Whitsunday Regional Council:

Flying-fox Management Plan 2025-2030

December 2024

Prepared for Whitsunday Regional Council

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Flying-fox Management Plan 2025-2030

Whitsunday Regional Council

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Terms and Abbreviations

ABLV	Australian Bat Lyssavirus
BAAM	Biodiversity Assessment and Management Pty Ltd
DES	Queensland Department of Environment and Science (superseded)
DETSI	Queensland Department of Environment, Science and Innovation (current)
UFFMA	Urban Flying-fox Management Area

1.0 Introduction

1.1 Background and Context

Flying-foxes are unique native animals that are essential to the health and stability of Australian ecosystems. They play a vital role in long-distance pollination and dispersing seeds, which maintains native vegetation health.

Despite their ecological importance, flying-foxes can cause conflict with humans when they congregate in large numbers at daytime roosts in urban environments. In particular, noise, smell, faeces, vegetation damage, and potential or perceived disease risk are the most common impacts reported. The Whitsunday Regional Council considers these effects seriously and evaluates the impacts and potential management of problematic flying-fox roosts.

The Whitsunday Regional Council has developed a Flying-fox Policy, which includes a summary of legislation and guidelines, a statement of management intent and the framework for evaluating flying-fox impacts. The Flying-fox Policy should be read in conjunction with this Flying-fox Management Plan, which describes the flying-foxes that inhabit the Whitsunday region, their biology, known roosts, potential impacts to the public and general management approach. This Flying-fox Management Plan will also summarise the communication plan for affected residents in relation to management activities.

1.2 Management Plan Review

This flying-fox management plan uses an adaptive management approach, ensuring that new data and knowledge on the best ways to manage human-wildlife conflict are implemented where possible. As such, a review of this Flying-fox Management Plan should be undertaken annually, to ensure it is still suitable and in line with the Whitsunday Regional Council policies and procedures, as well as contemporary government legislation, policies and codes of practice.

2.0 Flying-fox Biology

Of the four flying-foxes that occur on mainland Australia, two species are known to regularly occur in the Whitsunday region: the Little Red Flying-fox (*Pteropus scapulatus*)(**Figure 1**) and Black Flying-fox (*Pteropus alecto*) (**Figure 2**). Both species move seasonally within their distribution, influenced by food availability, climatic conditions and reproductive cycles (Vardon et al., 2001)

2.1 Little Red Flying-fox (*Pteropus scapulatus*)

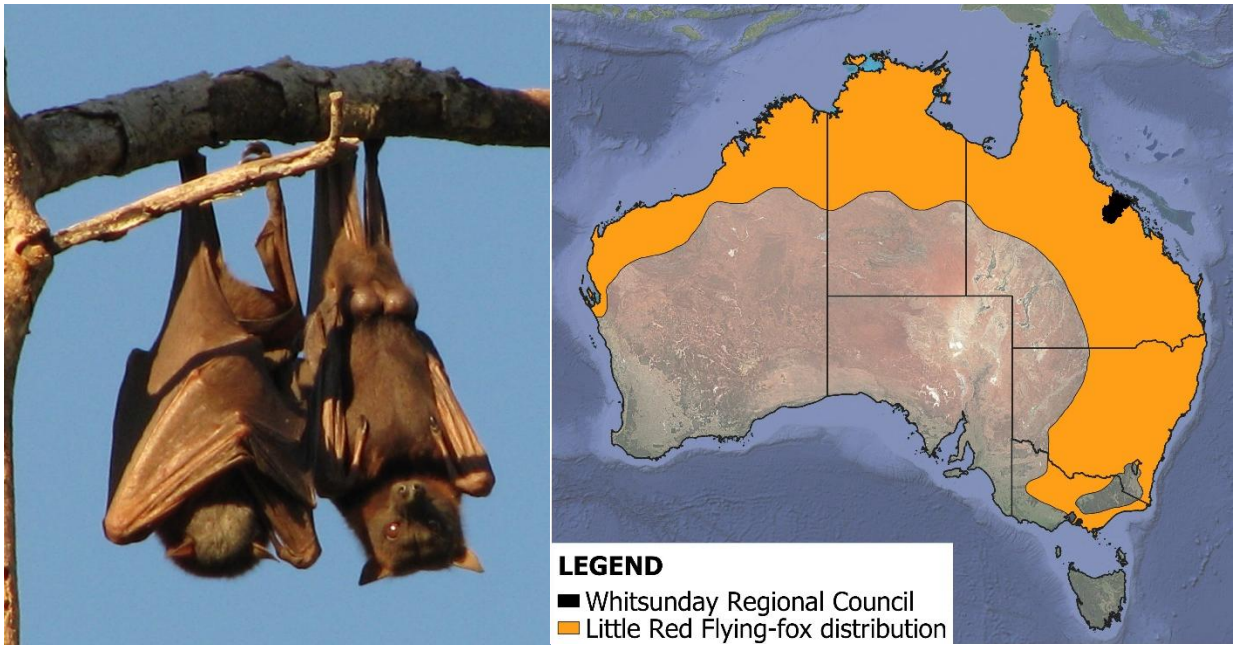


Figure 1. Image and distribution of Little Red Flying-fox.

Distribution data sourced from Australasian Bat Society, Qld Government (local government areas) and WMS/Google (base imagery). Photo © BAAM.

Little Red Flying-foxes are a medium-sized flying-fox, typically weighing between 300-600 g, with a head and body length of approximately 21 cm and wingspan between 0.9 – 1.2 m. The fur is reddish-brown to dark brown in colour, although the neck, shoulders, around eyes and under wings can vary from brown to yellow. Some grey may be visible on the crown. It can be distinguished from other flying-fox species by the smaller size, sparsely-furred legs and reddish-brown wing membranes that are translucent in flight (Welbergen et al., 2023).

Little Red Flying-foxes are the most widely distributed of the four mainland species of flying-fox, occurring across northern and eastern Australia. The species is highly nomadic and can travel long distances following the flowering of eucalypt trees, often congregating in roosts in large numbers (Bradford et al., 2022; Welbergen et al., 2023).

Due to their high preference for nectar, Little Red Flying-foxes are important dispersers of pollen. Their nightly foraging movements within and between stands of flowering trees enable effective pollen dispersal at landscape-scales, thus playing a key role in the genetic health and preservation of many forest ecosystems (Bradford et al., 2022; Welbergen et al., 2023). They are also important seed dispersers of riverine vegetation, particularly those that stabilise creek and riverbanks.

2.1.1 Diet

The Little Red Flying-fox is a nectar and pollen specialist, with a preference for blossoms from Myrtaceae species, particularly *Corymbia*, *Eucalyptus*, *Melaleuca* and *Syncarpia* species. The species is known to supplement its diet with fruit (~5% diet by weight, particularly native figs) and, less often, other plant parts and insects. The seasonal flowering of preferred food trees often drive mass aggregations and long distance dispersal movements (Welbergen et al., 2023).

2.1.2 Roost Preferences

Little Red Flying-fox roosts are typically in wet and dry eucalypt forests, mangroves, melaleuca and casuarina swamps, rainforest, dense vine thickets and bamboo communities. They are typically close to water and commonly shared with other flying-fox species. Roost occupation is strongly associated with local flowering of their primary food sources. As such, local colony numbers can fluctuate greatly, with roosts occupied for periods ranging between days to months, and sometimes vacated for several years. Seasonal movement and attachment to roost sites are more common within 100 km of the east coast (Welbergen et al., 2023).

2.2 Black Flying-fox (*Pteropus alecto*)

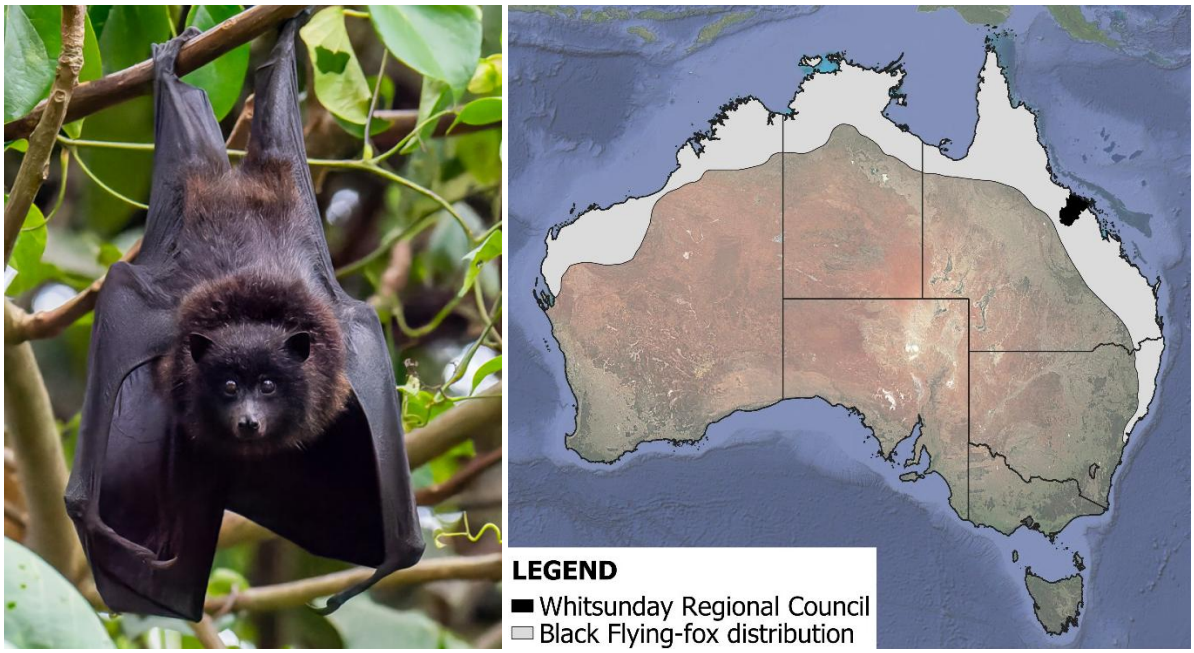


Figure 2. Image and distribution of Black Flying-fox.

Distribution data sourced from Australasian Bat Society, Qld Government (local government areas) and WMS/Google (base imagery). Photo © Bruce Thomson, Auswildlife.

The Black Flying-fox is one of the world's largest flying-fox species, weighing between 400-1000 g, with a head and body length of approximately 26 cm and a wingspan of over 1 m. The species is uniformly black in colour, except for a reddish collar around the back of the neck. However, sometimes the front fur appears frosted and brown eye-rings may be present.

The species is distributed along coastal areas of subtropical and tropical Australia. While typically more sedentary than other flying-fox species, Black Flying-foxes are known to travel more than 1000 km between roosts throughout the year. Habitat preferences are variable, including mangroves, swamp forests, wet forests and savanna habitats near water. The species is increasingly being recorded in urban parks and gardens (Welbergen, 2023).

2.2.1 Diet

The diet of Black Flying-foxes is primarily fleshy fruit and blossoms, although the species is known to eat leaves (Vardon et al., 2001). In particular, blossoms from *Eucalyptus*, *Corymbia*, *Banksia* and *Melaleuca* species are preferred, as well as rainforest fruits including native figs. Black Flying-foxes will also eat exotic and cultivated fruit where available (Welbergen, 2023).

Whilst foraging typically occurs within 10 km of the roost, the species is known to travel over 20 km away and forage between multiple sites each night.

2.2.2 Roost Preferences

Black Flying-fox roosts can range between less than one hundred to several thousand individuals and can be used intermittently or permanently. The species often occupies roosts with other flying-fox species, where Black Flying-foxes tend to roost higher in the canopy and often towards the periphery of the roost.

In natural habitats, the species roosts in dense riparian vegetation (including fresh and saltwater mangroves, paperbark forests, gallery forest and bamboo) and rainforests, although other natural habitats may be used. Urban and peri-urban environments are also commonly used for roosting (Welbergen, 2023) and this trend appears to be increasing throughout Australia.

2.3 Known Flying-fox Roosts

In the Whitsunday region, flying-fox roosts are known to occur currently or historically in a number of areas, including Proserpine, Cannonvale, Collinsville, Hideaway Bay and on the Whitsunday Islands. Flying-fox roosts that are being monitored by local, state or Commonwealth government agencies in the Whitsunday Regional Council municipality and immediate surrounds are shown in **Figure 3**.

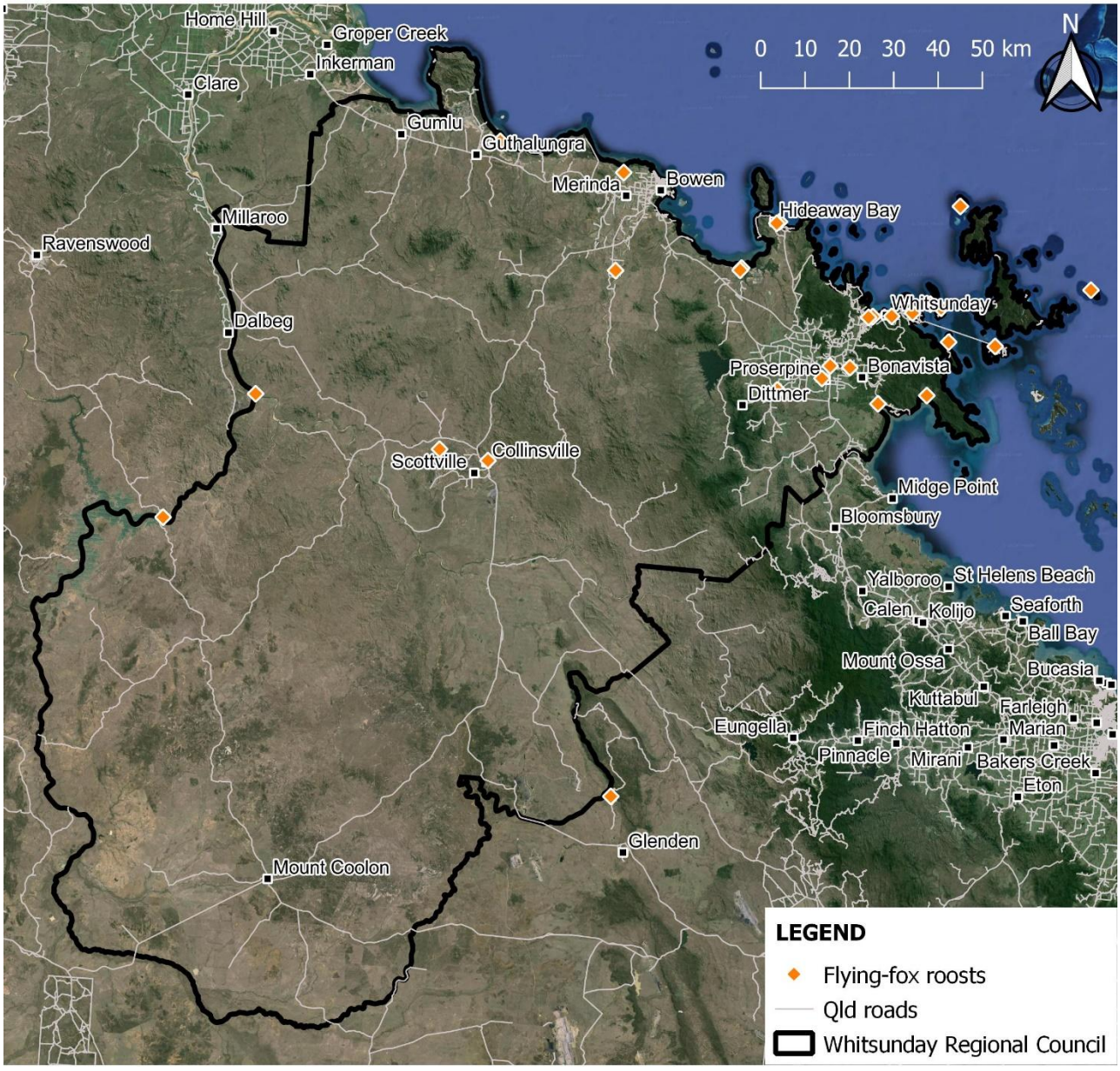


Figure 3. Historic and/or current flying-fox roosts in and adjacent to the Whitsunday Regional Council municipality.

2.4 Flying-fox Breeding Cycle

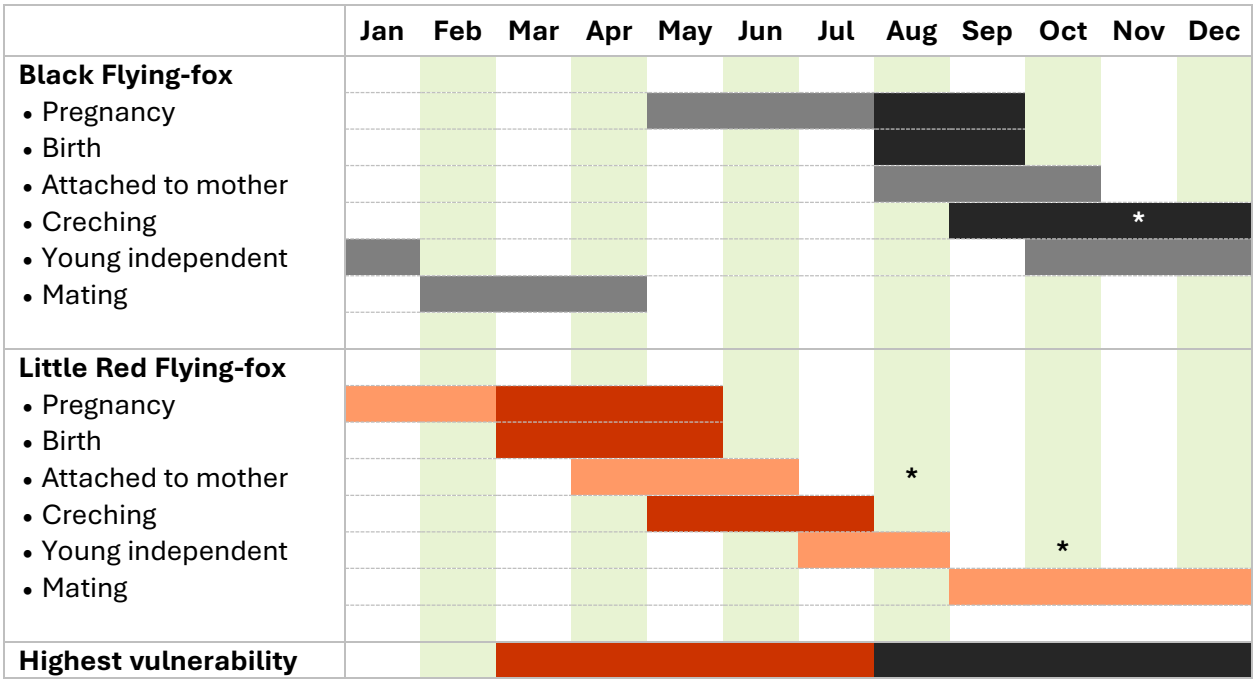
Flying-foxes breed only once per year, with a six month pregnancy before giving birth to a single live young. The pup is initially unable to fly and kept under the wing of their mother while in the roost, as well as during flight and foraging at night. When the pup becomes too heavy for the mother to carry whilst flying, they are left at the roost alone while the mother forages away (termed 'creching'). From three months of age, juveniles begin to fly and leave the roost at night to forage independently, but return to the roost to be nursed by their mothers until they are approximately six months old (Welbergen, 2023; Welbergen et al., 2023).

Due to the length of the breeding cycle (approximately one year) and the single young produced, population numbers can be severely impacted by juvenile mortality. For this reason, it is important to avoid disturbance of flying-foxes during particularly vulnerable times of breeding: namely late pregnancy, birthing and creching.

The timing of flying-fox breeding cycles varies between species, as well as between regions. For example, Black Flying-foxes in the Northern Territory give birth during January-March, but in Brisbane between October-November (Vardon and Tidemann, 1998). As such, the below breeding cycles (**Table 1**, as per DES, 2020) for the two species that regularly occur in the Whitsunday region are indicative and individual site observations are required to confirm breeding status.

It is noted that records from the Collinsville roost for Little Red Flying-foxes show deviation from the typical breeding cycle provided by the Queensland Government. Additionally, Black Flying-foxes have been recorded to breed outside of the standard breeding season (particularly if young were lost recently) and are thought to breed in response to high availability of food resources (Vardon and Tidemann, 1998).

Table 1. Indicative timing of the breeding cycle for Black Flying-fox and Little Red Flying-fox (as per DES, 2020).
Darker shading for each species indicates the periods of increased vulnerability to disturbance (late pregnancy, birthing and creching).



*Records from Collinsville roost

2.5 Threats

The predominant threat to flying-foxes is the loss and degradation of foraging and roosting habitat. Due to the nomadic nature of flying-foxes, which disperse widely in search of flowering and fruiting resources, they are particularly susceptible to periods of food shortage (e.g., droughts, bushfires, cyclones and after major weather events).

Another threat to flying-foxes is the increased frequency of heat stress events, where temperatures exceed and stay above 38°C (and particularly above 42°C and/or with a combination of high humidity). Death occurs as flying-foxes cannot regulate their body temperature at high ambient heat and/or humidity, thus resulting in hyperthermia. Lactating females and dependent young most affected, which due to the low birth rate of flying-foxes, can have serious impacts on population dynamics and sustainability. Such events are a cause of mass dying in flying-foxes; for example, on a single day in January 2014, 45 000 flying-fox deaths were recorded at 52 roosts in south-east Queensland alone, and was estimated to kill approximately 50% of the Black Flying-fox in the region.

Entanglement in barbed-wire and large-aperture fruit netting is another threat, which accounts for a large proportion of wildlife rescue and rehabilitation events. Electrocution on powerlines, as well as natural predators (raptors, arboreal reptiles and crocodiles) are also known threats to flying-foxes.

3.0 Impacts to Community

3.1 Noise

Due to their social nature, flying-foxes use vocal communication to interact with each other. In particular, vocalisations are used to declare ownership of territories and food sources, help mothers find their young within the roost, during courtship for mating and warn others within the colony of threats. Within the roost, such vocalisations are loudest when flying-foxes are leaving or returning to the roost, and during mating season.

Little Red Flying-foxes are typically the noisiest species, which in combination with their large aggregations in roosts, can be particularly problematic if roosts are located in urban areas or close to other human habitation.

3.2 Odour

The main odour that emanates from flying-fox roosts is not from the faeces, but due to males wiping their shoulder scent glands on tree branches to mark their territory and attract mates. Juvenile flying-foxes also have a distinct smell, likely to assist mothers in finding their offspring when returning to the roost.

The flying-fox odour at roosts is typically the most pungent after rain (when males re-mark their territories), during hot and humid weather and when large numbers of flying-foxes are present.

3.3 Faeces and Urine

In the roost and when foraging in trees, flying-foxes defecate and urinate by hanging onto branches with their wings and inverting their lower body downwards so that their wastes drop directly to the ground. They also expel waste as they take-off for flight to jettison any extra weight. Both activities can result in faecal matter or urine landing on cars, houses, outdoor laundry, or other structures and human belongings. Faeces from flying-foxes that have fed on Cocos Palms are particularly sticky and difficult to remove.

3.4 Damage to Vegetation

Flying-foxes, and particularly the large aggregations of Little Red Flying-foxes, can damage trees and other vegetation they roost in. This can lead to decreased tree health or death, as well as reduced amenity if roosts are located in urban areas.

3.5 Actual and Perceived Risk to Human and Animal Health

As per other wildlife, livestock and companion animals, there are a range of hygiene and health concerns relating to flying-foxes. Flying-foxes are known to carry two serious diseases: Hendra virus and Australian Bat Lyssa Virus. While these diseases have low prevalence in a healthy flying-fox population, both can be fatal to humans and horses. No mortality from these diseases has been recorded in other animals.

3.5.1 Hendra virus

Hendra virus is not transmitted directly to humans, but from flying-foxes to horses and then from horses to humans. In particular, horses may become infected after consuming food or water that is contaminated with urine, saliva or birthing products from an infected flying-fox. There is currently no evidence that Hendra virus can be transmitted through faecal matter. The disease is then transmitted between horses and/or, on occasion, to humans through high levels of exposure to infected horse bodily fluids. There have only been seven recorded cases of Hendra virus in Australia; however, the disease can be fatal for both horses and humans. Two cases of infection in dogs (at locations with infected horses) have also been recorded, although both dogs did not show symptoms of illness.

While generally at low prevalence within a healthy population, infection in flying-foxes increases during times of stress, such as low food availability (winter, droughts, severe weather events), increased roost disturbance or periods of high energy output (e.g., cool weather, pregnant and lactating females; see Plowright et al., 2008; McMichael et al., 2017; Páez et al. 2017).

There are several recommendations to reduce the risk of infection to horses and humans. For example, horses can be vaccinated against Hendra virus through local veterinary practices. Additionally, positioning water troughs and feed bins away from trees, or under cover, may prevent contamination with urine. Symptoms in infected horses include fever, increased heart rate, restlessness, difficulty breathing and/or weakness and neurological signs (e.g., unco-ordinated gait or muscle twitching). The presence of such symptoms warrants immediate veterinary assessment. Humans that have been in close contact with infected horses should monitor their health and seek medical advice from specialised Public Health Units (see www.health.qld.gov.au/system-governance/contact-us/contact/public-health-units).

More information on Hendra virus can be found at www.qld.gov.au/health/condition/infections-and-parasites/viral-infections/hendra-virus-infection

3.5.2 Australian Bat Lyssa Virus

Australian Bat Lyssavirus (ABLV) is transmitted from infected flying-foxes through their saliva into human mucous membranes (e.g., eyes, mouth) or broken skin (e.g., through bites and scratches). ABLV is in the same disease group as rabies and infection is typically fatal to humans. However, the disease in humans is very rare, with only three recorded cases in Australia – all in Queensland. Currently, only bats, humans and horses have been known to contract ABLV.

To avoid potential exposure to ABLV, it is highly recommended to not touch or handle flying-foxes unless you are vaccinated against rabies, suitably trained in handling bats and are using appropriate personal protective equipment. For the general public, the risk of being in close contact to flying-fox saliva is very rare. For example, despite myths relating to flying-foxes purposely flying towards humans (or into hair), bites and scratches are typically received when attempting to help injured flying-foxes. If an injured flying-fox requires assistance, contact your closest wildlife rescue organisation.

In the situation that a human is bitten or scratched by a flying-fox, wounded skin should be washed thoroughly with soap and water for at least 15 minutes, followed by application of an anti-viral antiseptic (e.g., povidone-iodine or ethanol). If the exposure is through mucous membranes, flush the area with water for several minutes. Urgent treatment should be sought from a medical provider within 48 hours.

The rabies vaccine provides a high level of protection against ABLV; however, people who are vaccinated should still seek treatment from a medical provider if they are bitten or scratched by a flying-fox or microbat to receive a booster injection.

More information on ABLV is available at: https://www.qld.gov.au/health/condition/infections-and-parasites/viral-infections/australian-bat-lyssavirus

3.5.3 Other health risks

Animal faeces and/or urine can contain various types of bacteria, such as Salmonella, *Escherichia coli* (E. coli) or leptospirosis. As such, appropriate protective equipment (e.g., gloves) should be used when cleaning surfaces of flying-fox faecal matter, as well as washing hands and practicing other hygiene methods when near roosts.

Flying-foxes are known to carry external parasites called bat flies. While they typically do not attach to humans, bites may produce minor skin irritation in some circumstances. There is currently no evidence that such bites transmit disease or bacteria between flying-foxes and humans; however, research is ongoing.

In terms of drinking water safety relating rainwater tanks, it is not possible to contract ABLV or Hendra virus through contamination of tank water with faeces or urine. However, other viruses, bacteria and protozoans may exist in untreated rainwater due to contamination with faecal matter from all animals. People with compromised immune systems are most at risk. Measures to reduce the risk of contamination are provided in the *Guidance on Use of Rainwater Tanks* at https://www.health.gov.au/sites/default/files/documents/2022/07/enhealth-guidance-guidance-on-the-use-of-rainwater-tanks.pdf

Maintaining effective pool disinfection procedures prevent health risks through the use of swimming pools. This includes regular backwashing of the pool filter, regularly running the filter every day, maintaining suitable chlorine levels and keeping the pH between 7.2 -7.8. Further advice should be sought from your local pool store.

Further information on flying-foxes and human health can be found at: https://www.qld.gov.au/health/condition/infections-and-parasites/bacterial-infections/bats-and-human-health

3.6 Community Consultation

In June-July 2024, the Whitsunday Regional Council held a community consultation process to gather information on the impacts and preferred management actions. This included the promotion of a survey (both online and hard copy), as well as a public meeting in Collinsville, where a flying-fox roost has persisted in recent years.

For the survey, a total of 29 submissions were received, with the majority of respondents (~79%) within 200 m of a flying-fox roost. The Collinsville public meeting was attended by 16 residents, many of whom had flying-foxes roosting on their property.

3.6.1 Impacts to Community

Impacts described, in order of perceived significance are provided in **Figure 4** below.

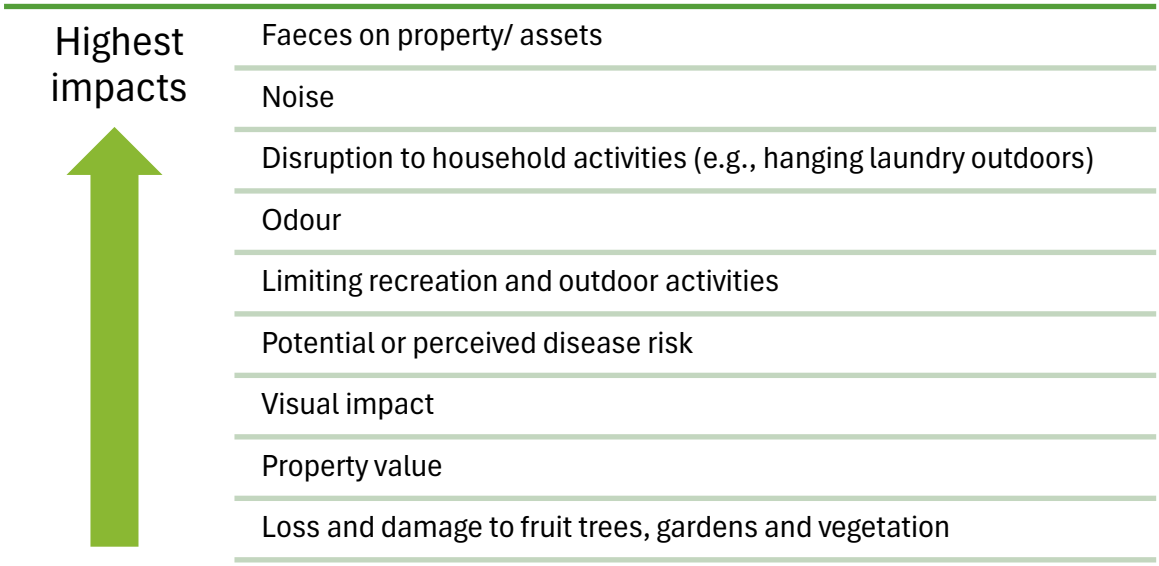


Figure 4. Impacts of flying-foxes as described by respondents to the community consultation survey.

3.6.2 Council Co-ordination

The majority of respondents in the survey and at the community meeting agreed that the Whitsunday Regional Council should co-ordinate flying-fox management activities in urban areas.

3.6.3 Management Actions

In the survey provided, respondents were asked whether they support various flying-fox roost management activities. Results are provided in **Figure 5** below.

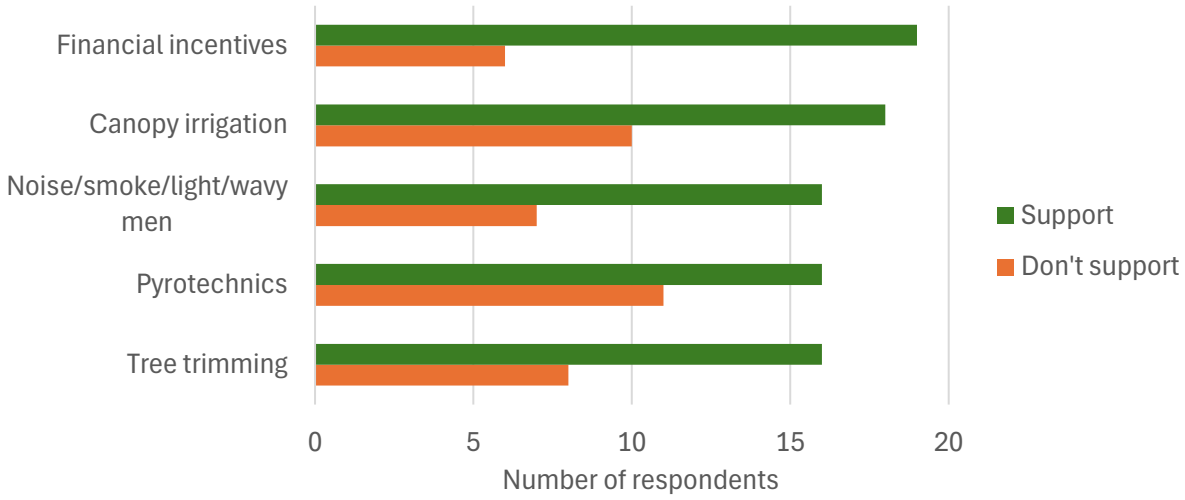


Figure 5. Response from community consultation survey on support of various roost management activities.

4.0 Legislation and Policy

The existing Commonwealth and Queensland legislative framework, and its supporting information, provides information about flying-fox protection and management options. While a summary is provided below, further detail on the legislation, codes of practice and guidelines for managing flying-foxes is provided in the Whitsunday Regional Council Flying-fox Policy.

All flying-fox species are protected under Queensland legislation through the *Nature Conservation Act 1992*. As such, management of flying-fox roosts need to be conducted in accordance with legislation and best-practice guidelines.

Two species of flying-fox are also protected under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*: Spectacled Flying-fox (*Pteropus conspicillatus*) and Grey-headed Flying-fox (*Pteropus poliocephalus*). While these two species have not been recorded in the Whitsunday Regional Council municipality, they are found in adjacent local government areas and could infrequently visit. Due to their national conservation status, management activities for roosts of these species are limited and/or required approval prior to actions being taken. More information is provided in the Whitsunday Regional Council Flying-fox Policy.

There are two Queensland Government Codes of Practice that must be adhered to when managing flying-fox roosts:

- *Code of Practice: Low impact activities affecting flying-fox roosts;* and
- *Code of Practice: Ecologically sustainable management of flying-fox roosts*.

Details on how these relate to this document are provided in **Section 5.4**. The Queensland Government has also developed a *Flying-fox Roost Management Guideline*, which provides further information and case studies on how to implement these Codes and associated legislation.

Additionally, certain actions undertaken in relation to flying-fox roost management need to notify the Queensland Department of Environment, Tourism, Science and Innovation (DETSI) prior to actions being undertaken.

5.0 Management Approach

5.1 Goals and Objectives

The goals and objectives for the management of flying-foxes within the Whitsunday region can be grouped into five themes. These are provided in **Table 2** below.

Table 2. Goals and objectives for the management of flying-foxes in the Whitsunday region.

Goals	Objectives/Actions	Due date/Timing
Theme 1. Education and awareness		
1.1. To provide information to the public regarding flying-fox management	1.1.a. To develop flying-fox fact sheets on roost management and risks	June 2025
1.2. To ensure information on flying-fox is available on the Council website	1.2.a. Place flying-fox factsheets on the Council website and in public libraries	June 2025
1.3. Ensure residents are informed about roost management	1.3.a. Engage with residents who are affected by flying-fox roosts	Ongoing
	1.3.b. Develop an action plan to inform budget considerations and identify timing and details of proposed actions for roost management activities	June 2025
	1.3.c. Develop a communication plan on the timing and details for roost management activities	July 2025
Theme 2. Human safety and amenity		
2.1. Provide a safe environment for the community where risks associated with flying-fox roosts are managed	2.1.a. Conduct a risk assessment of each roost in an urban area and ensure hazards are managed appropriately	Each roost assessed at least twice yearly if complaints are received
	2.1.b. Develop a Take-5 safety toolbox talk to discuss flying-fox management and safety for relevant Council staff	June 2025
	2.1.c. Develop a 'living with flying-foxes' health and safety information sheet for provision to affected residents, in public libraries and on the Council website	June 2025
2.2. To undertake flying-fox management actions to reduce amenity impacts	2.2.a. To choose appropriate roost management actions to maintain public amenity	Ongoing; as required
2.3. To ensure the safety of Council staff	2.3.a. Seek advice on whether key staff should be vaccinated against rabies (for protection against ABLV)	March 2025

Goals	Objectives/Actions	Due date/Timing
Theme 3. Flying-fox animal welfare		
3.1. To undertake roost management in a manner that does not harm the flying-fox	3.1.a. To choose roost management actions that reflect best practice and are consistent with the relevant Queensland government guidelines	Ongoing; reviewed annually
	3.1.b. Ensure roost management actions comply with permit conditions	Ongoing; reviewed annually
	3.1.c. Ensure roost management actions are overseen by personnel with knowledge and experience in roost management where possible	Ongoing; reviewed annually
	3.1.d. Ensure key Council staff are trained on flying-fox welfare	Annually, and prestart talks at each management event
Theme 4. Roost management		
4.1. Where a roost becomes a problem, roost management is undertaken in an efficient and cost-effective manner	4.1.a. Conduct reviews of management issues and dispersal options, consider potential roost locations and evaluate likelihood of a successful dispersal	As required
	4.1.b. Roost management actions use least cost options first	Ongoing; as required
	4.1.c. Roost management actions are documented	Within 1 month of completion of actions
	4.1.d. Identify and map potential roost sites in urban areas	Mapped as established; reviewed annually
4.2. Remain up-to-date on suitable methods for managing the flying-fox roosts	4.2.a. Maintain contact with other Councils on the methods and effectiveness of management options at flying-fox roosts	Annually (minimum)
	4.2.b. Network and/or review contemporary literature to learn and evaluate new methods for managing flying-fox roosts	Annually (minimum)

Goals	Objectives/Actions	Due date/Timing
Theme 5. Policy and administration		
5.1. To ensure the management of flying-fox issues comply with legislation, policy and best practice	5.1.a. To develop a process which ensures Council complies with the relevant legislation, policy and guidelines	June 2025
	5.1.b. Ensure key Council staff are identified to assist with the administration and implementation of the Flying-fox Management Plan	At development and each review of the plan
	5.1.c. Ensure Council staff are trained in the implementation of the Flying-fox Management Plan	At development and each review of the plan
5.2. To ensure flying-fox management documentation is appropriate and practical	5.2.a. Review and update the Flying-fox Policy and Flying-fox Management Plan regularly	Every five years, or following legislative changes
	5.2.b. Review and amend (if required) individual Roost Management Plans	Annually
5.3 Allocate budget for flying-fox management	5.3.a. Undertake annual budget review of required management activities and allocate budget accordingly	Annually

5.2 Role of Council

Under Queensland legislation, local governments have an as-of-rights authority to non-lethally manage issues around flying-fox roosts in declared Urban Flying-fox Management Areas (UFFMA). In line with this, the Whitsunday Regional Council has a Statement of Management Intent that describes the overarching roles of flying-fox management in the region. This is detailed in the Whitsunday Regional Council Flying-fox Policy and summarised in **Figure 6** below.

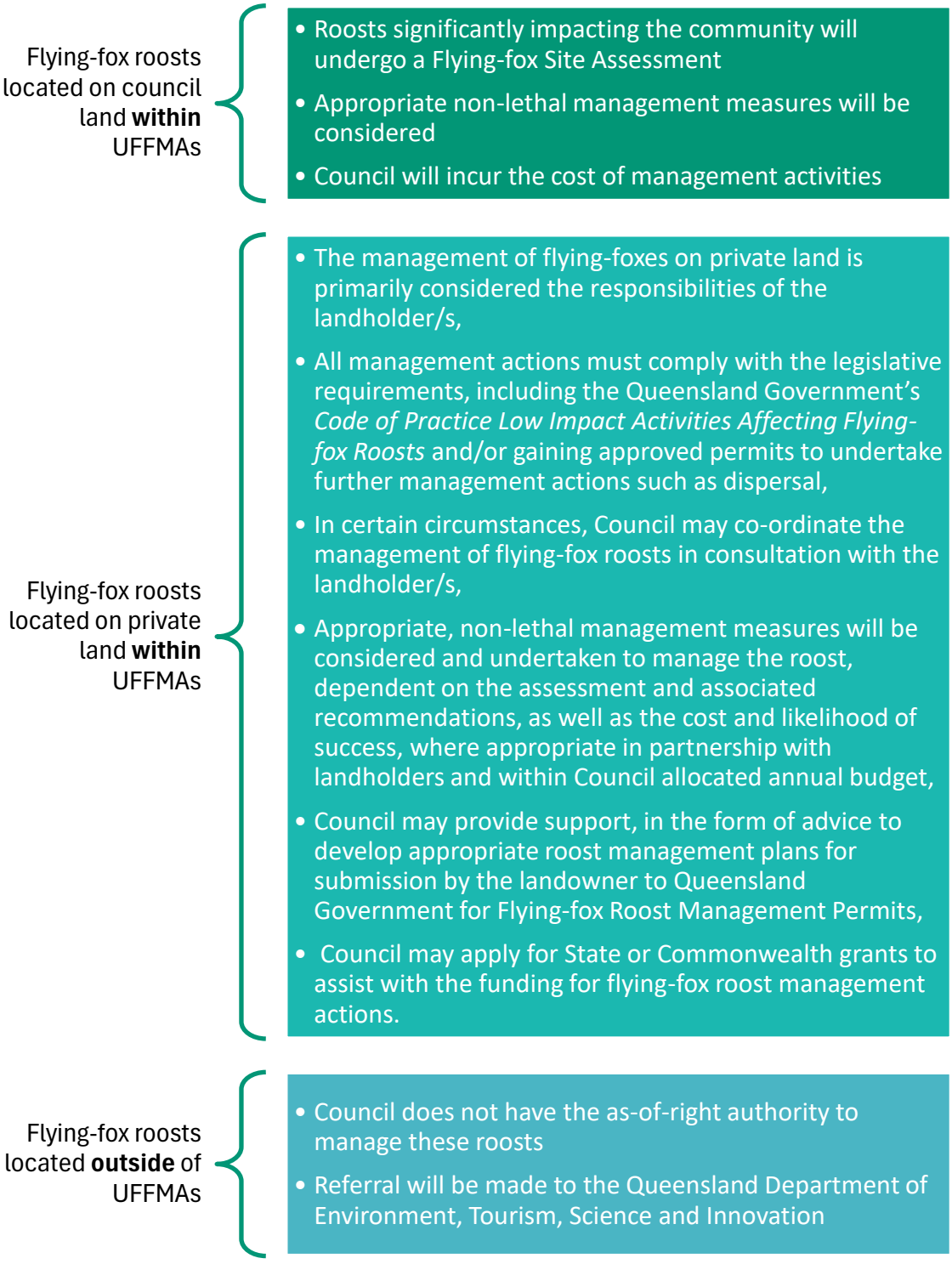


Figure 6. Role of Whitsunday Regional Council in the management of flying-fox roosts.

5.3 Roost Assessment Framework

When a complaint is received by the Whitsunday Regional Council regarding a flying-fox roost, the roost is subject to an assessment to determine potential management actions, if required. The intent and typical approach is summarised in **Figure 7**.

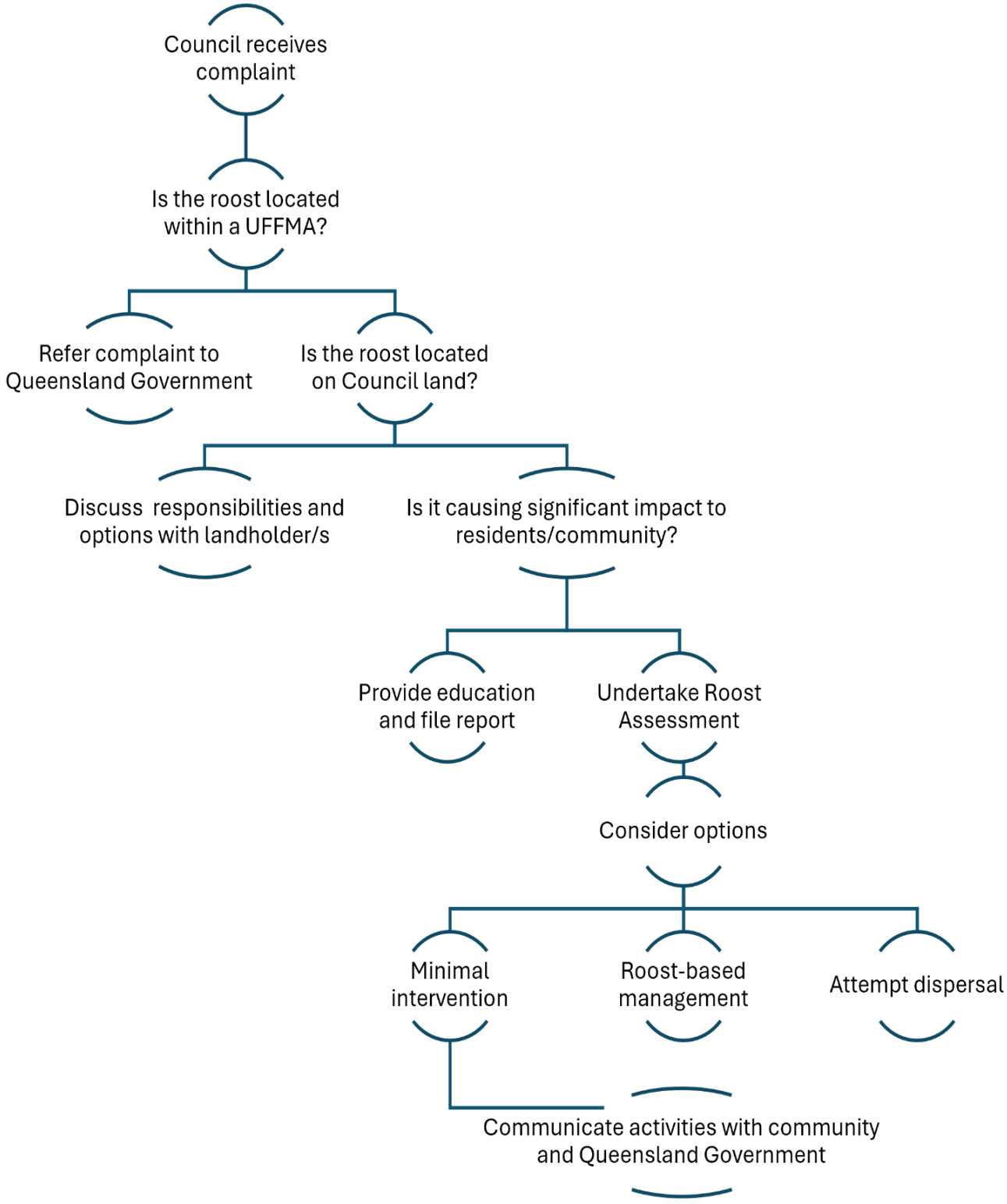


Figure 7. Whitsunday Regional Council's approach to investigating and managing flying-fox roosts.

5.4 Roost Management Actions

There are various management activities that the Whitsunday Regional Council can consider and undertake, if required, at a flying-fox roost.

5.4.1 Low impact activities

The Queensland Government *Code of Practice: Low impact activities affecting flying-fox roosts* sets out that any person may undertake low impact activities at, or near, a flying-fox roost anywhere in Queensland in accordance with Section 62 of the Queensland *Nature Conservation (Animals) Regulation 2020*.

This includes activities such as mulching, mowing, weeding, watering under or near roost trees, minor trimming of roost trees (<10 %), and installation/maintenance/removal of infrastructure, as long as the activities are not directed at destroying or disturbing a flying-fox roost.

However, activities must:

- Minimise the disturbance to flying-foxes as much as possible (e.g., using low impact and low noise equipment, take place after the dusk fly-out is complete);
- Not include the trimming of roost trees where flying-foxes are within 10 m of the trimming;
- Not include trimming of roost trees of more than 10% of total canopy per 12-month period;
- Immediately cease, and DETSI be immediately notified, if a flying-fox is killed, injured, or found on the ground as a result of management actions, and only recommenced after certain actions have occurred;
- Immediately cease, and DETSI be immediately notified, if daytime works cause 30% or more of the adult flying-foxes to leave the roost and remain airborne for five minutes or more, and only recommenced after certain actions have occurred;
- Be avoided during the high-vulnerability breeding phases (late pregnancy, birthing, creched young) of the flying-foxes present;
- Be avoided during or immediately after climatic extremes, or weather events that may cause food shortages (e.g., unusually high temperatures or humidity, cyclones, fire); and
- Not negatively impact the two conservation listed species: Grey-headed Flying-fox or Spectacled Flying-fox.

5.4.2 Ecologically sustainable management of flying-fox roosts

The Queensland Government *Code of Practice: Ecologically sustainable management of flying-fox roosts* describes how local governments, operating under Section 61 of the Queensland *Nature Conservation (Animals) Regulation 2020*, may undertaken management actions. This includes disturbing, driving away or destroying a flying fox roost, and comes with the following requirements:

- DETSI must be informed of management actions at least two business days prior to activities, which is valid for four weeks from the date of notification;
- No roost tree can be destroyed when there are flying-foxes are in or within 20 m of the roost tree;
- No roost tree can be trimmed when there are flying-foxes within 10 m of the trimming (excluding hazard reduction trimming, where flying-foxes must be moved to another part of the site prior to commencement);
- Must immediately cease, and DETSI be immediately notified, if a flying-fox is killed, injured, or found on the ground as a result of management actions, and only recommenced after certain actions have occurred;

- For attempts to move flying-foxes within a roost (e.g., nudging from one tree to another adjacent tree), disturbance should be minimised as much as possible, be property co-ordinated and led by a suitable person in charge (as per Code definitions, typically an authorised Council officer);
- For dispersal activities:
  - other local governments within 50 km of the roost must be notified in writing prior to commencement,
  - must be property co-ordinated and led by a suitable person in charge,
  - may only occur with a person knowledgeable about flying-fox behaviour (i.e., is experienced in identifying flying-fox species, assessing population numbers, determining stage in breeding cycle and recognising distress, harm or other negative behaviours in flying-foxes), is present for the first two days and available by phone or in person thereafter,
  - must only occur in the early evening and/or early morning during fly-out (for a period of 3 hours) or fly-in (for a period of 3 hours),
  - must be limited to non-lethal deterrence methods (e.g., smoke, light, noise, water) and not include methods that physically injure flying foxes (e.g., direct high-pressure water, paint ball guns, skin irritants, etc.),
  - must consider avoiding management actions during the high-vulnerability breeding phases (late pregnancy, birthing, crèched young) of the flying-foxes present,
  - must consider avoiding management actions during or immediately after climatic extremes, or weather events that may cause food shortages (e.g., unusually high temperatures or humidity, cyclones, fire),
  - must considering avoiding management actions that would negatively impact the two conservation listed species: Grey-headed Flying-fox or Spectacled Flying-fox; and
- Within six weeks of the date of management action notification, DETSI must be provided with a flying-fox roost management evaluation form.

5.4.3 Potential Management Actions

The suitability of management actions is dependent on the roost location, site characteristics, species present, breeding season, threat and inconvenience to the community, and likely cost of actions. Various actions commonly used to manage flying-fox roosts in Australia are provided in **Table 3**.

Table 3. Potential actions for managing flying-fox roosts in Queensland.

Management action	Description	Indicative cost	Effectiveness
Education and awareness	Includes the provision of information to the public relating to flying-foxes, as well as providing opportunities for discussion and feedback. Most effective if undertaken in a co-ordinated manner and lead by staff with stakeholder engagement skills. + May reduce fears around disease and health + Increases understanding of environmental contribution of flying-foxes - Often does not alleviate most of the human-flying-fox conflict	Low cost ($100s to $1,000s)	Low: can reduce some human-flying-fox conflict and complaints
Financial assistance and/or services	Includes the provision of financial assistance and/or services for residents impacted by flying-fox roosts. This has not been considered as yet by the Whitsunday Regional Council, but can options and delivery are variable. Other Council programs include: rate subsidies, purchase of protective items (e.g., car covers, air-conditioners, double-glazing), payment of external service providers (high-pressure cleaning, tree removal/lopping) or purchase/loan of cleaning items (e.g., high-pressure cleaner). + Can require limited physical or staffing resources from Council - Residents need to be pro-active in applying for assistance - Rate subsidies do not alleviate the actual human-flying-fox conflict - Framework and definitions for eligibility are required and reviewed	Moderate cost ($10,000s)	Low: can reduce some human-flying-fox conflict and complaints

Management action	Description	Indicative cost	Effectiveness
Removal of vegetation at roost edges (creating a buffer)	Discourages bats from roosting close to residents by removing vegetation at the edge of roosts. + Can be low cost and moderately effective - Residents may resent reduced amenity (i.e., loss of vegetation) - May contribute to habitat loss if cumulative with other vegetation removal/clearing - Roosts may move into other residential properties	Low-moderate cost ($1,000s to $10,000s)	Moderate: can shift the impact away from residents adjacent to roost
Passive dispersal: Removal of roost vegetation	Involves removing vegetation at the roost while the flying-foxes are not present, to stop them from returning or re-establishing. + Effectiveness at property level is high - Can result in the roost establishing in next closest suitable vegetation. - Residents may resent reduced amenity (i.e., loss of vegetation) - May contribute to habitat loss for flying-foxes or other wildlife if cumulative with other vegetation removal/clearing	Low-moderate cost ($1,000s to $10,000s)	Moderate: can shift the impact away from current area, but may move to other areas/properties nearby
Active dispersal: Smoking	Fires, particularly with elements to increase smoke (e.g., green vegetation), are positioned below trees that flying-foxes typically roost in and lit prior to flying-foxes returning to roost at dawn. + Can be low cost and moderately successful - Ineffective when breeze/winds are present - Needs consistent (daily) action until roost remains dispersed - Can be problematic for people with asthma or respiratory illnesses in vicinity	Generally low cost, although depends on time-frame required	Moderate: often only at a tree/property basis, but can be successful. Can be undertaken at multiple locations to affect wider area.

Management action	Description	Indicative cost	Effectiveness
Active dispersal: Sprinklers	The use of high-powered sprinklers for short bursts to mimic predator movement in the canopy to nudge them away from resident boundaries + No significant change in vegetation or hydrology - Flying-foxes may move to nearby trees/properties, causing conflict - Can have animal welfare risk during heat events - Requires considerable administration/logistics	Moderate cost ($10,000s)	Moderate: some Councils have had some success with this method
Active dispersal: Wavy man	Involves erecting an inflatable 'wavy man' at a tree roost prior to dawn to prevent flying-foxes returning to roost in the tree. + Council owns a number of wavy men, thus no on-going hire costs - Spatial and temporal effectiveness is low - Effectiveness inconsistent	Low cost ($100s to $1,000s)	Low-moderate: often only effective short-term and at the individual tree/property
Active dispersal: Light	Shining high powered lights (e.g., roadworks light towers) into roost trees, particularly during early morning to prevent flying-foxes return. + Light can be directed to not disturb residents below - Flying-foxes may move to nearby trees/properties, causing conflict - Requires high luminosity lights, which are typically not found in residential homes	Low cost ($1,000s to $10,000s)	Low-moderate: often only effective short-term and at the individual tree/property
Active dispersal: Sound	Creating noise as a disturbance mechanism to discourage flying-foxes returning to roost trees. + Resident participation can promote feeling of involvement and pro-activity to concerns - Can cause disturbance to nearby residents - Spatial and temporal effectiveness is low	Low cost ($100s to $10,000s)	Low-moderate: often only effective short-term and at the individual tree/property

Management action	Description	Indicative cost	Effectiveness
Active dispersal: Pyrotechnics/Air cannons	The use of pyrotechnical or gas guns to produce loud noises and lights near roosts as flying-foxes are returning at dawn. + Can be effective, particularly in a large area if coordinated correctly - Requires personnel with fire-arms/pyrotechnics (fireworks) licence - Can be very expensive, particularly if required over a prolonged period - Flying-foxes may return as soon as dispersal activities cease for the day	High cost, although depends on time-frame required	Moderate-high: some Councils have had success but typically only after a long campaign and/or results are temporary

5.4.4 Success of Roost Dispersal in Australia

There have been many previous attempts to disperse flying-fox roosts from urban locations in Australia. Various reviews of these dispersal attempts have been documented, with a brief overview of findings below. It should be noted that the majority of these roosts were congregated roosts in a single patch of trees, not dispersed in individual trees, such as at Collinsville.

1. In 94% cases reviewed by Roberts and Eby (2013), dispersals did not reduce the number of flying-foxes in a local area. In all cases, dispersed animals remained in the local area.
2. Dispersed animals did not move far, with approximately 63% of dispersals only moving the roost <600 m from the original site (Roberts and Eby, 2013) and in 88% of dispersals, replacement camps were formed within 1 km and became sites of transferred conflict (Roberts et al., 2021).
3. In all cases, it was not possible to predict where replacement roosts would form.
4. Conflict was often not resolved. In up to 77% of cases, conflict was still being reported either at the original site or within the local area years after the initial dispersal actions (Roberts and Eby, 2013; Roberts et al., 2021).
5. Repeat dispersal actions were generally required (all cases except extensive vegetation removal).
6. The financial costs of all dispersal attempts were high ranging from tens of thousands of dollars for vegetation removal to hundreds of thousands for active dispersals (e.g. using noise, smoke etc.). There were a few exceptions to these patterns, but they only occurred when there were abundant financial and human resources (e.g. Royal Botanic Gardens Melbourne and Sydney) and/or specific landscape characteristics (e.g., isolation from neighbours or habitat link to 'acceptable' location)(Roberts and Eby, 2013).
7. No dispersal attempt costing less than $250,000 proved successful (Roberts et al., 2021). However, in the Whitsunday region, dispersal of the Proserpine flying-fox roost cost less than half of this amount.
8. Outcomes of dispersals are often not known for several years.

The low success of dispersal attempts is potentially due to the relatively long-life expectancy of flying-foxes (>14 years) and highly migratory behaviour, where they return to known roost sites over their lifetime (Hall, 2002). A review of published research on flying-fox dispersals indicates that there are no conclusive, successful dispersal methodologies recommended, or identification of parameters by which the likelihood of dispersal can be measured; rather, methods and likely success are site-specific.

The literature indicates that, in general, while flying-foxes have the potential to relocate within a 20 km radius of the original roost site, they are far more likely to relocate to an alternative site between 200 m and 2 km of the original roost site. Successful relocations, typically require extensive vegetation removal and ongoing dispersal activities over many years.

5.4.5 Success of Roost Dispersal in Whitsunday Regional Council

Two attempts of dispersing flying-fox have been undertaken in the Whitsunday region.

A flying-fox roost in Faust Street, Proserpine was successfully dispersed in 2016. The roost contained both Little Red Flying-fox and Black Flying-fox, with monitoring activities recording up to 1,700 individuals in March 2016. Flying-foxes were roosting in mango trees on a residential property and adjacent Council parkland. Active dispersal by removing roost vegetation was undertaken in late March, with further vegetation removal and sprinklers used in trees when flying-foxes attempted to return to nearby trees. There has been minimal return of individuals in the preceding eight years, with these dispersing naturally following food resources in the region. Total cost for the dispersal activities was less than $100,000.

Various attempts to disperse flying-fox at Collinsville have occurred since 2021, including tree trimming, smoking, water spraying, peppermint oil and pyrotechnics. Many of these methods moved the flying-foxes to adjacent trees and properties, but no method has been successful in moving the roosts out of town. Costs for deterrents and dispersals between March 2021 to September 2024 was approximately $420,000.

5.5 Roost Management Plans

As of early 2025, the only roost management plan in effect in the Whitsunday Regional Council is for Collinsville. A separate document is available that further details the framework and suitability of management activities at this location.

6.0 Related Documents

Code of Practice: Ecologically sustainable management of flying-fox roosts, Nature Conservation Act 1992. Queensland Department of Environment and Science, 2020. https://www.des.qld.gov.au/policies?a=272936:policy_registry/cp-wl-ff-roost-management.pdf

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Whitsunday Regional Council Flying-fox Policy 2025-2030. https://www.whitsundayrc.qld.gov.au/community-and-environment/our-environment/pest-management-biosecurity-and-wildlife

Whitsunday Regional Council Flying-fox Roost Management Plan – Collinsville. https://www.whitsundayrc.qld.gov.au/community-and-environment/our-environment/pest-management-biosecurity-and-wildlife

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