damage crops.

**Correct Information:** While they may occasionally feed on fruit crops, they play a crucial role in pollination and seed dispersal, benefiting the ecosystem. Efforts are made to manage any crop damage humanely.

**Myth 4** Flying-foxes are dirty and disease-ridden.

**Correct Information:** Flying-foxes, like all wild animals, can carry diseases. However, the risk of disease transmission to humans is minimal when they are observed from a safe distance. Avoid handling them and take necessary precautions.

**Myth 5** Flying-foxes are aggressive and will attack people.

**Correct Information:** Flying-foxes are generally not aggressive towards humans. They may become defensive if threatened or handled, but their primary concern is to feed and roost peacefully.

**Myth 6** Flying-foxes are responsible for spreading COVID-19.

**Correct Information:** There is no scientific evidence to suggest that flying-foxes are responsible for spreading COVID-19. The virus primarily spreads through human-to-human contact.

**Myth 7** Flying-foxes are a nuisance because of their noise at night.

**Correct Information:** While they can be noisy during their evening and dawn gatherings, this behavior is natural for them. Noise can be minimized through proper management techniques.

**Myth 8** Flying-foxes are not native to Australia.

**Correct Information:** Flying-foxes are native to Australia, with several species found across the continent. They have been part of the Australian ecosystem for thousands of years.

**Myth 9** Flying-foxes are not beneficial to the environment.


**Correct Information:** Flying-foxes play a vital role in pollination and seed dispersal, contributing to the health and diversity of ecosystems.

**Myth 10** Flying-foxes are not worth protecting.

**Correct Information:** Flying-foxes, like all species, are important for maintaining biodiversity. Protecting them is essential for the overall health of ecosystems and the balance of nature.

*Understanding and dispelling these myths about flying-foxes in Australia is crucial for promoting coexistence, conservation efforts, and fostering a better appreciation of these unique and ecologically important animals.*

## Learning notes for flying-fox books:



**“Farmers of the Bush”**  
 Written and illustrated by Tyron de Kauwe  
 Contact: tyrondekauwe@gmail.com  
 The Book Studio, 2022.

### Ideas to explore in your interaction with the book:

**Dedication in book “To the bats of Australia... you have cared for this land over millions of years and face constant persecution in return. I hope this book goes a small step towards tolerance, understanding and co-existence”.**

A book dedication is a way for authors to bestow a high honour on a person (or small group of people) they want to praise or otherwise spotlight. Why did the author want to honour the “bats of Australia” in this way? If you wrote a book, who would you choose to honour with a dedication and why? What do you think about honouring a group of animals instead of a person or group of people? Explore the hope of the author that the book has changed your understanding and feelings about bats since reading. How can books influence us or have an impact? Discuss other books that you have read that you still remember, enjoy or learnt something important from.

**Movement of bats - why do animals migrate/move around the landscape?**

Migration is the seasonal movement of animals from one habitat to another in search of food, better conditions, or reproductive needs. Flying-fox movements are generally in response to food availability, rather than any strict seasonal migratory patterns. Flying-foxes eat flowers and fruit, and sometimes leaves, from over 100 species of native trees and vines. They fly large distances between food sources. Consider the impact of land clearing and the destruction of large populations of Melaleuca and Eucalyptus trees for urban and road development. Find out more about the Little Red Flying Fox species and the distances they travel.

**Explore issues people have about bats - noise, smell, eating fruit in gardens/orchards, disease.**

When you talk to people about flying fox or read articles in local newspapers, what are people’s perceptions to bats in their area? What are the concerns? What noises do bats make? The sounds made by Flying-foxes generally consist of squealing, shrieking and cackling calls as they squabble at a feeding tree. In flight, their large, leathery wings make a distinctive heavy, flapping sound. Just like humans, they communicate with each other when they are all together. Flying-foxes congregate together in large numbers in roosts - these are often noisy.

**Threats - clearing habitat (mapping local area).**

Explore Google Earth and find your school location. Through Voyager/Layers/Timelapse you can see how the vegetation around your area has changed over time. You will also be able to see the increase in housing development in areas that were once forest or grassland. Can you see in the current maps where there are nature refuges for wildlife where forest is still intact and available to animals? What effect does clearing habitat have on the wildlife? What other wildlife may be affected by the reduction of trees - for shelter, food resources and hollows for example? Play the “Habitat” game as a group and discuss.

## Learning notes for flying-fox books:

**Pollination and seed dispersal roles - “furry night-time bees” - comparisons to bees**

When we think of pollinators, we typically picture the birds and bees that visit our gardens and feast on flowers. But there’s another species that’s been flying – literally – under the radar, playing a vital role in the pollination of flowers and dispersal of seeds: flying-foxes. They pollinate many of our native plants by carrying pollen from plant-to-plant when feeding and spread seeds through their droppings. A flying-fox can spread seeds over a distance of 50km in a single night. In comparison, bees can move pollen around 1.5km. Look at some photos of bees and flying-fox and the pollen from flowers on their bodies. What process is taking place? Consider the role flying-fox have on pollinating Eucalypt (gum tree) species - what other wildlife will be affected? What industries rely on hardwood trees?

**Nocturnal behavior**

Flying-foxes are nocturnal—sleeping in trees throughout the day, flying out at dusk to search for food and returning to the trees again near dawn. The trees that flying-foxes sleep in and use for breeding are known as roosts. What other local animals are nocturnal? What would be the benefits of this adaptation?

**Distances traveled - mapping, maths, radius from roost**

Flying-foxes are large bats (some weigh more than 1kg) that forage by night on floral resources and rest by day in arboreal roosts that may contain colonies of many thousands of individuals. They are the largest mammals capable of powered flight, and are highly mobile, which makes them key seed and pollen dispersers in forest ecosystems. The Grey-headed Flying-fox is a partial migrant, using winds to travel long distance movements, with round trips reaching up to 2000 km. Why would flying-foxes travel such long distances? Consider how these large scale movements across the range could be driven by a lack of resources and in response to the flowering and fruiting of food plants. Grey-headed Flying-fox can travel up to 50km in a night - although they usually keep to a 5 - 15 km forage range from the roost. Find a map of the local area (Google Maps) and mark the roost site. Using a measuring tool, make circles 5km and 15 kms from the roost. Locate all the forest feeding sites the Flying-fox may access.

**Living in harmony in shared spaces**

Flying foxes are important to the environment as they support biodiversity and play an integral role in the reproduction, regeneration and dispersal of plants across the landscape. At times humans and Flying-foxes are in shared spaces. Make a list of the local areas where Flying-foxes and humans are interacting - for example: in your local skatepark. Make a list of ways that humans are impacting the flying-fox and that the animals are impacting visitors to the park. How can we live in harmony with all animals - not just flying-foxes?

**Myths about bats - “will you give my neck a bite?”**

Blood-sucking or Vampire Bats are only found in Central and South America. Flying foxes are vegetarian and like to eat blossoms and nectar from eucalyptus and melaleuca trees, and native fruits such as Quandongs, Lilly Pillies and Figs. Flying foxes detect their food using their excellent sense of smell. Explore other myths about bats - create a series of posters exposing the myths and the relevant facts.

**Influence of Gran to the author**


Is there someone in your life that encourages you to love and care for the natural world? What are the messages about nature they share with you? What values can be shared with others as we take on the role of encouraging others to change their behavior and be more aware of the value of the natural world?

**Watercolour techniques used in illustration**

Tyron de Kauwe has used pen and watercolor to create his beautiful illustration in the book. Do you think this style of illustration suits the subject matter? Explore this technique to create your own flying-fox images. Try using watercolour pencils and then a wet brush to smooth and blend colours. Have a mini exhibition of your artwork to share with others.



## Learning notes for flying-fox books:



**“Life Upside Down - Australia’s grey-headed flying-foxes”**

Written by Doug Gimesy and Heather Kiley

Email - info@gimesy.com  
Published by Australian Geographic 2020

### Ideas to explore in your interaction with the book:

#### Megabats

Grey-headed flying-foxes are classed as Megabats. What other species of megabats live on the Sunshine Coast? What makes megabats different from microbats? Create a chart to explore the differences and similarities between the two groups of bats.

#### Physical appearance

Look at the image of the flying-fox wings from below. Compare the structure of your arm and a flying-fox’s arm. Make a diagram including bones, fingers and the skin of the wing. How have these adaptations helped these animals? What other physical features do flying-fox have that are discussed in the book? How are these unique and what benefits do they provide to flying-fox?

#### Biodiversity and Ecosystems

What part do flying-fox play in the border context of biodiversity and ecosystems. How can changes in flying-fox populations impact on the overall health of ecosystems? Look at the photos of the flying-fox eating fruit and nectar? What important role are they playing when they do this?

#### Roosts and camps

Look at the photo of the large flying-fox camp. Have you seen camps like this at local roost sites? What are the benefits for flying-fox to group together in such large camps? What would these roosts sounds, smell and look like?

#### Threats

Discuss the threats outlined in the book that flying-fox face - these include habitat loss, climate change and disease. Brainstorm solutions for safeguarding flying-fox. Design a poster campaign to engage local communities in contributing to the protection of flying-fox and their roost sites.

#### Ways to help

Towards the end of the book, there is a list of ways you can help. Pick one of these and become a flying-fox champion!


#### Wet Flying-fox

Look at the photo on the last page - the flying-fox is flying really close to the water and collecting water on its tummy fur. Why would it do this? What could be the dangers or advantages of this behaviour?

#### Author images

Doug Gimesy and Heather Kiley have included pictures of themselves at the end of the book upside down. What do you think of this?

## Learning notes for flying-fox books:



**“Bangu the Flying Fox - A Dreamtime story of the Yuin People of Wallaga Lake”**

Retold by Jillian Taylor

Published by Aboriginal Studies Press, 1994

### Ideas to explore in your interaction with the book:

#### Yuin People of Wallaga Lake

This story was retold with the permission of the elders of Wallaga Lake, their people’s story is retold in this form so that children everywhere can share it and learn from it. Find Wallaga Lake, New South Wales on a map. Do you know which Aboriginal Country your school is in? Perhaps there are Aboriginal place names related to bats in your area.

#### Aboriginal and Torres Strait Islander storytelling

Traditionally and culturally stories have been shared through many generations to teach children about plants, animals and the world around us. Does your school library have other traditional stories you could read? Often these stories are teaching us about the way to behave and care for Country - what lessons can we learn from these books?

#### Sticking by your friends

One of the key messages in this book is the value of being part of a society, a community and a family. Are these groups important to you? What other groups are you a part of? Think about your class group, soccer team, writing group, neighborhood friends.

#### Illustrations

Explore the watercolour illustrations that Aaron Norris and Penny Jones have created for the book. Do you think this art form complements the text? Two illustrators have worked together to create the images - pick a part of the book you like best and try to illustrate it with a friend.



## What are the unique parts of a Flying-fox?

Flying-foxes exhibit unique anatomical characteristics that distinguish them not only from other bat species but also from a wide array of mammals.

These distinctive features include their large wingspans, elongated fingers, and specialized adaptations for flight, making them remarkable members of the mammalian order *Chiroptera*.



## Flying-fox Classification

- Kingdom – *Animalia*
- Phylum – *Chordata*
- Class – *Mammalia*
- Order – *Chiroptera*
- Family – *Pteropodidae*
- Genus – *Pteropus*

“Pteropus” is from the Latin “pteron” meaning wing “pous” - meaning foot

## Identifying local Flying-fox species



## Grey-headed Flying-fox

*Pteropus poliocephalus*

- head and shoulders covered with thick grey fur
- orange/reddish/yellow collar completely encircles the neck
- fur on legs to the ankle
- usually hangs in lower part of vegetation
- approx. 23 - 28 cm long



## Black Flying-fox

*Pteropus alecto*

- largest species of FF
- brown rings around eyes
- no fur on lower legs
- short black fur with slight silver frosting on older bats
- approx. 25-30cm long

## Little Red Flying-fox

*Pteropus scapulatus*

- smallest species of FF
- reddish brown to dark brown short fur
- top of head usually grey
- little or no fur on legs
- prominent ears
- cluster close together in camps
- approx. 19-24 cm long



## Flying-fox backyard food trees

**BIMONTHLY AVAILABILITY SCHEDULE**

FOOD TYPE	SCIENTIFIC NAME	COMMON NAME	DEC/ JAN	FEB/ MAR	APR/ MAY	JUN/ JUL	AUG/ SEP	OCT/ NOV
Fruit	<i>Acmena smithii</i>	Lilly Pilly						
Fruit	<i>Alphitonia excelsa</i>	Red Ash						
Flower	<i>Angophora costata</i>	Smooth-barked Apple						
Flower	<i>Angophora floribunda</i>	Rough-barked Apple						
Fruit	<i>Archontophoenix cunninghamiana</i>	Bangalow Palm						
Fruit	<i>Avicennia marina</i>	Grey Mangrove						
Flower	<i>Banksia integrifolia</i>	Coast Banksia						
Fruit	<i>Cissus hypoglauca</i>	Five-leaf Water Vine						
Flower	<i>Corymbia eximia</i>	Yellow Bloodwood						
Flower	<i>Corymbia gummifera</i>	Red Bloodwood						
Flower	<i>Corymbia intermedia</i>	Pink Bloodwood						
Flower	<i>Corymbia maculata</i>	Spotted Gum						
Flower	<i>Corymbia trachyphloia</i>	Brown Bloodwood						
Fruit	<i>D. photinophylla</i>	Shining-ived Stinging Tree						
Fruit	<i>Dendrocnide excelsa</i>	Giant Stinging Tree						
Fruit	<i>Diospyros pentamera</i>	Myrtle Ebony						
Fruit	<i>Diploglottis australis</i>	Native Tamarind						
Fruit	<i>Ehretia acuminata</i>	Koda						
Fruit	<i>Elaeocarpus obovatus</i>	Hard Quandong						
Fruit	<i>Elaeocarpus reticulatus</i>	Blueberry Ash						
Flower	<i>Eucalyptus acmenoides</i>	White Mahogany						
Flower	<i>Eucalyptus albens</i>	White Box						
Flower	<i>Eucalyptus amplifolia</i>	Cabbage Gum						
Flower	<i>Eucalyptus botryoides</i>	Bangalay						
Flower	<i>Eucalyptus camaldulensis</i>	River Red Gum						
Flower	<i>Eucalyptus deani</i>	Mountain Blue Gum						
Flower	<i>Eucalyptus fibrosa</i>	Red Ironbark						
Flower	<i>Eucalyptus grandis</i>	Flooded Gum						
Flower	<i>Eucalyptus longifolia</i>	Woollybutt						
Flower	<i>Eucalyptus melliodora</i>	Yellow Box						
Flower	<i>Eucalyptus moluccana</i>	Grey Box						
Flower	<i>Eucalyptus paniculata</i>	Grey Ironbark						
Flower	<i>Eucalyptus parramattensis</i>	Drooping Red Gum						
Flower	<i>Eucalyptus pilularis</i>	Blackbutt						
Flower	<i>Eucalyptus piperita</i>	Sydney Peppermint						
Flower	<i>Eucalyptus propinqua</i>	Small-fruited Grey Gum						
Flower	<i>Eucalyptus punctata</i>	Grey Gum						
Flower	<i>Eucalyptus resinifera</i>	Red Mahogany						
Flower	<i>Eucalyptus robusta</i>	Swamp Mahogany						
Flower	<i>Eucalyptus saligna</i>	Sydney Blue Gum						
Flower	<i>Eucalyptus siderophloia</i>	Northern Grey Ironbark						
Flower	<i>Eucalyptus sideroxylon</i>	Mugga Ironbark						
Flower	<i>Eucalyptus tereticornis (coastal)</i>	Forest Red Gum						
Flower	<i>Eucalyptus tereticornis (inland)</i>	Forest Red Gum						
Fruit	<i>Ficus coronata</i>	Creek Sandpaper Fig						
Fruit	<i>Ficus fraseri</i>	Sandpaper Fig						
Fruit	<i>Ficus macrophylla</i>	Moreton Bay Fig						
Fruit	<i>Ficus obliqua</i>	Small-leaved Fig						
Fruit	<i>Ficus rubiginosa</i>	Rusty Fig						

## Flying-fox backyard food trees

**BIMONTHLY AVAILABILITY SCHEDULE**

FOOD TYPE	SCIENTIFIC NAME	COMMON NAME	DEC/ JAN	FEB/ MAR	APR/ MAY	JUN/ JUL	AUG/ SEP	OCT/ NOV
Fruit	<i>Ficus superba</i>	Deciduous Fig						
Fruit	<i>Ficus watkinsiana</i>	Strangler Fig						
Fruit	<i>Hedycarya angustifolia</i>	Native Mulberry						
Fruit	<i>Livistona australis</i>	Cabbage Palm						
Fruit	<i>Maclura cochinchinensis</i>	Cockspur Thorn						
Flower	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark						
Fruit	<i>Melia azedarach</i>	White Cedar						
Fruit	<i>Melodinus australis</i>	Southern Melodinus						
Fruit	<i>Morinda jasminoides</i>	Morinda						
Fruit	<i>Notothixos cornifolius</i>	Kurrajong Mistletoe						
Fruit	<i>Passiflora herbertiana</i>	Native Passionfruit sp.						
Fruit	<i>Pennantia cunninghamii</i>	Brown Beech						
Fruit	<i>Pittosporum undulatum</i>	Sweet Pittosporum						
Fruit	<i>Planchonella australis</i>	Black Apple						
Fruit	<i>Podocarpus elatus</i>	Plum Pine						
Fruit	<i>Polyosma cunninghamii</i>	Featherwood						?
Fruit	<i>Rhagodia candolleana</i>	Seaberry Saltbush						
Fruit	<i>Rhodamnia argentea</i>	Malletwood						
Fruit	<i>Rubus rosifolius</i>	Native Raspberry						
Fruit	<i>Sambucus australasica</i>	Yellow Elderberry						
Fruit	<i>Schizomeria ovata</i>	Crabapple						
Fruit	<i>Solanum aviculare</i>	Kangaroo Apple						
Flower	<i>Syncarpia glomulifera</i>	Turpentine						
Fruit	<i>Syzygium australe</i>	Brush Cherry						
Fruit	<i>Syzygium corynanthum</i>	Sour Cherry						
Fruit	<i>Syzygium crebrinerve</i>	Purple Cherry						
Fruit	<i>Syzygium oleosum</i>	Blue Lilly Pilly						

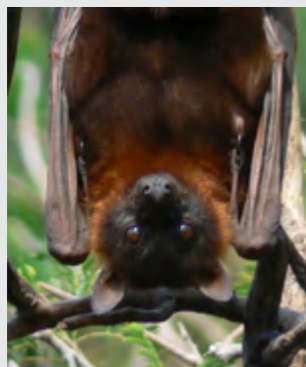


## Flying-fox species identification

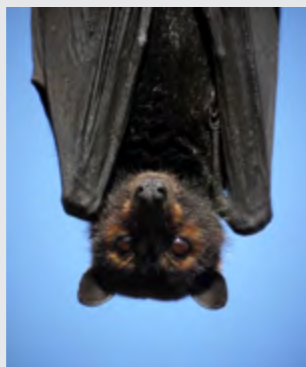
The purpose of this information sheet is to provide assistance to participants of the Department of Environment and Science flying-fox monitoring programme for field identification and breeding cycle of flying-foxes in Queensland.

### Background

There are four species of flying-fox found in Queensland that participants of the Department of Environment and Science's flying-fox monitoring programme may record. These include the black flying-fox (*Pteropus alecto*), grey-headed flying-fox (*Pteropus poliocephalus*), little red flying-fox (*Pteropus scapulatus*) and spectacled flying-fox (*Pteropus conspicillatus*). All four species are protected under the *Nature Conservation Act 1992*, with black, grey-headed and little red flying-foxes being listed with a conservation status of least concern, while the spectacled flying-fox is listed as vulnerable. The grey-headed and spectacled flying-fox are also listed as vulnerable under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*.



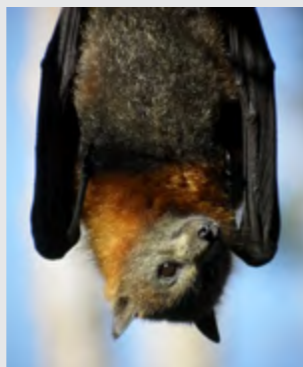
Little red flying-fox



Black flying-fox



Spectacled flying-fox



Grey-headed flying-fox

## Flying-fox Species Identification

### The Little Red Flying-fox

- Smallest species of flying-foxes
- Reddish brown to dark brown, fur is short.
- Fur on neck, shoulders, around the eyes and under the wing varies from brown to yellow. The top of the head tends to be grey.
- There is little to no fur on the legs and ears are prominent.
- Cluster together in camps, unlike others species that hang with space between individuals.
- Distinguishable from other common flying-foxes by its small size; forearm length 125–156 mm and head and body length 195–235 mm.

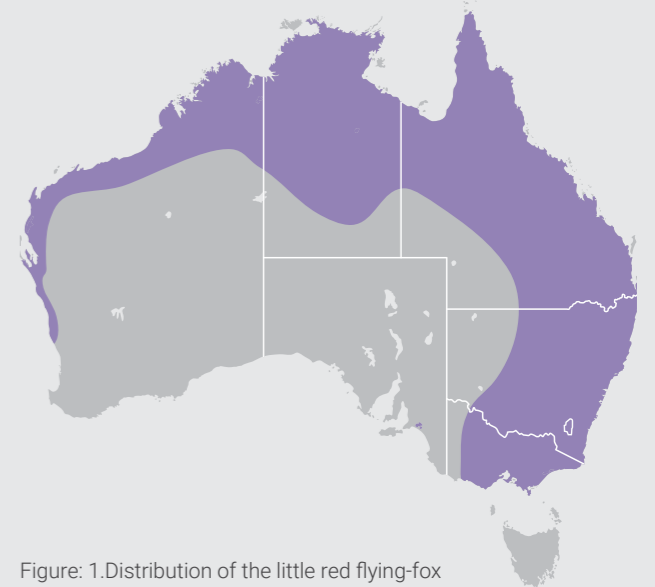


Figure: 1. Distribution of the little red flying-fox



## Flying-fox species identification

### The Black Flying-fox

- Short black fur with a slight silver frosting in older individuals.
- Brown rings around the eyes are found on some individuals who usually have dark grey-brown hind neck and shoulder fur.
- Collar, if present, rarely fully encircles neck.
- There is no fur on the lower leg of this species.
- Largest of the Australian flying-foxes with a forearm length of 150–191 mm and a head and body length of 240–280 mm.

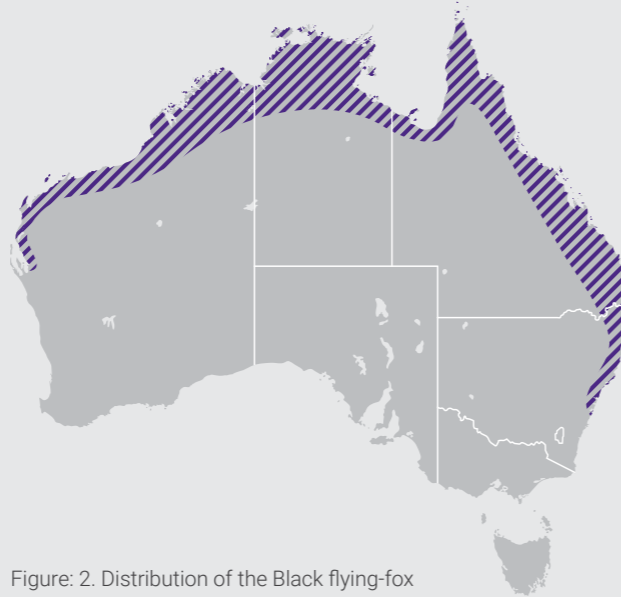
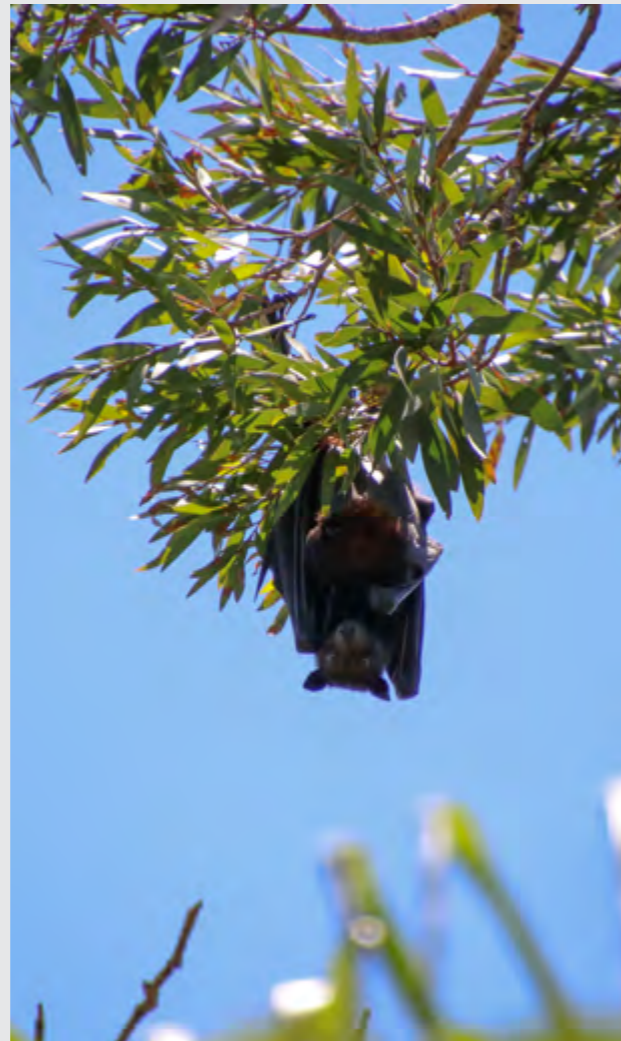


Figure: 2. Distribution of the Black flying-fox



## Flying-fox species identification

### The Grey-headed Flying-fox

- Head and body covered in thick grey fur, belly fur is greyish long and shaggy.
- Orange/reddish-yellow collar completely encircling the neck.
- Fur extends to the ankle.
- Large species with a forearm length of 138–180 mm and a head and body length of 230–289 mm.
- Usually found hanging in the lower part of the vegetation within the colony.

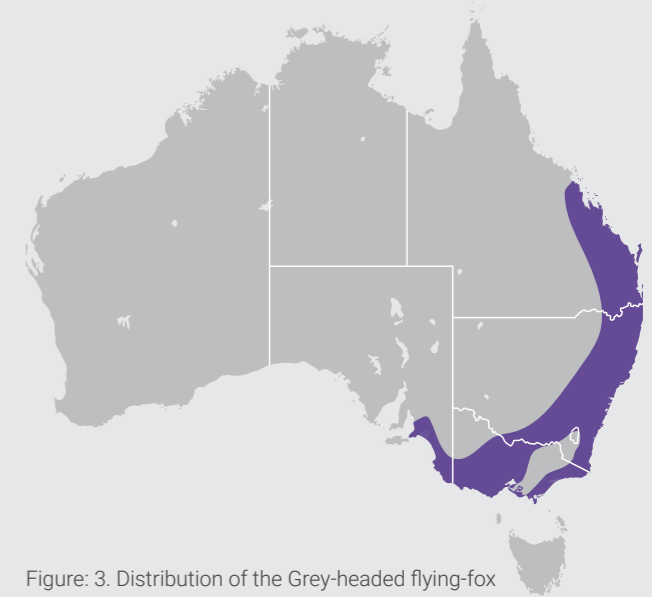
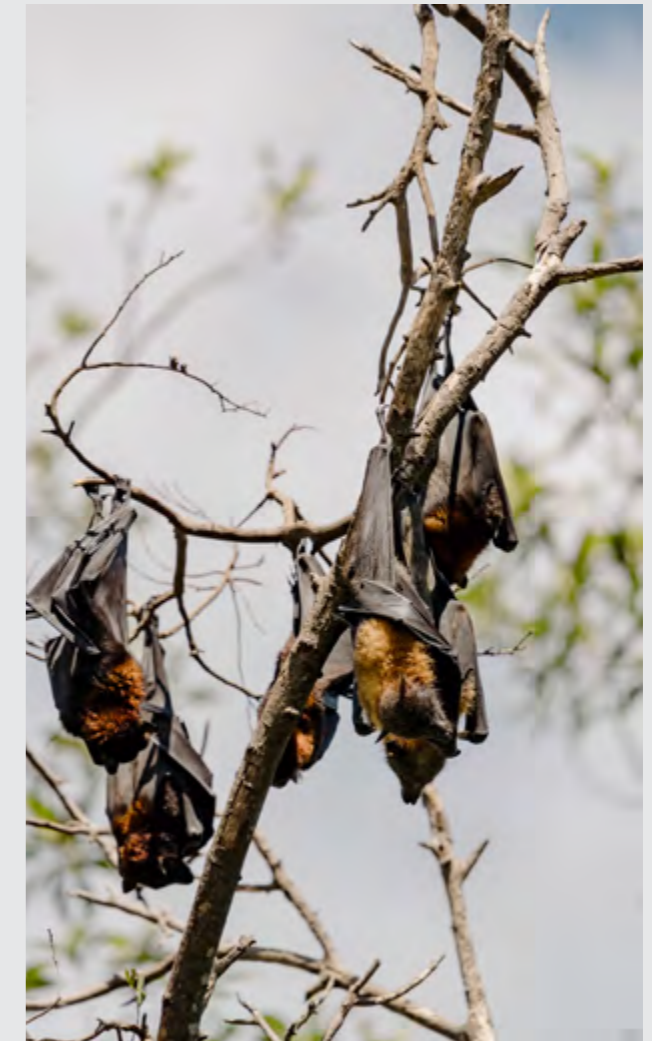
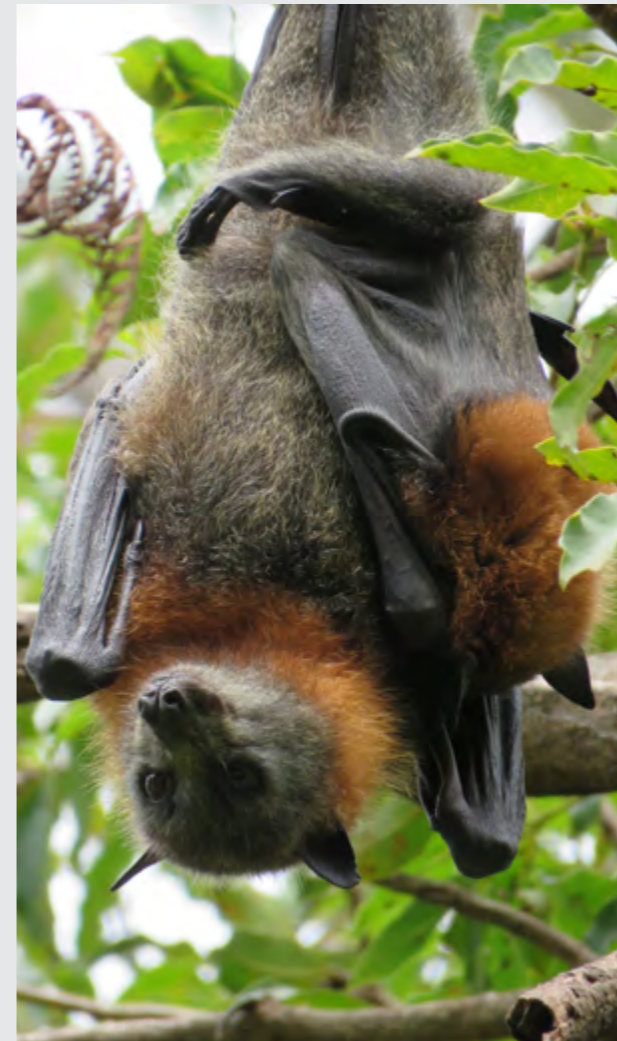


Figure: 3. Distribution of the Grey-headed flying-fox



## Flying-fox species identification

### The Spectacled Flying-fox

- Almost black with prominent yellow neck ruff and prominent straw-coloured fur surrounding the eyes and along the muzzle.
- The ruff and head is silver-blond in some individuals, pale yellow fur often found on shoulders and back of neck.
- Yellow rings (spectacles) around the eyes.
- There is no fur on the lower leg of this species.
- Size of forearm is 160–189 mm and head and body length is 220–240 mm.
- Only in North Queensland.

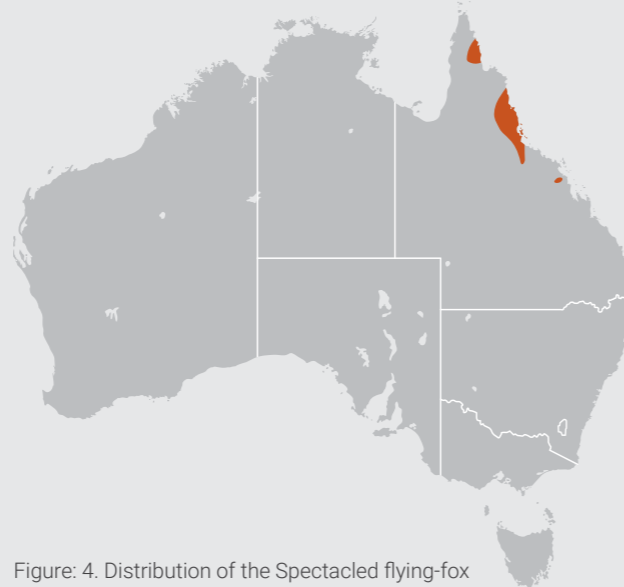
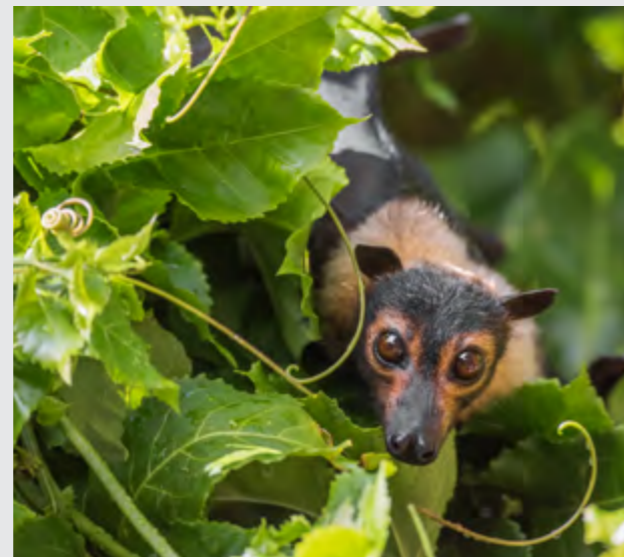


Figure 4. Distribution of the Spectacled flying-fox



## Flying-fox species identification

### Breeding cycle of flying-foxes

#### Black, spectacled and grey-headed flying-foxes

The reproductive cycle of black, spectacled and grey-headed flying-foxes commences in approximately January with conception usually in April or May. Females give birth to a single pup in October or November and lactate until approximately March.

#### Little red flying-foxes

The breeding cycle of the nomadic little red flying-fox is out of phase with the other species by about six months, with its reproductive cycle commencing in July with conception usually in October or November. Female little red flying-foxes give birth to a single pup in early autumn (April or May). Lactation continues for two months until June or July.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Black flying-fox	Young independent	Mating territories formed	Conception	6 months gestation	Birth	Carry young	Young at camp	Young independent	Birth	Birth	Carry young	Young at camp
Grey-headed flying-fox	Young independent	Mating territories formed	Conception	6 months gestation	Birth	Carry young	Young at camp	Young independent	Birth	Birth	Carry young	Young at camp
Spectacled flying-fox	Young independent	Mating territories formed	Conception	6 months gestation	Birth	Carry young	Young at camp	Young independent	Birth	Birth	Carry young	Young at camp
Little red flying-fox	5-6 months gestation	5-6 months gestation	5-6 months gestation	5-6 months gestation	5-6 months gestation	5-6 months gestation	5-6 months gestation	5-6 months gestation	5-6 months gestation	5-6 months gestation	5-6 months gestation	5-6 months gestation

Figure 5: Calendar of flying-fox breeding cycle

## Scientific observation techniques

Hands-on scientific observation techniques for kids during a roost site visit should be engaging and age-appropriate, allowing them to learn about Flying Foxes and their environment.

Ideas to explore in your interaction with the book:

### 1. Counting and Estimation

Have students count the number of Flying Foxes in different sections of the roost. Encourage them to estimate the total population and discuss the challenges of counting animals in the wild.

### 2. Behavioural Observation

Ask students to observe and record behaviours, such as grooming, social interactions, and feeding patterns. Discuss what these behaviours might reveal about the Flying Foxes' daily lives.

### 3. Habitat Assessment

Have students examine the roost site's physical features, such as tree species, temperature, access to waterways and humidity. Discuss how these factors might affect the Flying Foxes' choice of roost site.

### 4. Recording Vocalizations

Encourage students to listen for and record any vocalizations made by the Flying Foxes. Discuss the possible functions of these sounds, such as communication within the colony.

### 5. Plant Surveys

Guide students in identifying and documenting the types of plants in the area. Discuss the importance of specific plant species for Flying Fox feeding and shelter.

### 6. Seed Dispersal Study

Look for signs of seed dispersal by Flying Foxes. Collect seeds and document their characteristics, discussing the role of Flying Foxes in forest regeneration.

### 7. Fruit Identification

If fruiting trees are nearby, have students identify the fruits eaten by the Flying Foxes. Discuss how their diet relates to the local ecosystem.

### 8. Data Collection

Teach students how to use simple data collection sheets to record their observations. This can include the date, time, weather conditions, and specific behaviours they observe.

### 9. Photography and Sketching

Encourage students to take photos or make sketches of the Flying Foxes and their surroundings. This can be a creative way to document their findings.

### 10. Sensory Observations

Ask students to engage their senses. What do they hear, see, and smell at the roost site? How do these sensory experiences connect to the behaviour of Flying Foxes?

### 11. Microclimate Monitoring


Use thermometers and humidity sensors to measure temperature and humidity at different locations within the roost site. Discuss how microclimates can vary.

### 12. Natural History Journal

Provide students with notebooks for journaling their observations, sketches, and reflections. This encourages a holistic approach to scientific inquiry.

### 13. Comparison to Classroom Learning

After the visit, have students compare their field observations with what they've learned in the classroom. Discuss any surprises or new insights they gained.

 These hands-on techniques not only make learning fun but also provide students with valuable insights into the world of Flying Foxes and the role they play in the ecosystem. Encourage critical thinking and curiosity throughout the observation process.



## Roost excursion notes

Conducting a field trip to explore Flying Fox roost sites involves careful planning and safety considerations. Here's a list of requirements and measures to ensure a successful and safe field trip:

### Requirements:

- **School safety protocols and policies:** Obtain written or electronic consent from parents/carers for school excursion.
- **Supervision:** Adequate supervision ratios of 1:5 (Year 3 students) and a 1:10 ratio adult supervision for Years 4-8.
- **Risks Assessment:** Complete relevant risk assessment documentation. These are public spaces so other people and dogs may be in the parks/reserves.
- **First Aid Kit:** Take a first aid kit and have an adult member of the team with appropriate qualifications.
- **Transport:** Arrange for suitable transportation to and from the roost site. Ensure that the vehicles are well-maintained and safe for students.
- **Emergency Contacts and Medical Status:** Familiarize excursion staff with the medical status of students, particularly with respect to epilepsy, diabetes, asthma and heart conditions. Also make staff aware of students with behavioral issues, or who may require additional support, and the support strategies for these students. Provide a list of emergency contacts, including local authorities, emergency services, and the school's contact information.
- **Safety Briefing:** Ensure all participating staff, including the school contact person, understand their specific roles and are familiar with the program itinerary, risk management plans and emergency response plan. Provide maps for all adults supervising students.
- **Qualified Guides:** If possible, have a qualified guide accompany the group who is knowledgeable about Flying Foxes, the specific roost site, and safety protocols. This could be a local Bat Rescue carer or a Sunshine Coast Council staff member.
- **Communication:** Ensure that there is a reliable means of communication, such as mobile phones or two-way radios, in case of emergencies.
- **Field Equipment:** Prepare and bring field equipment such as binoculars, cameras, notebooks, pens, and relevant field guides for observations.
- **Weather Forecast:** Check the weather forecast to ensure safe conditions for the field trip. Be prepared for weather changes. Ensure students are dressed appropriately for weather conditions. Being outdoors, a wide-brimmed hat is important.
- **Safety Gear:** Depending on the specific site and potential hazards, provide students with appropriate safety gear, such as hats, sunscreen, insect repellent, and closed-toe shoes.

## Roost excursion notes

### Measures:

- **Safety Protocols:** Emphasize and enforce safety protocols throughout the trip. Ensure that students understand the importance of staying together and following guidelines.
- **Environmental Awareness:** Teach students about the importance of respecting the natural environment and wildlife. Avoid disturbing the Flying Foxes or their habitat. Brief students not to feed or interact with animals at roost sites. Human food can be deadly to many animal species or have serious health impacts.
- **Quiet Observation:** Emphasize the need for quiet and respectful observation. Loud noises or sudden movements can disturb the animals.
- **Stay on Trails and Pathways:** Stick to designated paths and trails to avoid trampling vegetation and disturbing the habitat. Be aware of other users on the pathways and roadways and monitor for vehicles.
- **Waste Management:** Encourage students to bring waste free lunch if your excursion occurs during meal times. Some parks/reserves do not have waste bins. Encourage students to carry out all litter and waste, leaving the roost site as they found it.
- **Hydration:** Provide students with water to keep them hydrated and energized during the trip.
- **Emergency Plan:** Have a well-defined emergency plan in case of injuries, health issues, or unforeseen circumstances. Make sure all participants are aware of the plan.
- **Data Collection:** If the purpose of the trip is for data collection, ensure that students are trained in proper data recording techniques and that they have the necessary tools.
- **Debriefing:** After the field trip, conduct a debriefing session to discuss the experiences and observations. Encourage students to share what they've learned.

*By carefully addressing these requirements and implementing these measures, you can conduct a safe and educational field trip to explore Flying Fox roost sites while minimizing any negative impact on the environment.*







# Activity Pages



## Creating a school herbarium

Setting up a School Herbarium is a great way to collect, record, and learn about plant species in your school or local roost site.

Here are step-by-step instructions to help you get started:

### Materials and Tools:

- Plant identification guides or books (see list below of recommended titles)
- Plant press or heavy books for drying and pressing plant specimens
- Acid-free photocopy paper
- Labels for plant specimens.
- Pencils and pens
- A camera for photographing plants.
- Small plastic bags or envelopes for collecting specimens in the field.
- Storage space for the herbarium.



### Step 1: Define Your Purpose and Goals:

Determine the objectives of your School Herbarium. Is it primarily for educational purposes, research, or community engagement? Clarify what you aim to achieve with this project.

### Step 2: Choose the Location:

Select a suitable location for your herbarium. It should be a clean, dry, and well-ventilated space where plant specimens can be stored safely, such as the school's library.

### Step 3: Collect Plant Specimens:

Gather plant specimens from your school campus or the local roost site. Ensure that you have proper permissions and are following ethical and legal guidelines for collecting plants. Collect samples of leaves, flowers, fruits, and other plant parts. Document the date, location, and any relevant information about each specimen. Avoid collecting rare or endangered plants, and take only a small sample from a single individual to minimise impact. Be careful when using sharp secateurs for collecting your sample.

### Step 4: Press and Dry Specimens:

Place the collected plant specimens between layers of absorbent paper, such as newspaper or blotting paper. Use a plant press or stack heavy books on top of the specimens to flatten and dry them. Change the absorbent paper periodically to speed up drying. Drying time can vary, but it typically takes a couple of weeks to a month. Ensure that specimens are completely dry before proceeding.

### Step 5: Mount Specimens:

Once specimens are dry, mount them on acid-free paper. Glue or tape each specimen to the sheet, ensuring it's well-centered and securely attached. Include a label with the plant's common and scientific name, location, date of collection, and any other relevant information. Use the example provided as a guide.

## Creating a school herbarium

### Step 6: Organise and Catalogue:

Arrange your mounted specimens in a systematic order, such as by plant family, genus, or habitat type. Create a catalogue or database to keep track of the specimens, including their accession number, description, and any additional notes. Consider also recording observations about plant-animal interactions - this could be bird species feeding on flowers and fruit, insects seen or hollows and nests.

### Step 7: Educational Materials:

Develop educational materials and resources that can accompany the herbarium. These can include field guides, information about the importance of plants, and activities for students to engage with the herbarium.

### Step 8: Accessibility and Outreach:

Make the herbarium accessible to students, teachers, and the local community. Consider organising workshops with other classes to engage others in plant science and conservation efforts.

### Step 9: Maintenance:

Regularly inspect and maintain the herbarium to prevent damage or deterioration of specimens. Periodically update the collection with new specimens and remove any that are damaged or deteriorating.

### Step 10: Record and Document:

Encourage students to document their observations, discoveries, and research related to the herbarium. Use the herbarium as a valuable resource for learning about local plant species and their ecological significance.



## Creating a school herbarium

*Setting up a School Herbarium not only provides a valuable resource for learning about local plant species but also fosters an understanding of biodiversity and the importance of plant conservation.*



### Useful Flora Books/Guides for Sunshine Coast

- "Mangroves to Mountains" - Glenn Leiper, Jan Glazebrook, Denis Cox and Kerry Rathie
- "Noosa's Native Plants" - Stephanie Haslam
- "Weeds of the Sunshine Coast" - Joan Heavey and Sonia MacDonald
- "Grasses of the Noosa Biosphere" - Joan Heavey and Sonia MacDonald
- "Sedges, rushes and restiads" - Joan Heavey and Sonia MacDonald
- "Rainforest Trees and Shrubs" - Gwen Harden, Bill McDonald and John Williams
- "Field Guide to Native Plants of Bribie Island" - Allan Carr
- "Dictionary of Botanical Names" - Don Perrin

### Label for Plant Specimens

NAME (the person who collected the specimen)	
DATE	
LOCATION	
DESCRIPTION (include information/ observations about flowering, fruiting, soil conditions, indicators of animal interactions (nest, bite marks, presence, scats, scratches etc).	
COMMON NAME	
BOTANICAL NAME	

## Creative projects to share flying-fox information

Creative projects can be a fantastic way for students to consolidate their knowledge about Flying-foxes and raise awareness of their importance in the ecosystem.

Here are some creative project ideas:

### 1. Educational Posters:

Students can create colourful and informative posters that highlight key facts about Flying-foxes, their habitat, behaviour, and ecological role. These can be displayed in the school or community to educate others.

### 2. Children's Storybooks:

Task students with writing and illustrating children's storybooks that feature Flying-foxes as central characters. These books can be shared with younger students to promote understanding and empathy.

### 3. Video Documentaries/ Short Films:

Encourage students to work in groups to create short video documentaries or short films. These can include footage from the field trip, interviews with experts, and animations to explain Flying-fox biology and their significance.

### 4. Art Exhibitions:

Organise an art exhibition featuring students' artwork inspired by Flying-foxes. This can include paintings, drawings, sculptures, or mixed media art. Use the exhibition as an opportunity to educate visitors about these animals.

### 5. Model Ecosystems:

Challenge students to build dioramas or model ecosystems that depict the habitat of Flying-foxes. Include plants, animals, and Flying-fox figurines to showcase their role in the ecosystem.

### 6. Infographics:

Have students create informative infographics that condense key information about Flying-foxes into a visually appealing format. These can be shared online, in school newsletters, or on social media.

### 7. Public Service Announcements:

Teach students how to create Public Service Announcements that can be shared on school websites or local television and radio stations. These should convey the importance of Flying-fox conservation.

## Creative projects to share flying-fox information

### 8. Interactive Websites:

For older students, consider having them design interactive websites or blogs that contain in-depth information about Flying-foxes, videos, quizzes, and resources for further learning.

### 9. Letter Writing Campaign:

Engage students in writing letters to local government officials or environmental organisations, advocating for the protection of Flying-fox habitats and conservation efforts.

### 10. Song or Poem Composition:

Encourage students to express their knowledge and feelings through creative writing. They can compose songs, poems, or raps that celebrate Flying-foxes and their role in nature.

### 11. Role-Playing Skits:

Have students create and perform role-playing skits that demonstrate the ecological relationships between Flying-foxes and other species in their habitat.

### 12. Guest Speaker Event:

Organise a guest speaker event with local ecologists or experts in Flying-fox conservation. Students can be responsible for planning and promoting the event. Members of the wider school community can be invited to attend.

### 13. Social Media Campaign:

Encourage students to create a social media campaign with educational posts, images, and facts about Flying-foxes. Use relevant hashtags to reach a broader audience.

### 14. Environmental Impact Assessment:

Challenge students to assess the potential environmental impact of the loss of Flying-fox populations in their local area. This project can include predictions, data analysis, and recommendations for conservation actions.

*These creative projects not only reinforce students' understanding of Flying-foxes and their importance but also empower them to become advocates for these animals and their conservation.*



## Flying-fox games

### Shrinking Habitat Game - Instructions

#### Objectives:

After participating in this activity, students will be able to:

- Define habitat as it relates to both people and wild animals;
- Describe the effect of human development on plants and animals living in the area;
- Evaluate the importance of suitable habitat for wildlife;
- Recognize that loss of habitat is the most critical problem affecting wildlife today.

#### Materials:

Green and blue construction paper; 2 desks or chairs (or hula hoops) to delineate a herbivore habitat; 5 or 6 sheets and blankets to simulate development for a group of about 25 students

#### Vocabulary:

habitat, food chain, development, herbivore, carnivore, vegetation

#### Procedure:

##### PART 1:

1. Put three words on the board – People, Pets, Wildlife. Ask students "What do people need in order to live?" List student answers under the "People" column. Ask the same questions and record the answers for both Pets and Wildlife.
2. After the lists are made, ask the students if some ideas can be lumped together under a more general category (such as food, water, shelter, space, etc.). Try and narrow down the list so that only the essential survival needs are displayed.
3. Ask the students to compare the lists – are they similar or different? The most basic survival needs should be the same for each of the three groups and can be limited to:

<b>Food</b>	<b>Water</b>	<b>Shelter</b>
<b>Space</b>	<b>Arrangement</b>	<b>Sunlight</b>
<b>Soil</b>	<b>Air</b>	

People and wild animals have the same basic needs for survival.

Carnivores suggestions: carpet python, dingo, eagle, owl, goanna

Herbivores suggestions: flying-fox, sugar glider, ring-tail possum, lewin's honeyeater

## Flying-fox games

##### PART 2:

Let students know that this part of the lesson will simulate wildlife in its habitat.

1. Divide participants into 4 groups. For a group of 25 students, the breakdown would be as follows:  
Herbivores (9) 3 times as many carnivores  
Carnivores (3)  
Vegetation (6)  
Land developers (2)
2. Establish a large playing area (outside or in the classroom with chairs, tables, and desks moved to the side). This simulates a wildlife habitat area.
3. Provide each herbivore with:  
SHELTER: Two desks or chairs (or hula hoops)  
FOOD: 3 pieces of green construction paper  
WATER: 1 piece of blue construction paper  
Some VEGETATION portrayed by STUDENTS.

Provide each carnivore with:  
SHELTER for their den/nest : one desk or chair (or hula hoop)  
SPACE equivalent to that used by 3 herbivores.  
3 HERBIVORES as a potential food source.  
WATER: One piece of blue construction paper  
Some VEGETATION portrayed by STUDENTS.

4. Ask the herbivores to arrange the food, water, and shelter and the vegetation (students) in a space to represent their habitat.
5. Once the herbivores have arranged their habitat, ask the carnivores to move into the area to establish their den/nest and water sources, keeping an eye on the herbivores for possible food sources. (For added interest, students can identify what type of animal they are and then role play its characteristics). This phase may take up to 10 minutes – students who are developers may begin planning their development while herbivores and carnivores arrange their habitat.
6. Once all the animals are established in their habitats, it is time for the developers to enter the picture. These developers have been given the opportunity to build a new housing development. They may use approximately 5 minutes to construct their development, explaining their actions as they take them. They may use the space equivalent to that used by 3 herbivores.
7. The developers can use the sheets and blankets to build their development. They may remove vegetation (without physically hurting the students), they may remove shelter (represented by desks or hula hoops or whatever pre-determined materials), food, and water.
8. Once the development is constructed, engage all the students in a discussion of what happened.

#### Some questions to consider:

1. What action took place? With what consequences?
2. Would or did any animals die? How were you affected by this development? From what causes?
3. Could the developers have done anything differently to change the consequences?
4. Could they have developed several smaller areas instead of one large area, or vice versa, with what effects?
5. Would it have reduced the negative consequences for wildlife if they put the development in a different area of the habitat?
6. Were there any positive consequences? If so, what were they? How were they achieved?
7. What are some possible impacts on wildlife from human activities like development of land?
8. Are there places in your community where wildlife habitat has been lost by human development?
9. Are there ways to minimize negative impacts when wildlife areas are developed? What can people do to minimize the negative impacts on wildlife?

## Flying-fox games

### Predator Prey Game - Instructions

#### Introduction:

The population of a species in an area is dependent upon the limiting factors of the ecosystem. One such factor is the population or availability of food. The relationship of predator populations and prey populations is very cyclical.

#### Objectives:

At the end of this activity, the students will:

1. Understand that prey population will change and thus affect the predator's population and visa versa.
2. See the effect of habitat reduction has on both prey and predators within an ecosystem.

#### Procedure:

This is an active activity that requires some room to run. It can be done outside.

1. Create a habitat for the interactions to occur.
2. Line all students up at one end of the habitat. These kids will be the prey (flying-fox) for year 1.
3. Choose 1 or 2 students to be the predators (owls) for year 1. They should stand in the middle of the habitat.
4. The class will need 1 data recorder. (Teacher could do this.) Population of flying-foxes and owls should be recorded at the beginning of each round. (year)

5. This activity is a version of freeze tag. The teacher blows a whistle and the flying-fox tries to run from one end to the other without being tagged (eaten) by an owl.

6. Any flying-fox tagged must immediately freeze so that any other owls do not eat them.

7. Once all the remaining flying-foxes make it to the other side that concludes the year. These are the surviving flying-fox. Any tagged (eaten) flying-fox now becomes owls. A owl must tag (eat) a minimum of 1 flying-fox to survive. If there is an owl that starves (does not tag any flying-fox) they must stand off to the side for 1 year and then return as flying-fox.

8. It is very important that time is taken before the start of the next round (year) to verify a correct population of owls and flying-foxes

9. Create a record of the Data in a Table with Years and compare numbers of Owls and numbers of Flying-fox

10. Start the game again and add flying-fox roost sites with hula-hoops - these are safe places where the flying-fox can go and not be eaten/tagged by owls. Only a certain number of flying-fox are safe in each roost. See how the safe places can make it harder for owls. What happens if this habitat/roost site decreases. After a round, remove hoops to show reduction in habitat. How does this affect the game?

#### Extensions:

Assign students to reflect on the fact that an ecosystem is an open system with many more factors that affect the populations of organisms. An ecosystem will have animals migrating in/out, there will be more predators/prey species, sickness/diseases, hunting, weather/climate, etc.



## Flying-fox games

### Pollination Game - Instructions

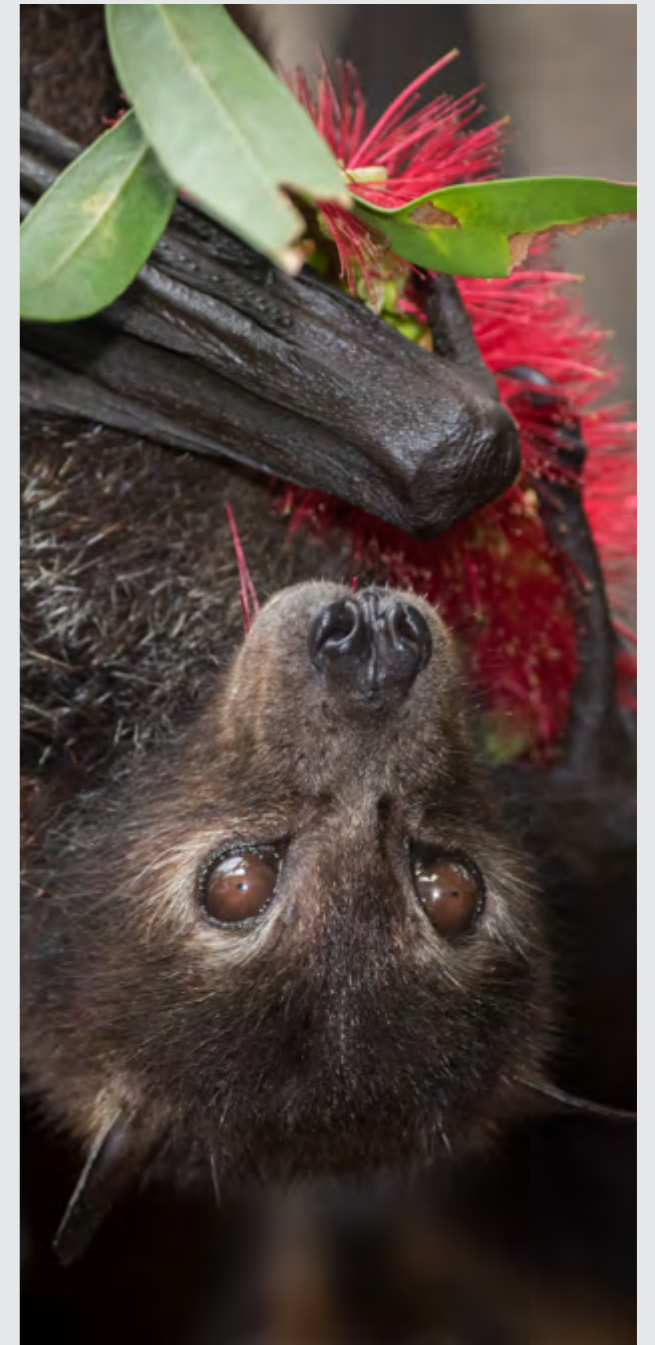
#### Objectives:

At the end of this activity, the students will:

1. Understand that flying-fox play an important role in plant pollination
2. Identify the threats to flying fox include barbed wire, netting and extreme weather conditions

#### Procedure:

1. Students get into 4 relay teams and pretend to be flying foxes. Each team has a bucket with pollen (balls) that they need to get from their flower to a flower on the opposite side of the playground to pollinate. One flying fox from each team is allowed to run at a time and needs to get back to tip the next person before they can go.
2. In the centre are 2 students who take the role of fruit netting and barbed wire. If the flying foxes get tipped, they become tangled up and have to link arms with barbed wire and fruit netting. They can now help tap people.
3. If they get tapped while carrying pollen, the pollen gets dropped to the ground and can be picked up by any team. The next person in the team can run.
4. To make it more challenging, when the teacher yells HEAT WAVE, all the flying foxes have to do slow lunging steps because they are too hot to fly properly. The fruit netting and barbed wire can still run as normal. The heat wave ends when the teacher yells COOL WEATHER.
5. The winning team is the one that is best at pollination, getting the most pollen across to the second flower/ bucket.





# Flying-fox Roost Bingo

Can you find all 9 ?



Name \_\_\_\_\_

Date \_\_\_\_\_



A Bird



A Creek



Flying-fox Hanging



Animal Tracks



Native Plants in Fruit



An Insect



Flying-fox in Flight



Native Flowers



Lomandra





Environmental Operations  
[naturalareas@sunshinecoast.qld.gov.au](mailto:naturalareas@sunshinecoast.qld.gov.au)