REGIONAL FLYING-FOX MANAGEMENT PLAN

Lockyer Valley Regional Council

Client: Lockyer Valley Regional Council

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1. Introduction

Flying-foxes, also known as 'fruit bats', are a genus of megabats which occur across tropical and subtropical regions of Africa, Asia, Australia, and some oceanic islands. There are at least 60 species known worldwide, with three (3) species occurring across a range of habitat types in southern Queensland. Flying-foxes are nocturnal and form congregations called roosts during the day, with the sizes of congregations ranging from several individuals to hundreds of thousands. As the size of these roosts grow they can be a source of community concern, with impacts such as noise, odour, disease, damage to infrastructure an damage to fruit crops experienced by nearby residents and landowners.

Flying-foxes play an integral role in regulating and maintaining the eastern Australian environment and are a keystone species within the eastern Australian states. Flying-foxes are key species in pollination of eucalypt and other forests and the dispersal of seeds from fruiting trees, contributing to maintenance of ecological functions throughout the landscape. Some trees like eucalypts only flower at night and depend on flying-foxes to pollinate their flowers and spread their seeds. Without Flying-foxes, there would be no eucalypt forests and no habitat for koalas.

Historically within Queensland and across Australia, Local Government (Councils) have led and coordinated management of flying-fox roosts. Asoon Beginnings Pty Ltd, trading as Range Environmental Consultants (hereafter 'Range Environmental') was engaged by Lockyer Valley Regional Council (hereafter 'Council') to assist in the development of a Flying-Fox Management Plan (FFMP) for the Lockyer Valley Region, providing a long-term, strategic management framework for the region-wide management of flying-fox roosts.

There are thirteen (13) current and historic roosts across the Lockyer Valley region, known to Council through access to the National Flying-fox Monitoring Viewer and engagement with residents. The region currently contains two (2) known permanent roosts which are regularly inhabited, being the Gatton and Laidley Roosts.

Impacts of climate change, extreme heat events, bushfire and, changes to food resource availability are driving changes in flying-fox behaviour across roosts throughout Australia. This plan aims to manage public health, amenity, critical infrastructure supply and conservation considerations in a long-term, holistic and balanced way, ensuring equitable treatment is provided to communities across the region.

1.1 Objectives of FFMP

The FFMP was developed to provide effective, long-term management of flying-fox roosts, particularly in potential and realised high-conflict areas. The key objective of the FFMP is to balance community expectations of Council, public amenity and conservation of flying-fox species across the region. This FFMP has been informed by a Statement of Management Intent (SOMI), which outlines Council's framework for management of roosts. The SOMI has been incorporated into this document and is outlined in Section 9.

This FFMP provides an overview of the following relevant information:

- State and Commonwealth legislative requirements
- Flying-fox ecology
- Roost information
- Councils approach to roost management
- Community education
- Research
- Heat stress management

1.2 Management Responsibilities

The responsibility to manage flying-foxes lies with the owners of lands on which a flying-fox roost is located. Council is not responsible for the management of flying-foxes on land which is not controlled by the Council (e.g. private or state controlled lands).

Council may contribute to joint management activities when human-flying-fox conflicts arise on both private and Council lands. The contributions, and extent, in these circumstances are at the discretion of Council and will be assessed on a case-by-case basis.

Where Council undertakes roost management actions on any lands Council shall seek to engage with the State Government to facilitate cost sharing arrangements through the Department of Environment and Science 'Flying-Fox Roost Management - Local Government Grants Program'.

1.3 Management Approach

Given the significant level of uncertainty of management success and high financial costs associated with management of flying-fox roosts, Council's position is to avoid and minimise interference with flying-fox roosts, with significant roost management actions only undertaken

where a clearly unacceptable impact to public health, amenity or environmental values can be demonstrated.

2. Definitions

2.1 Flying-fox Roosts

Flying-fox roosts are protected under the *Nature Conservation Act 1992*, with management actions required to comply with State Codes of Practice. Under these Codes of Practice specific restrictions apply to management of roosts, dependent on their status as a permanent roost.

Council's position is that an area which contains a congregation (grouping of at least 50 flying-foxes) of flying-foxes between the hours of 6am and 6pm is a roost, and will be managed as a roost. The Department of Environment and Science's Operational Policy *Interim policy for determining when a flying-fox congregation is regarded as flying-fox roost under section 88C of the Nature Conservation Act 1992* provides the State Government legislative definitions for a flying-fox roost. The below definitions have been included from version 2.0 (July 2021) of this Policy.

Table 1 State Government's interim policy for determining when a flying-fox congregation is regarded as a flying-fox roost

Congregation Type	Congregation Characteristics
Flying-fox Roost	• Means a tree or other place where flying-foxes congregate from time to time for breeding or rearing their young.

Permanent Roost	• The site has previously met the requirements to satisfy the roost definition under this policy
	• Includes Continuous Use sites
	  ◦ Continuous Use – indicates that the site is permanently, or almost permanently, occupied by flying-foxes
	• Includes Seasonal Use sites
	  ◦ Seasonal Use – indicates that a site is occupied by flying-foxes during certain periods as a result of the availability of nearby food sources such as nectar/flowers or due to climactic changes such as seasonal temperature variations.
	• Includes New Congregations which satisfy the requirements of the roost definition under this policy

New Congregation	• A site where flying-foxes have not been known to congregate previously, or where occupation has not yet met the criterion for ‘from time to time’ • Includes ‘splinter camps’ • May include overflow from existing roost sites into trees that have previously not been occupied by flying-foxes
Historical Site	• A site that has previously met the 'roost definition' requirements but hasn't been occupied by flying-foxes for a period of 5 consecutive years • If flying-foxes resume occupancy of an Historical Site, the site should be classified as a New Congregation until it has once more met the density, temporal,

Congregation Type	Congregation Characteristics
	behavioural and spatial aspects that allow it to once again be classified as a Permanent Roost
Destroyed Roost	• A site that has been destroyed either legally/illegally or destroyed through natural events (e.g. cyclone, fires etc) and is no longer being occupied by flying-foxes, and not capable of being occupied by flying-foxes.

2.2 Council Definitions

Term	Definition
Codes of Practice	
Low impact activities	Means mulching, mowing, weeding, watering under or near roost trees, minor trimming of roost trees, and installation, maintenance or removal of infrastructure, where the activities are not directed at destroying a flying-fox roost, driving away, or attempting to drive away, a flying-fox from a flying-fox roost, or disturbing a flying-fox in a flying-fox roost.
Management actions	Means non-lethal actions intended to stop flying-foxes from making use of a site or part of a site, and include destroying and/or trimming vegetation at a site, as well as coordinated action to drive flying-foxes away from a site or move flying-foxes within a roost site.
Additional terms	
As-of-right authority	In the context of flying-fox roost management, is a legal right to carry out a flying fox roost management activity, provided the activity is carried out in accordance with the relevant Australian Government and Queensland Government legislation, codes and guidelines. The current Code of Practice for management of a flying-fox roost commenced in 2020.
Buffer zone	Refers to physical separation between humans and flying foxes (such as an area cleared of roost trees)
Flying-fox roost	Refers to a discrete spatial area where flying-foxes (50 or greater) congregate during the hours of 6am to 6pm, regardless of breeding or temporal status.
Common use area	Refers to areas of a property which are accessed and/or actively used by residents, visitors or occupants, for example outdoor seating areas or veranda areas. Common use areas do not include backyards associated with a dwelling.
Containment	Refers to management actions (such as creation of cleared buffer zones) which are aimed at containing flying-foxes within an area of a roost which reduces the impact of the roost on sensitive receptors.
Commonwealth-owned or Commonwealth-managed land	Is property which is under Australian Government control.
Council land	Is property which is under Council.
Creche	Is a tree or other place where females leave dependent young (ie those unable to fly independently)
Dispersal	Refers to management actions which result in temporary or permanent relocation of flying-foxes to alternative roosts

Term	Definition
Flying Fox Roost Management Plan (FFRMP)	Refers to a document which outlines the management approach/strategy for a singular roost or several related roosts.
Food tree	Is a tree or other plant which flying-foxes use as a source of food, typically at night
Owner (of a property)	In the context of this document may refer to the person or organisation who owns, manages, occupies, leases or is otherwise responsible for the property in question (e.g. trustee)
Pollarding	Is the removal of the upper branches of a tree. This may include reducing the tree back to only its basic structural components (the trunk).
Private property	In the context of this document is a property which is owned by a member of the public or a private entity, and the property is occupied by the owner, tenant or manager
Residential dwelling	Is a permanent, approved place of residence, and does not include temporary living facilities, sheds or other constructs on private property
Roost vegetation management plan	A Roost Vegetation Management Plan is a site-specific document detailing potential vegetation management options for a roost. This plan includes maps with specific management areas, proposed management intents/actions, rehabilitation actions and details of sequencing. The intent of this plan is to provide a long-term strategic approach to management of the roost. This plan will also document relevant regulatory requirements or restrictions to vegetation management and include details of whether the roost is a maternity roost. A schedule for works (including timing within the year) is to be included to guide any delivery of management actions.
Sensitive receptor	Sensitive receptors near flying-fox roosts may include dwellings (houses), schools, medical centres, playgrounds, pools, approved/certified attached structures such as patios. It also includes common use areas (such as courtyards) in facilities used by potentially vulnerable members of the community such as children or elderly persons. For the purpose of this plan sensitive receptors do not include agricultural, industrial or indoor commercial areas (i.e. warehouses)
Splinter roost	Refers to a roost which contains a smaller number of flying-foxes which have established in close proximity to an existing roost, typically as a consequence of dispersal actions
SOMI	Statement of Management Intent (provided at section 9)
State-owned or State-managed land	Is property which is under Queensland Government control
UFFMA	Refers to the Queensland Government Urban Flying-Fox Management Area (Appendix A:). An UFFMA delineates where a local government maintains as 'as of right authority' to undertake flying-fox management actions

The Department of Environment and Science definitions for a permanent roost, new congregation, historical roost and destroyed roost will be utilised by Council in the first instance where consideration of these definitions is required.

3. Legislation and Other Requirements

3.1 State and Local Legislative Considerations

Under Queensland's *Nature Conservation Act 1992*, flying-foxes are protected. However, local governments are permitted to interfere with flying-fox roosts within their designated *Urban Flying-Fox Management Areas* (*UFFMA*) under an 'as of right authority'. Where management actions are proposed these are required to be undertaken in compliance with one of the two relevant codes of practice:

- Code of Practice – Ecologically sustainable management of flying-fox roosts
- Code of Practice - Low impact activities affecting flying-fox roosts

Where local governments interfere with a flying-fox roost, methods are limited to non-lethal techniques with implemented controls to avoid harm or death occurring to an animal. The Department of Environment and Science Flying-fox Roost Management Guideline (DES 2020) aids the assessment of viable management options, and the planning of safe and effective management actions in relation to flying-fox roosts.

Under the Queensland Planning framework vegetation clearing is regulated under the *Planning Act 2016* and subordinate regulations. Where clearing of vegetation is proposed, this must be completed in accordance with the requirements of the Act and subordinate regulation.

Vegetation protection provisions may also apply under the local planning scheme in addition to State restrictions. Vegetation clearing within areas of local significance may be assessable development where sought to be undertaken.

Flying-fox roosts are protected under Section 88C of the *Nature Conservation Act 1992*. Under the Act a person must not:

- destroy a flying-fox roost unless the person is an authorised person or the destruction is authorised under this Act;
- drive away, or attempt to drive away, a flying-fox from a flying-fox roost unless the person is an authorised person or the driving away is authorised under this Act; or
- disturb a flying fox in a flying-fox roost unless the person is an authorised person or the disturbance is authorised under this Act.

3.2 Federal Legislative Considerations

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act 1999*) protects the environment in relation to Matters of National Environmental

Significance (MNES) which include listed threatened species and ecological communities. This includes the Grey-headed flying-fox, which is listed as 'vulnerable' under the Act.

Under the EPBC Act, if a flying-fox management action is likely to result in a significant impact on an MNES, the proposal must be referred to the Department of Agriculture, Water and Environment (DAWE) for assessment against the Act.

The EPBC Act Policy Statement: *Referral guideline for management actions in* G*rey-headed and spectacled flying-fox camps* (DoE 2015) provides assistance assessing whether an action may require approval under the EPBC Act. Impacts within roosts which are not identified as nationally significant roosts or which constitute low impact activities such as mowing, minor vegetation trimming, or other activities which apply best practice mitigation standards (outlined in the EPBC Act Policy Statement) are unlikely to require referral to the Department of the Environment. Flying-fox roosts which are occupied by 10,000 of more Grey-headed flying-foxes more than once within the past ten years, or are occupied (either permanently or seasonally) by more than 2,500 Grey-headed flying-foxes each year for the past ten years are considered nationally important.

No Nationally significant flying-fox roosts are currently identified within the region.

Foraging habitat for the Grey-headed flying-fox is protected under the *EPBC Act 1999*. A significant impact assessment against the relevant Commonwealth guidelines is recommended to be undertaken where an ecological values assessment identifies Grey-headed flying-fox habitat is likely to be impacted by a project proposal.

4. Flying Fox Background

4.1 Flying-foxes

There are four native species of flying-foxes in Australia. Three of these species occur in the Lockyer Valley, and all are legally protected. Species present include Grey-headed flying-fox (*Pteropus poliocephalus*), Black flying-fox (*P. alecto*) and the Little Red flying-fox (*P. scapulatus*). These species are all protected under the NCA, and the Grey-headed flying-fox is also listed as 'vulnerable' under the EPBC Act. Images of these species and their national distribution are provided in Figure 1.

Black Flying-fox (*Pteropus alecto*)

Grey-head Flying-fox (*Pteropus poliocephalus*)

Little Red Flying-fox (*Pteropus scapulatus*)

Figure 1 Flying-foxes of the Lockyer Valley Region and their national geographic distribution (sourced from Flying-fox Roost Management Guideline, State of Queensland 2020)

Both the Grey-headed and Black flying-fox have an adult wingspan up to 1 m and a body mass of up 1kg (Hall 2002). Both species occupy coastal regions, while Black flying-foxes also inhabit northern Australia and Grey-headed flying-foxes occupy south-eastern and eastern Australia (Churchill 2008). Across the Lockyer Valley Region, these species are the typical roost inhabitants, with both species recorded year-round.

Both species feed in the canopy of trees, especially blossoms and fruits of eucalyptus, Melaleuca and rainforest trees. The blossoms and fruits from introduced tree species (such as

those found in commercial orchards) are also consumed, particularly in times of limited native food sources (Harden et al. 2004).

Little Red flying-foxes are smaller, weighing up to 500g (Vardon and Tideman 1999), and occur throughout eastern, northern and north-western Australia (Vardon and Tideman 1999). Little Red flying-foxes are nectarivorous, primarily feeding on eucalypt blossoms (Hall and Richards 2000 & Bradford et al. 2022). They are highly nomadic and migrate to northern Australia during the winter. The movements and duration of time spent in a single location by Little Red flying-foxes is understood to be influenced by the availability of food sources (Roberts et al. 2012).

Little Red flying-foxes arrive in the Lockyer Valley region in the warmer summer months as flowering eucalypts provide a ready source of foraging resources. During this period, they may temporarily join camps of Grey-headed or Black flying-foxes, appearing suddenly in large numbers and remaining from a few days to several months. As Little Red flying-foxes roost in dense clusters on individual branches, considerable damage to trees may occur. Where large congregations of this species occur significant community concern can arise, with populations of roosts quickly increasing in size, with corresponding intensification of noise and odour impacts to nearby residents.

4.2 Flying Fox Ecology and Impacts

4.2.1 Roosts

A flying-fox roost is a discrete spatial area where flying-foxes congregate during the hours of 6am to 6pm, regardless of breeding or temporal status. Flying-fox roosts typically are located within vegetation adjacent to watercourses, typically with a dense (but often sparse or absent) understory. Across the region flying-fox roosts have predominantly been recorded along creeks with a mix of dense understory vegetation and open woodland environments. Historic locations of flying-fox roosts across the region have also included large areas of semi-evergreen vine thicket ("dry rainforest" or "vine scrub").

4.2.2 Ecological Importance

Flying-foxes are essential pollinators, by transporting pollen grains between tree species while feeding (Eby 1991; Fujita & Tuttle 1991; Wescott et al. 2008). Fruit seeds are also digested and spread over large areas as they feed and move between roosts (McConkey et al. 2011; Wescott et al. 2008). The ecological function of flying-foxes maintains native forest ecosystems, including hardwood species which are commercially important (Hall & Richards 2000; Rose 2011).

Flying-foxes are able to maintain genetic diversity of forest ecosystems as they have high mobility and can travel long distances regularly, allowing for transport of genetic material to isolated forest patches. This genetic movement/exchange, is becoming even more important with increased habitat fragmentation (Eby 1995). Figure 3 shows an approximate extent of woody vegetation values which may provide foraging habitat areas across the region. As shown on this map of potential food resources significant areas of foraging habitat are provided by the regions northern and southern forests much of which is conserved by National Parks. The Helidon Hills are also thought to provide a ready source of flowering eucalypts to flying-foxes across the Lockyer Valley and Toowoomba Regional areas.

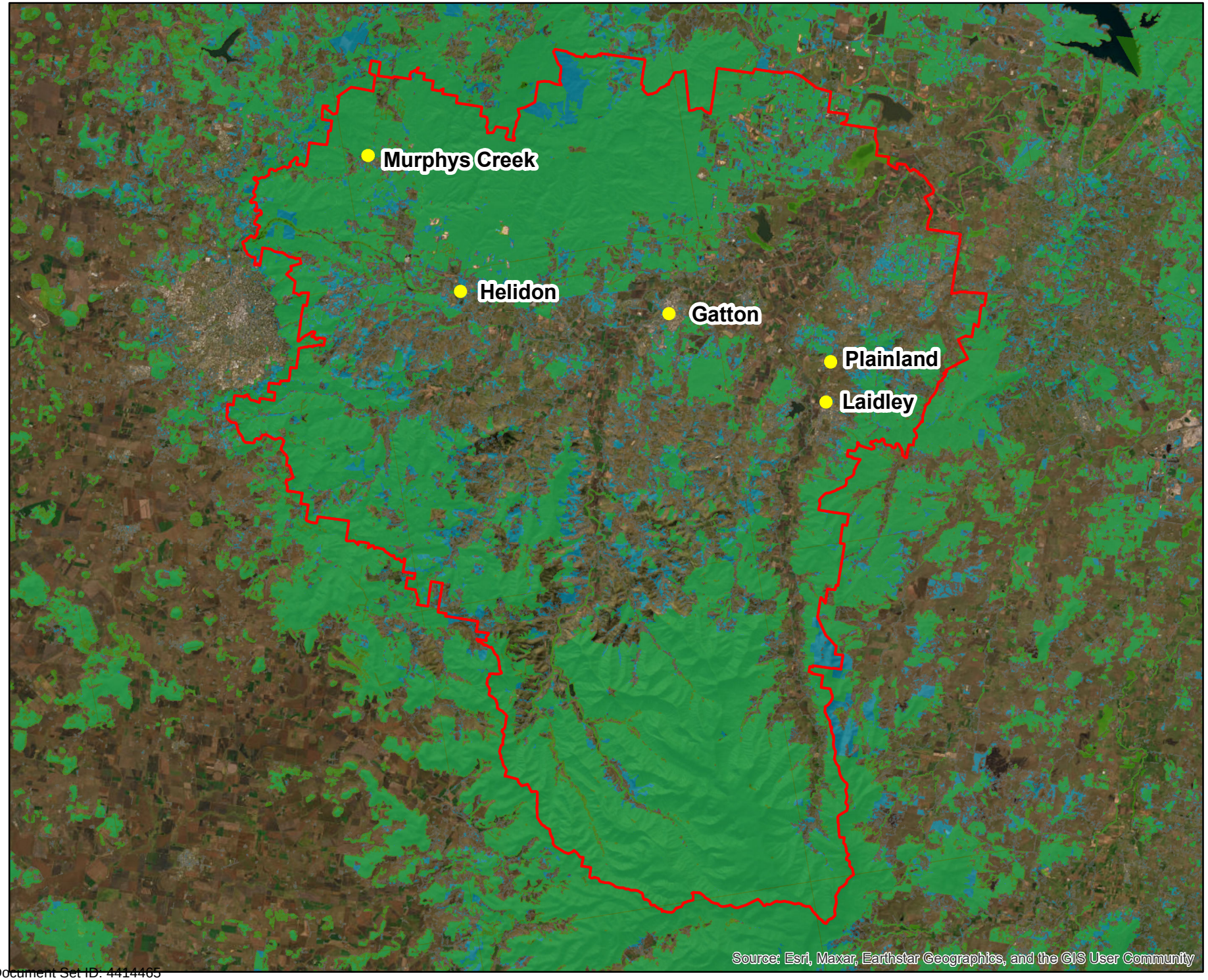

Figure 2
Potential foraging habitat areas (LVRC Region)

Project: Flying-fox Management Plan

Client: Lockyer Valley Regional Council

Project No.: J001024

Compiled by: HB Date: 08/11/2022
Approved by: WG Date: 08/11/2022

Metres
0 5,000 10,000

Legend

- Lockyer Valley Regional Council LGA
- State Protected vegetation values (RVM areas)
- Other woody vegetation values (Additional woody vegetation areas shown by SLATS 2019 mapping)

Source: Cadastral data sourced from DNRME (2021)

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range environmental consultants

4.3 Flying Fox Movements

Flying-foxes have been recorded travelling 50 km from a roost to search for food, and can travel hundreds of kilometres over several nights when moving between roosts. All three flying-fox species found in the region are capable of travelling large distances, which allow them to arrive in large numbers overnight to local flowering events.

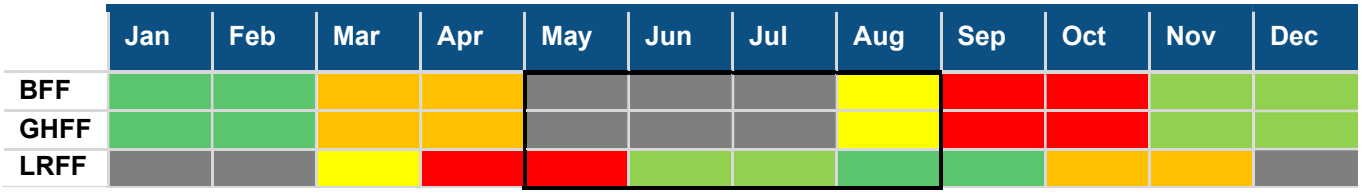
Grey-headed and Black flying-foxes have typically roosted year-round within the region, with regular summer arrivals of Little Red flying-foxes. Limited radio tracking of flying-foxes has been conducted across the region to inform discussion of inter-roost dynamics. Based on the results of other south east Queensland based tracking projects regular movement between roosts is highly likely, with constant turnover of individuals at each roost location (Moreton Bay Regional Council 2022). Thinking of roosts as 'airports' for flying-foxes, with large amounts of different visitors coming and going all the time can help appreciate the management complexities for management of roosts.

4.4 Flying Fox Breeding Cycles

Flying-foxes reach reproductive maturity between two to three years of age, with females producing a single offspring each year, resulting in slow population growth (Westcott et al. 2018).

Flying-fox young are carried by their mothers 'under wing' for approximately four weeks following birth (Markus and Blackshaw 2002). As young grow and become too heavy for their mothers to carry while foraging they are left in crèches within roosts overnight, for up to 8 weeks (Churchill 2008).

Black and Grey-headed flying-foxes both birth their young at roosts across the region.



Key	Stage of breeding
	Peak conception
	Late-stage pregnancy
	Birthing and young under wing
	Pregnant
	Young crèched at roost
	Young capable of short flight
	Period of least impact on breeding

Figure 3 Birthing and breeding cycle for flying-fox species present within the region

Where works are undertaken adjacent to or within camps across the region works should predominantly be undertaken in May to mid August, minimising impacts to breeding cycles and dependent young.

4.5 Threats

4.5.1 Loss of foraging Habitat

Flying-fox foraging habitats include a broad range of eucalypt woodlands, rainforests, semi-evergreen vine thickets and urban green spaces. The habitats have historically been threatened through clearing for agriculture, heavy industry, infrastructure and urban development. The introduction of significant State legislation in 1999 to slow and minimise clearing of remnant and high-value regrowth native vegetation values has played a role in slowing the loss of foraging habitat values for flying-foxes.

Within urban areas where the majority of vegetation comprises regrowth, gardens and parks, streetscape areas and landscape feature trees, limited protection is generally afforded to potential foraging trees., These trees play a potentially significant role in providing food resources for local populations during periods of drought and heat stress.

4.5.2 Roost fragmentation

Flying-fox roosts have been historically disturbed to remove populations from urban and rural centres where noise, odour and disease impacts to residents and landowners can cause significant disruption (Lane 1984). Through these roost management actions large, significant roosts have been disturbed and fragmented resulting in numerous splinter or offshoot roosts. Along waterway corridors this may have resulted in increased 'roost hopping', where a roost seasonally shifts up and down a vegetated corridor. In part, as a result of historic camp disturbance roost sizes have potentially decreased (particularly in very large roosts), however due to the splinter roosts, the number and overall spatial impact of roosts on residents and land managers is likely to have increased, especially in urban areas.

4.5.3 Heat stress and climate change

Long-term changes to the climate of the Lockyer Valley region may lead to increased incidence of extreme weather events including flooding, bushfires, temperature extremes and altered weather patterns. Flying-foxes are extremely vulnerable to high temperatures above 38°C and have suffered widespread mass mortality events where temperatures exceed 42°C. Increases in the frequency and intensity of extreme heat events may result in a rapid population decline, and possible extinction of flying-foxes through death of individuals and reduced reproductive capacity (Welbergen et al 2008).

From the three (3) flying fox species found in the Lockyer Valley, Black flying foxes are the most susceptible species to heat stress, followed by Grey-headed Flying-foxes (Welbergen et al 2008). This increased vulnerability to heat stress events is potentially a result of increasing dispersal ranges to regions where these species were not previously found with increased temperature extremes (Welbergen et al 2008). Evidence suggests that Black Flying-foxes have

lower species-specific physiological limits, which reduces their ability to cope with higher temperatures (Welbergen et al 2008). When Flying-foxes are experiencing higher metabolic activities (e.g. when pregnant or lactating), resting core body temperature is higher, increasing susceptibility to heat stress events (Welbergen et al 2008). Little Red flying foxes may have increased resilience to heat stress events through their regular exposure to high temperature, high humidity climates in northern Australia.

4.6 Living with Flying-foxes

Where flying-fox roosts are close to urban or residential land uses, potential exists for human/wildlife conflict. Typical impacts reported within these situations include noise, odour, disease concerns and impacts to infrastructure and vegetation. Droppings from flying-foxes can also be a source of annoyance to both residents near roosts and residents with significant feed trees within or around their properties.

4.6.1 Disease

Some people worry about flying-foxes spreading disease and threatening both human and animal (pets and livestock) health. While a small proportion of flying-foxes may carry diseases such as Australian bat lyssavirus and Hendra virus, the risk of those diseases being transmitted to people, pets or livestock can be effectively controlled through education, basic hygiene measures, management protocols and Personal Protective Equipment (PPE).

Queensland Health advice on Australian bat lyssavirus (Queensland Health 2022)

Australian bat lyssavirus (ABLV) is a virus closely related to the rabies (classical rabies) virus which causes serious and usually fatal disease in humans. Australia is free from classical rabies in land-dwelling animals. However, ABLV has been found in a number of bat species including flying foxes/fruit bats and microbats. Surveys of wild bat populations have indicated less than one percent of bats carry ABLV. In sick and injured bats, around 7% have been found to carry the virus. However, it must be assumed that any bat (sick, injured or healthy) in Australia could be infectious with ABLV.

Three cases of human infection of ABLV have been recorded in Australia. All occurred in Queensland. All were associated with being bitten or scratched by a bat and all were fatal. Do not touch bats, even if they are injured. Instead, call a trained vaccinated handler to attend the bat: RSPCA (1300 ANIMAL), Department of Environment and Science (1300 130 372), or local wildlife care groups. Only trained and vaccinated handlers should touch bats.

Queensland Health advice on Hendra virus (Queensland Health 2022[1])

Hendra virus was discovered following an outbreak of illness in horses in a large racing stable in the suburb of Hendra, Brisbane in 1994. The natural host for Hendra virus is the flying fox.

The virus can spread from flying foxes to horses, horses to horses and rarely, from horses to people.

Since Hendra virus was identified in 1994, more than 90 horses are known to have been infected. These animals have either died as a direct result of their infection or have been euthanised. Several hundred people have been exposed to Hendra virus infected horses but have not been infected. However, 7 people have been confirmed to have Hendra virus following high levels of exposure to infected horses (excessive contact with horse bodily fluids). Four of these people died, the most recent in 2009.

Evidence of exposure to Hendra virus has been identified in asymptomatic dogs on two occasions. These dogs were identified as contact animals on properties with infected horses. Research and testing of many other animals and insects has shown no evidence of Hendra virus infection occurring naturally in any other species.

4.6.2 Noise

Flying-foxes roosts can often be a source of nuisance to adjacent residents due to loud vocalisations from individuals within roosts. Where roosts are disturbed regularly by human activities or by other animals (such as ibis, crows and domestic dogs) a near consistent level of vocalisation can be heard during the day. Roosts can also become disturbed where individual animals are competing over territorial spaces or mating partners. Flying-fox roosts are generally quiet when undisturbed; however, can be noisier in March and April during peak mating season. During summer months when Little Red flying-foxes arrive roost noise levels can increase rapidly as the roost size and extent increase. These impacts typically subside as the seasonal Little Red flying-foxes continue to follow the flowering eucalypts south.

4.6.3 Odour

Flying-foxes use odour as another form of communication, including the marking of territory or mate attraction. Odour of flying-fox roosts is particularly strong following rain, during hot and humid weather, and large population events (e.g. Little Red flying-foxes temporarily joining a camp). Juvenile flying-foxes also emit scent to help mothers correctly identify their young upon returning from foraging activities.

4.6.4 Droppings

Flying-foxes often defecate at feeding sites and after leaving their roosts, which can impact residents property, including; outdoor furniture, cars, swimming pools, solar panels, washing and roofs. When flying-foxes consume fruit of the introduced cocos palm (*Syagrus romanzoffiana*), their faeces become particularly sticky and more difficult to remove (DAFF 2013). The cocos palm is commonly planted in gardens for ornamental purposes and has been spread and become naturalised throughout SEQ as flying foxes and birds spread its seeds.

4.6.5 Vegetation Damage

Where flying-foxes roost in large numbers, impacts to vegetation values have been recorded. Impacts typically consist of temporary defoliation (loss of leaf cover) and damage (cracking or snapping of branches). Concern generally is raised where impacts to heritage or locally significant values (i.e. street trees) are observable. However, flying-foxes often adjust their core roosting locations within permanent roosts. Within intact forest, damage to vegetation opens the canopy, and initiates a natural cycle of vegetation regeneration in the impacted area (SEQ Catchments 2012). In small remnant vegetation patches with edge effects, damage to vegetation caused by flying-fox activity may increase the impact of invasive weeds within the site (particularly vines) (SEQ Catchments 2012).

From observations of historical flying-fox roosts which have been abandoned disturbed areas of native vegetation often naturally regenerate, allowing for cycling of the vegetation community back to a typical mature status.

Opportunities to manage these impacts on heritage or locally significant trees include; tree trimming, sprinkler systems, nudging of roosts and other novel deterrent devices (odour, noise or light emitters).

4.7 Historic Management of Flying-fox Roosts

4.7.1 Dispersal of Flying-fox Roosts

Flying-fox roost dispersal, which is the permanent exclusion of flying-foxes near human settlements, is a management tool utilised to mitigate human-wildlife conflict (Roberts et al. 2021).

In their review of 48 dispersal attempts at flying-fox roosts across Australia, Roberts et al. (2021), found that in 88% of cases alternative roosts formed within 1km of the original roost site following management actions, transferring conflict to alternative residents. Of the 48 roost dispersal attempts only 23% were considered successful, generally after expensive destruction of roost vegetation.

Costs were poorly documented; however, no roost attempt costing less than $250,000 was successful. The authors of this review paper concluded the following:

- Roost dispersal is a high-risk, high-cost tool for mitigating human–wildlife conflict;
- In situ management strategies and tools should be developed;
- Evidence-based information on management options should be made available to stakeholders via a nationally curated resource library; and
- Research is required on the impacts of roost management practices on flying-foxes.

5. Lockyer Valley Roost History and Community Impacts

5.1 Overview of Roost History

A total of thirteen (13) flying-fox roosts have previously been recorded within the LVRC region. Roost locations have been determined through a combination of access to the National Flying-fox monitoring viewer, Council records and Department of Environment and Science records.

The extent of known current and historical roosts is provided in Figure 4 and tabulated in Table 2. Individual roost maps for the Laidley, Gatton and Helidon roosts are provided at Appendix B:.

Table 2 Known roost locations across the region

LVRC Roost number	Roost	CSIRO NFFMV identification number	Classification	BFF	GHFF	LRFF
Active Roosts (National Flying-fox Monitoring Viewer)						
1	**Laidley**	372	Permanent	✓	✓	✓
2	**Gatton**	347	Seasonal	✓	✓	✓
3	**Helidon**	570	Seasonal	✓	✓	✓
Historical Roosts (natural dispersal and forced)						
4	**Helidon State School**	1036	Destroyed	✓	✓	✓
5	**Murphys Creek**	185	Historical (before 2017)	✓	✓	✓
Unknown Status						
6	**Mt Berryman (Scanlons Scrub)**	178	Unknown	Unknown	Unknown	Unknown
7	**Laidley (Whites Rd)**	188	Historical	Unknown	Unknown	Unknown
8	**Laidley (show grounds)**	215	Historical	Unknown	Unknown	Unknown
9	**Mulgowie**	172	Unknown	Unknown	Unknown	Unknown
10	**Black Duck Creek**	747	Unknown	Unknown	Unknown	Unknown
11	**Mt Berryman (Welks Remnant)**	N/A	Unknown	Unknown	Unknown	Unknown
12	**Adare**	N/A	Seasonal	Not recorded	Not recorded	✓
13	**Regency Downs**	N/A	Unknown	Unknown	Unknown	Unknown

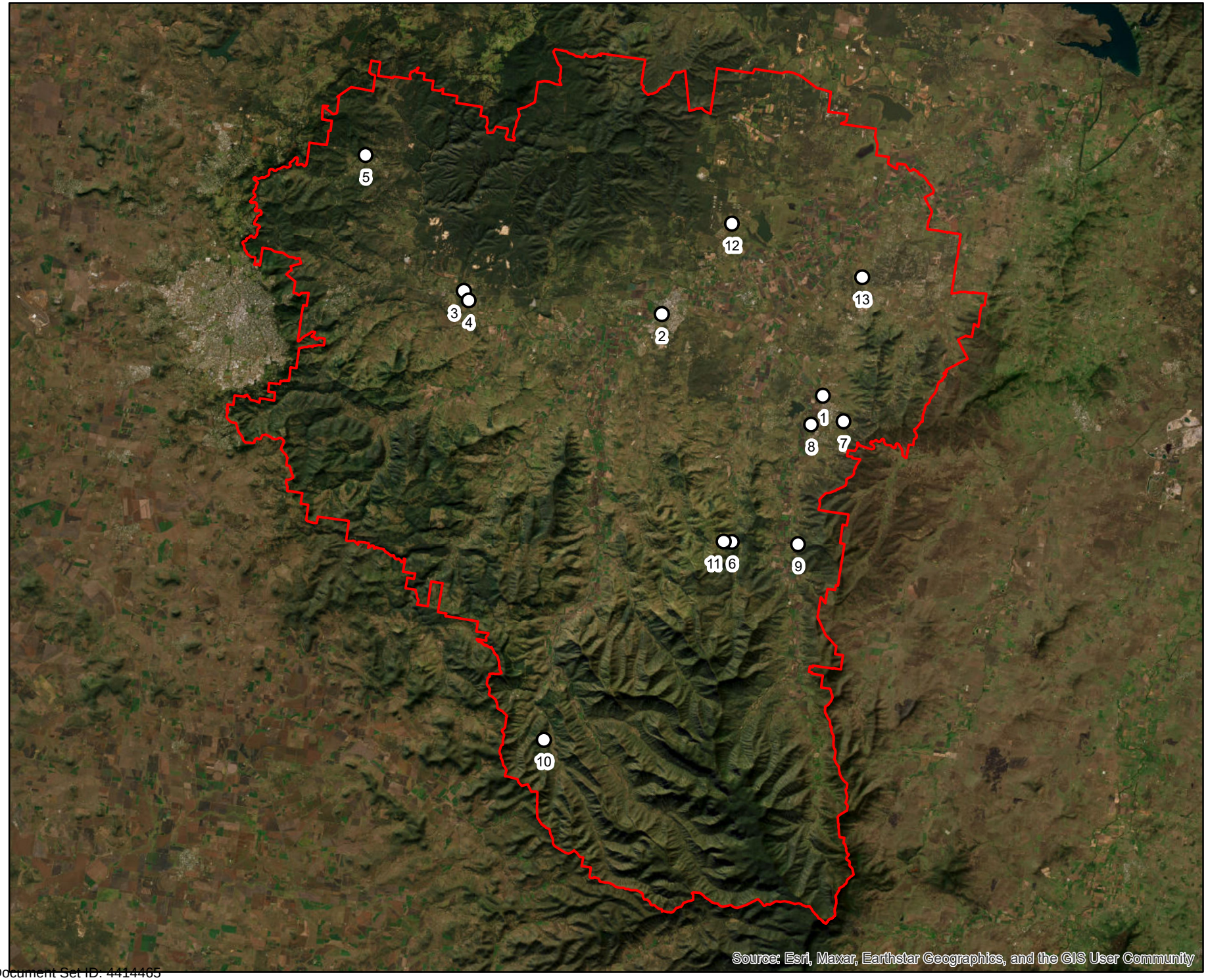


Figure 4
Overview of roost locations (Lockyer Valley Regional Council LGA)

Project: Flying-fox Management Plan

Client: Lockyer Valley Regional Council

Project No.: J000875

Compiled by: HB Date: 08/11/2022
Approved by: WG Date: 08/11/2022

Metres
0 5,000 10,000

Legend

- Lockyer Valley Regional Council LGA
- Roost Locations

Source: Cadastral data sourced from DNRME (2021)

N

range environmental consultants

5.2 Roosts

5.2.1 Laidley (Roost 372)

Flying-foxes have been consistently recorded utilising this site back to at least 2011, with all three species of locally present flying-foxes recorded regularly. Sited along Lagoon Creek and straddling Council controlled land and private land the Laidley Roost has been a source of long-term human/wildlife conflict. The roost itself is, approximately 40m from adjacent residential dwellings at the closest extent. Responding to community concerns in 2017, Council, in conjunction with the private landowner, undertook vegetation management actions within a buffer adjacent to the roost. Council continue to maintain the Council managed park by mowing the areas away from the roost and leaving an unmown buffer around the roost trees to avoid human disturbance, particularly during summer.

The roost is predominantly comprised of mixed native/non-native vegetation including forest red gum (*Eucalyptus tereticornis*), river she-oak (*Casuarina cunninghamiana*), *Angophora sp.*, Chinese elm* (*Ulmus parvfolia*), Sally wattle (*Acacia salicina*), thin pepper* (*Schinus molle*), broad-leaved pepper* (*Schinus terebinthifolius*), *Leucaena sp.**, Groundsel bush* (*Baccharis halimifolia*) and wild tobacco* (*Solanum mauritianum*). Water hyacincth* (*Pontederia crassipes*) has also been recorded within the watercourse. Non native species are marked with '*'.

Appendix B: shows a map of the maximum known roost extents.

Photograph 1 Laidley Roost viewed from south of roost extent

5.2.2 Gatton (Roost 347)

Flying-foxes have been consistently recorded utilising this site back to at least 2008, with all three species of locally present flying-foxes recorded regularly. In 2014 the Gatton flying-fox camp was a source of community concern due to odour, noise and disease concerns, particularly in association with an adjacent care facility. Following consideration of the concerns raised, Council undertook significant vegetation management actions including removal of understory vegetation, pollarding and removal of trees.

Flying-foxes have continued to roost at this site in various extents/locations. A permanent source of water is available at this roost in association with Tenthill Creek.

Flying-foxes continue to roost in mature forest red gum, Moreton Bay ash (*Corymbia tessellaris*), Chinese elm* and Mulberry* (*Morus sp.*). The roost has a predominantly grassy and vine understorey with sparse shrubs. The eastern extent of the roost, near Railway Street, contains a higher density of non-native understory shrubs and trees (Chinese elm and Mulberry).

Appendix B: shows a map of the maximum known roost extents.

Photograph 2 Gatton Roost viewed from west of site

5.2.3 Helidon (Roost 570)

Flying-foxes were recorded occupying this site located along the banks of the Lockyer Creek back to at least 2012. This roost is predominantly recorded as a seasonal Little Red flying-fox roost, with low numbers of Black and Grey-headed flying-foxes from time to time. The roost dissipated in early 2018 possibly due to roost trees dying (either through flood or human intervention), reappearing briefly in April 2020 and February 2021. In November 2019, a flying-fox camp was recorded at Helidon State School (Roost 1036), south of the Warrego Highway and approximately 400m southeast of this historic roost site. Flying-foxes have continued to seasonally roost at the primary Helidon Roost.

Vegetation at the historic Helidon site was observed to be highly impacted from recent flooding events (2021-2022), with numerous likely historical roost trees uprooted. Roosting habitat at this location predominantly constituted forest red gums, River she-oak and Chinese elm*. An exotic understory was present at this roost with extensive non-native grass cover dominating the understory stratum.

Photograph 3 Helidon roost observed from south of Lockyer Creek

Appendix B: shows a map of the maximum known roost extents.

5.2.4 Helidon State School (Roost 1036)

The Helidon State School Roost is a previously destroyed roost sited at the Helidon State School. In November 2019, the roost comprised a population of approximately 1300-1500 Little Red flying-foxes, Black flying-foxes and Grey-headed flying-foxes. The roost was predominantly sited within a large fig (*Ficus microcarpa hilli*) and adjacent Camphor laurel* (*Cinnamomum camphora*) and Silky oak (*Grevillea robusta*) trees.

Concerns regarding the impacts of the roost were raised by the community and school, including disease, respiratory illnesses, faeces and urine contamination of eating and drinking areas, potential for scratches from injured bates, noise impacts on learned, psychological impacts and odour. In response to these concerns, Council engaged Bruce Tomson (Redleaf Environmental) to undertake an assessment of the site in November 2019. The report recommended that dispersal not be undertaken on the grounds that the roost was relatively small, there was a limited risk of flying-fox/human interaction and the likelihood of Little Red flying-foxes moving on as foraging resources shifted with the seasons was high. The assessment also recommended that consideration be made to re-establish trees along Lockyer Creek to provide alternative long-term roosting locations.

The Helidon State School roost continued to be a cause for concern and in mid 2020 the school authority dispersed and destroyed the roost. No flying-fox roosts have been recorded at the site since this time.

5.2.5 Murphys Creek (Roost 185) (Private Property)

The Murphys Creek roost is a large historic roost with documented usage as far back as 2007. Flying foxes have not been recorded through quarterly monitoring since November 2016. Significant numbers of Grey-headed flying-foxes (20,000-50,000) have been recorded historically at this site, with Black and Little Red flying-foxes also recorded.

Vegetation within this roost is generally inaccessible, with the roost understood to be adjacent to the West Moreton Rail Line on private property.

5.2.6 Mt Berryman (Scanlans Scrub) (Roost 178) (Private Property)

No observations of the Mulgowie (Mt Berryman) roost have been made since October 2007. Between 2004 and 2007 all three species of locally occurring flying-foxes were recorded at the site, with up to 8,000 flying foxes recorded at its peak.

5.2.7 Laidley (Whites Road) (Roost 188)

The National Flying-fox Monitoring Viewer locates a historic roost location at Wilson Court, Laidley, however its name references Whites Road which is located 1.7km west. DES historic monitoring data shows a significant influx of 40,000 Little Red, 20,000 Black and 20,000 Grey-

headed flying foxes in October 2009. A subsequent record of 1,000,000 Little Red flying-foxes is recoded in November 2009. No other records of this roost are available and Council was not previously aware of this roost location.

5.2.8 Laidley showgrounds (Roost 215)

The National Flying-fox Monitoring Viewer records a roost location at the end of Hayes Street, with monitoring data recorded in 2018/2019. Council is not aware of a recent roost at this location and this monitoring data is potentially a duplicate of the primary Laidley roost.

Historical anecdotes have been provided to Council of a potential historic roost to the west of the showgrounds generally aligning with the location of Roost 215. Based on these accounts this roost has not been present for several decades.

5.2.9 Mulgowie (Roost 172)

No data on the extent of this roost, or species which have been observed at this roost is available. The location of this roost is maintained with the DES roost locations database.

5.2.10 Black Duck Creek (Roost 747)

No data on the extent of this roost, or species which have been observed at this roost is available. The location of this roost is maintained with the DES roost locations database.

5.2.11 Mt Berryman (Welks Remnant) (Private Property)

An additional Mt Berryman historical roost site is known to have occurred in proximity to Roost 178 within an area of semi-evergreen vine thicket. It is understood that this roost was recorded within the 1990s, however no further information is available and the persistence of the roost is unknown.

5.2.12 Adare (Temporary) (Private Property)

The Adare roost was recorded in January 2021 with approximately 5000-7000 Little Red flying-foxes recorded at the site. The roost is understood to have moved on shortly after arriving. It is unknown whether the abrupt arrival of the flying-foxes was the result of dispersal activities elsewhere.

5.2.13 Regency Downs (Historical) (Private Property)

Approximately 100 flying-foxes were recorded congregating within one (1) tree within a rural residential property within Regency Downs in late 2014. The property contained a water feature and sparse non-remnant vegetation. No detail was recorded regarding the species of flying-fox present or how long the congregation was present at the site.

6. Conservation of Flying-fox Populations

6.1 Whole of LGA Management Approach

Lockyer Valley Regional Council supports a regional approach to management of flying-fox roosts to provide strategic, long-term and ecologically sustainable management of flying-fox roosts and populations throughout their range. Council will provide education and leadership on flying-fox roost conflict management, with this regional flying-fox management plan providing a framework for equitable, evidence based and environmentally responsible management.

6.2 Protection of Viable Flying-fox Roost Locations

Council supports retention and protection of flying-fox roosts unless a clearly unacceptable public impact can be demonstrated. Where significant impacts to sensitive receptors can be demonstrated and the roost is on Council managed land, Council will provide a tailored management strategy to manage and reduce conflict at the site. Council is unsupportive of dispersal activities, due to the significant level of cost to ratepayers, high levels of uncertainty in success, and potential long-term obligations,

Cost sharing agreements are to be sought with the State Government (including where available through grant programs) to support provision of management actions in identified roosts where these are to be undertaken.

6.3 Identification and Establishment of Alternative Long-term Flying-fox Roost Locations

Council supports identification, rehabilitation and establishment of low-conflict, long-term flying-fox roost locations throughout the region. Long-term roost locations are preferred on Council or State managed lands to ensure effective, long-term sustainable management of roosts. Long-term roosting locations may also be supported on high-conservation value properties which are registered with Council or the Department of Environment and Science (such as properties with voluntary conservation agreements, Nature Refuges or Special Wildlife Reserves). Low-conflict locations generally will have the following characteristics:

- No sensitive receptors are located within 150 metres of the roost;
- The site zoning is inconsistent with further intensification of residential or other sensitive land uses;
- The site provides, or is able to provide a permanent water source for flying-foxes; and
- The site supports or is able to support a predominantly native vegetation community.

6.4 Protection and Restoration of Flying-fox Foraging Habitats

Protection and restoration of foraging habitats for flying-foxes is supported by Council as it provides protection of habitats for a range of additional federal, state and local conservation significant species across the region.

6.5 Support for Additional Research

Council supports provision of additional research to fill knowledge gaps in flying-fox ecology, roost choice behaviours and management strategies. Council will seek to partner with the Department of Environment and Science, neighbouring Local Governments, industry and research organisations to facilitate region-based research opportunities. Research topics of high interest to Council include the following:

- GPS tracking research, focusing on the following study areas;
    - Additional roost locations
    - Regional population dynamics
    - Foraging patterns
- Roost impact mitigation and ongoing management measures;
- Roost habitat characteristics;
- Heat stress monitoring and assessments, determining at-risk roost locations; and
- Detailed further assessment and modelling of long-term, low-conflict alternative roost locations.

7. Community Engagement

7.1 Methods

Range Environmental, in partnership with Council undertook the following community engagement actions:

- Review of historical customer requests received by Council in relation to flying-fox management between 2013 and 2022; and
- An online survey regarding Council management of flying-fox roosts throughout the region. This survey was open to all residents of the region, with targeted letter box drop around flying-fox roosts and print media advertising encouraging residents to 'have their say'. See Appendix C:.

7.2 Review of Historic Customer Requests

Review of historical customer requests was undertaken from a period of 2013 to 2022 to inform consideration of the community's engagement with Council in relation to flying-foxes and their management across the region.

In total, twenty (20) requests were in relation to a known roost in LVRC (typically in relation to impacts from a roost), seven (7) requests to Council regarding the removal of a deceased flying-fox, nine (9) miscellaneous, uncategorised requests for information or requests from State agencies, one (1) request for advice regarding a flying-fox roost on private property, and three (3) requests regarding flying-fox foraging activities.

7.3 Community Survey (2022)

In preparation of the FFMP the community were invited to provide feedback to Lockyer Valley Regional Council regarding their views of flying-fox camp management and flying-fox impacts throughout the region. The survey was available online and hardcopy versions available at Council service centres. A phone service was also made available to residents who were unable to access the digital or hardcopy versions. Flyers with a URL link and QR code to the survey were delivered to approximately 550 properties near current and historical flying-fox roosts between Gatton, Laidley, Helidon and Murphys Creek . A total of 18 responses were received. An invitation to local community groups for letter submission was also made, however no submissions were received.

Of the respondents, 44% were from Gatton, 27% were from Laidley and 22% were from Helidon. One response from a suburb not considered to be associated with an active or historical roost site was received. A total of 72% of respondents lived within 1 kilometre of a flying-fox roost, and of the residents 67% had lived near a roost between 1 to 5 years or longer.

The survey predominantly included 'radio button' answers, with options for further comments provided. Questions included the following broad topic groups:

- The locality of the respondent, and their proximity to a flying fox roost
- How long they had lived near a flying fox roost
- Their views on the impacts of flying foxes, and whether their populations were increasing or decreasing and their role in maintaining a healthy natural environment
- What impacts residents had experienced from living near flying-fox roosts
- Details on whether they had ever contacted an authority about flying foxes
- Whether respondents believed Council had an obligation to manage flying-fox roosts on Council and private lands
- What actions they would support Council undertaking in respect to management of flying-fox roosts

Overall, 50% of respondents believe that flying-foxes have a positive impact on the natural environment, 17% were neutral, and 33% believe that flying-foxes have a negative impact on the environment. Of the respondents, 55% believe that populations are increasing

Respondents ranked their concerns relating to the flying-fox roost. Flying-fox noise, odour and property impacts were ranked as issues of highest concern. Half of the respondents to the survey considered living near a roost to be negative, with the views generally that Council is responsible for roost management on all land.

While respondents provided minor changes in responses when asked about what actions should be undertaken on private, rather than Council managed lands these preferences did not change the ranking of preferred management actions. Across both tenures the following general trend in preferences for management actions was recorded:

1. Education
2. Vegetation removal (major or minor works)
3. Find or create alternative roosting sites to encourage flying-foxes to camp in areas that will not affect residents
4. Destruction of flying-fox roost (dispersal)
5. No action

A number of general comments were provided in response to questions and a general comment section provided at the end of the survey. A number of broad suggestions provided by respondents included:

- Council maintaining a level of communication with adjacent impacted residents (i.e. regular letter box drops)
- Council maintaining an up-to-date register of flying fox roost locations and information, ensuring transparency for future prospective landowners
- Protection of habitats
- Provision of alternate habitat areas with suitable foraging, water and microclimate features

The results of the community consultation survey and letterbox flyer are provided at Appendix C:.

8. Council Policy

8.1 Management of Flying Fox Roosts Policy

Council's endorsed 'Management of Flying-Fox Roosts' Policy (Review date: April 2019) outlines the management actions that Council may undertake to reduce the impact of flying-fox roosts in the Lockyer Valley. This Flying-Fox Management Plan will inform a revised Policy document.

9. Statement of Management Intent

9.1 Flying-foxes on Council Managed Lands

Council's primary responsibility is the management of flying-fox roosts on Council managed lands. This can include state owned land, managed by Council as trustee.

Works are to be undertaken in a manner consistent with the following:

- Code of Practice – Low impact activities affecting flying-fox roosts (DES)
- Code of Practice – Ecologically sustainable management of flying-fox roost (DES)
- Flying-fox Roost Management Guideline (DES)
- Any relevant guidance under the EPBC Act 1999 in relation to management of Grey-headed flying-fox roosts

Council's as-of-right authority allows for management of roosts within Urban Flying-fox Management Areas (UFFMA) within the region. Where Council undertakes management of roosts outside of the UFFMA a Flying-fox Roost Management Plan (FFRMP) shall be developed and approved by the State prior to commencement of works. Roosts within and outside the UFFMA are to be managed in a manner consistent with Council's approach to roost management (section 9.3). Council will not extend their as-of-right authority to roosts that Council does not manage and are wholly on private or State managed lands.

9.2 Flying-foxes on Private, State or Commonwealth Managed Lands

Council will not undertake vegetation management, dispersal or significant roost destruction activities on private lands. Council may provide advice and assistance to landowners and residents about flying fox ecology (education), buffer management options and asset protection measures. Where a roost is sited over private and Council lands Council will seek to lead management of the roost and may assist with weed management and minor vegetation works on private lands where a clear community benefit is able to be demonstrated.

Council may seek to assist landowners in obtaining a FFRMP where they seek to obtain one. Council may also support landowners through the following:

- Provision of detailed advice on the vegetation composition of their properties (native/exotic species) and options for management
- Opportunities for wildlife conservation (Land for Wildlife)

- Advice on flying-fox ecology and roost information
- Assistance to landowners in developing an implementation strategy (plan) for low impact activities within the roost, under the DES Code of practice - Low impact activities affecting flying-fox roosts

Council will assess all assessable development at a roost site, or adjacent to a roost site for impacts to a 'Matter of State Environment Significance (MSES) - Wildlife Habitat' value and impacts to local Planning Scheme Overlays.

9.3 Approach to Colony Management on Council Managed Land

Council will implement a staged approach to conflict management where it identifies an unacceptable impact to community health, wellbeing, public amenity or environmental values. Council considers an impact to be unacceptable where a roost is located within 35m from the edge of a sensitive receptor and is causing significant nuisance to occupants or users. A 35m buffer provides an appropriate balance in retention of local vegetation values and provision of setbacks to minimise nuisance to sensitive receptors. This buffer distance is aligned with best practice management of roosts across Southern Queensland.

Council will first undertake community engagement actions to understand impacts to sensitive receptors and any other impacted parties. Council will implement the following staged approach where management of a roost is undertaken in accordance with the relevant code of practice (Figure 5).

See sections 9.5.3, 9.5.4 and 9.5.5 for further detail on the tiers of vegetation management.

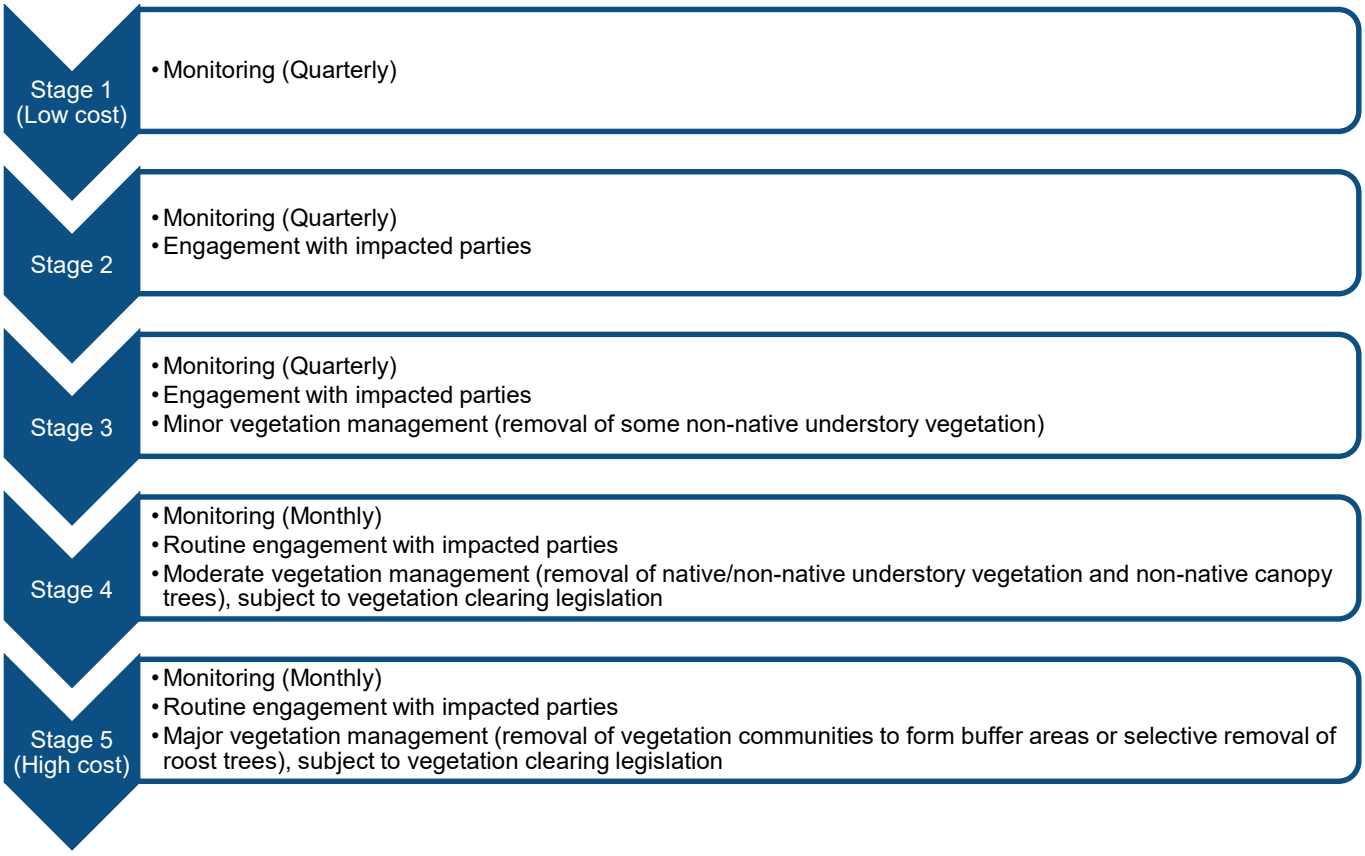


Figure 5 Staged management approach to flying-fox roost management

9.4 Considerations for Management Approach

Council will consider the management of individual roosts in a balanced manner to ensure equitable and responsible governance is provided for the region. Council will consider the following factors when determining a management approach:

- Whether a roost is permanently occupied or seasonal
- The period of occupancy, and roost dynamics (do populations naturally fluctuate significantly in size, extent or location)
- The proximity of sensitive receptors/sites
- The level of impacts to adjacent sensitive receptors/sites
- The probability of success in providing enhanced health, amenity and environmental outcomes as a result of the management actions (i.e. addressing community concerns)
- Regulatory factors (including vegetation management legislation)
- The status of the roost (Nationally significant and/or maternity roost)

- The cost of management actions, and opportunities to receive assistance with funding from the State Government

Council will not support dispersal of a flying-fox roost due to the low likelihood of management success, potential for extreme long-term costs and risk of exacerbating impacts. A successful roost attempt is likely to cost greater than $250,000 and is unlikely to provide a satisfactory long-term outcome.

9.5 Management Decision Support Tool

Council has established a framework for the management of customer requests in relation to the impacts from flying-fox roosts (Figure 6 and Figure 7). Dependent on a range of factors Council will provide an appropriate response to educate, provide advice and where appropriate, deliver actions to manage the impacts of flying-foxes on communities. Council will also seek to work with infrastructure asset managers to manage impacts of flying-foxes on critical infrastructure services. Council's approach to planning and management of specific vegetation management actions within roosts on Council land and which impact sensitive receptors is provided in Figure 7.

Examples of a buffer management approaches are demonstrated in Figures 8 and 9.

Figure 6 Council decision support tool

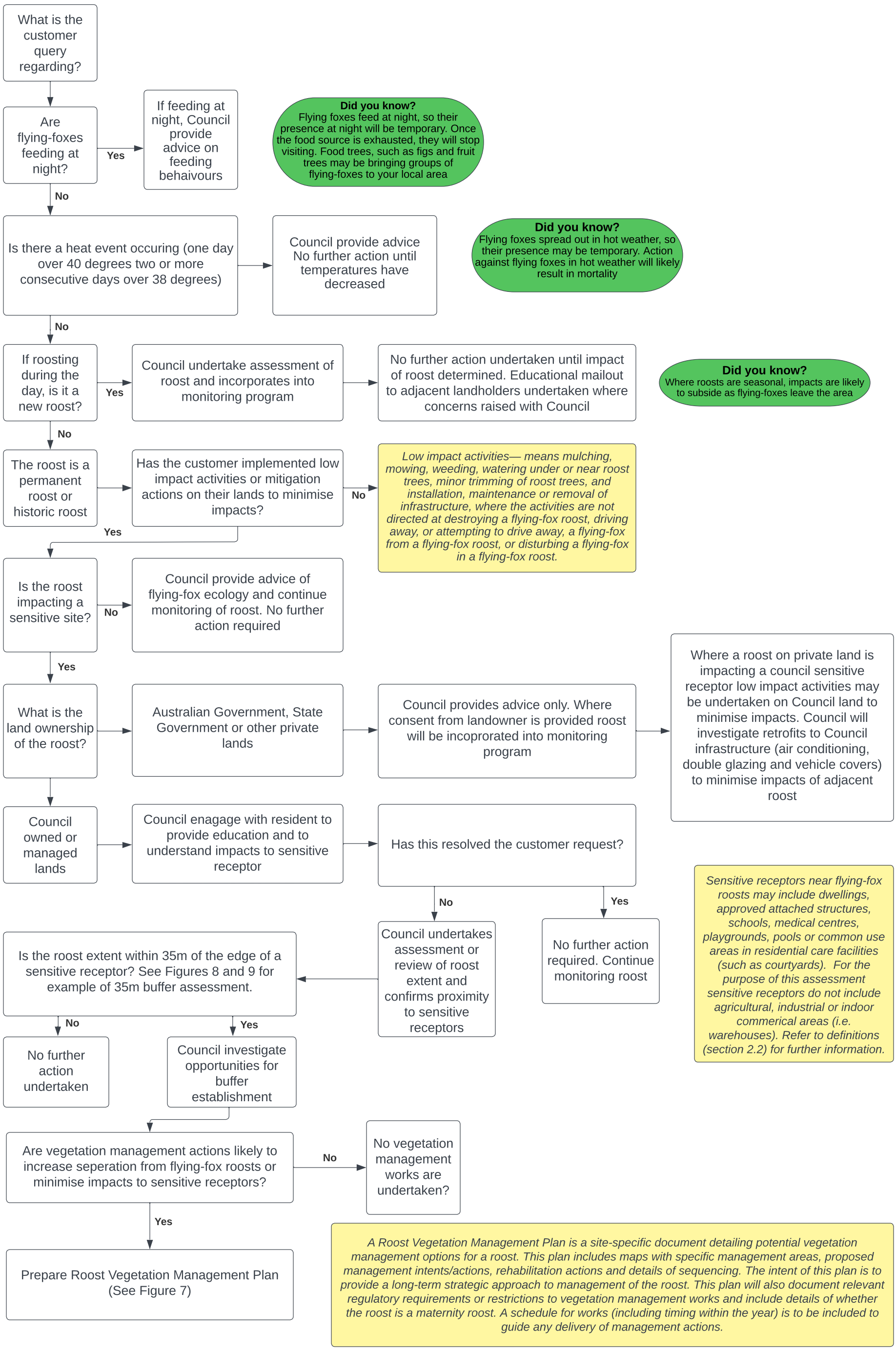
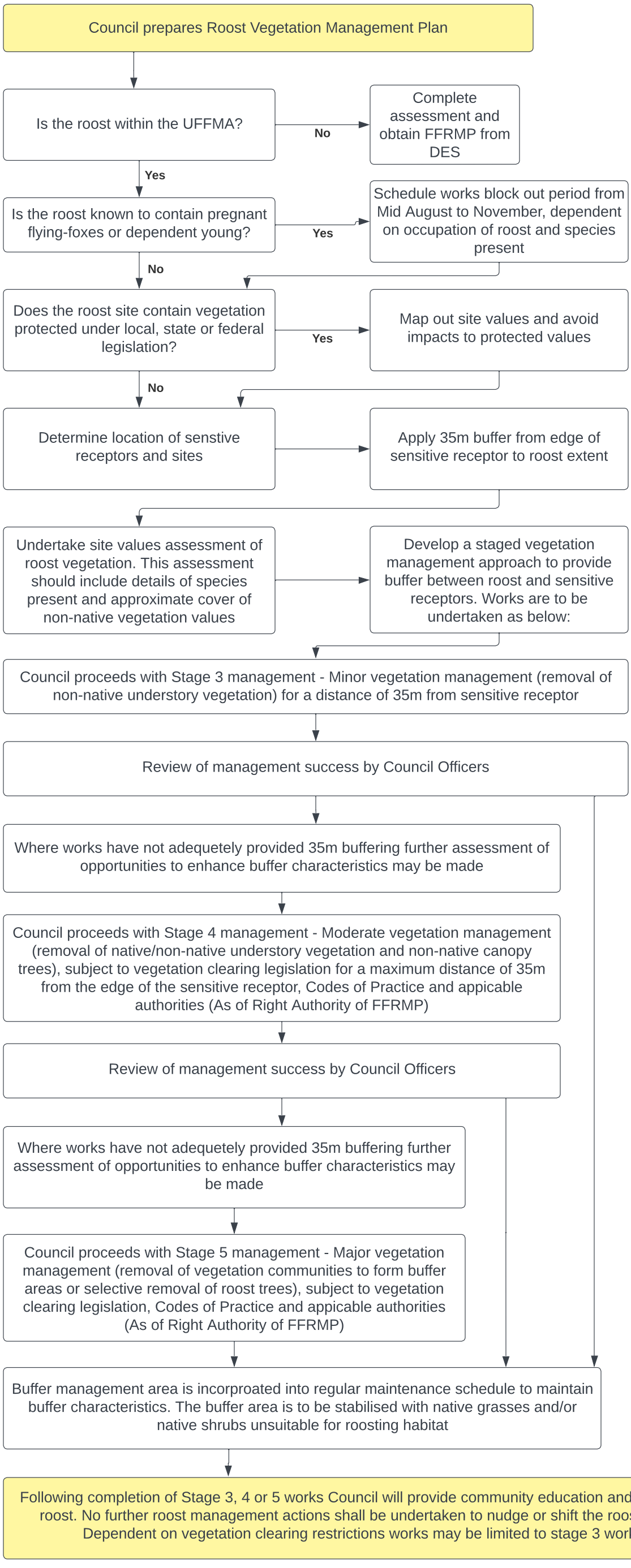


Figure 7 Framework for Roost Vegetation Management Planning



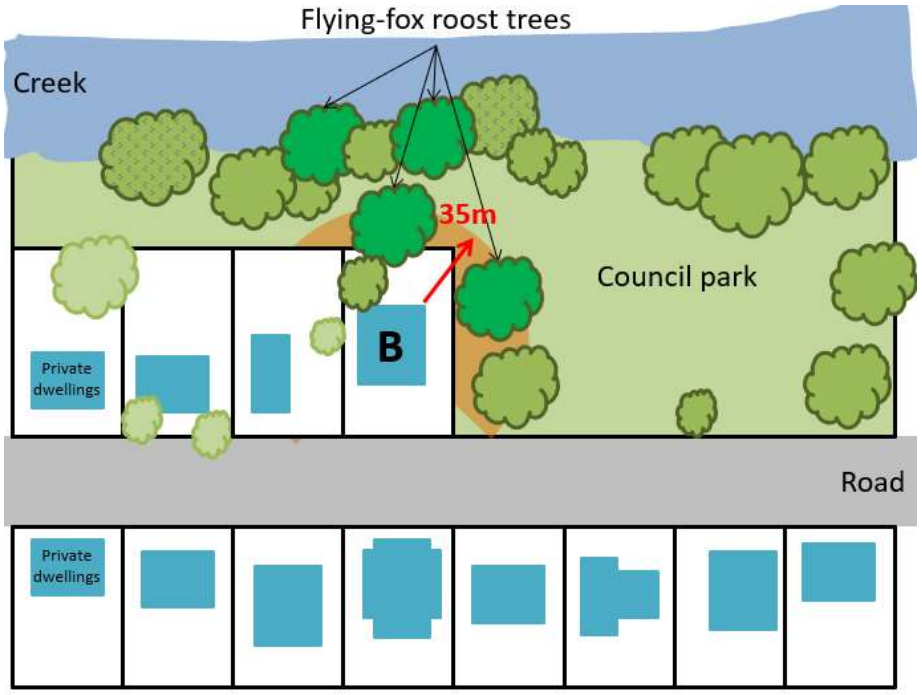
Note: Where a roost is a nationally significant Grey-headed flying-fox roost Commonwealth approval of proposed actions may be required prior to completing the works

The edge of the sensitive receptor is determined to be the outer wall of a dwelling house, approved attached structure (such as patios) or other sensitive receptor use defined in section 2.2. Figures 8 and 9 provide further detail on assessment of these terms.

Did you know?
Management of understory vegetation within flying-fox roosts can often have significant impacts to roost microclimate, density and extent. In the first instance in establishing buffers focus should be on weed management works to 'nudge' the roost further away from sensitive receptors

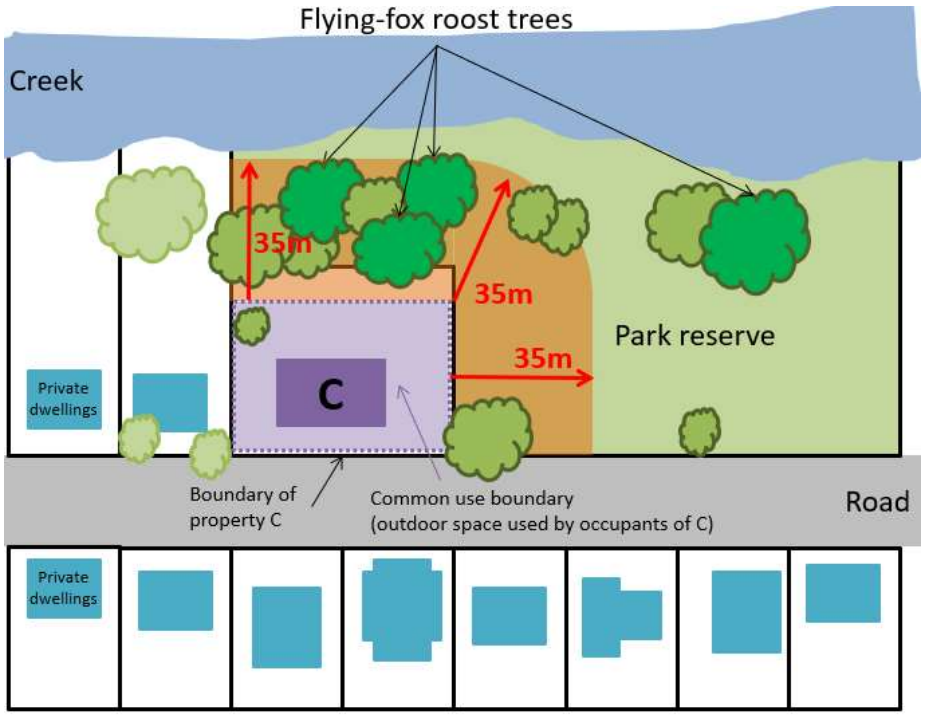
In some instances buffering or 'nudging' may not be effective due to inadequete habitat within the roost to support movement or shifting of the roost. In these instances revegetation and establishment of additional habitat areas may be required to facilitate management. Where revegetation is undertaken, care should be taken to consider any resultant impacts from habitat establishment.

In ecologically sensitive areas (waterway corridors, mapped koala habitat, threatened species habitat or locally significant areas) enactment of Stage 4 or 5 works may not be permissable. Where restrictions to works under these categories are identified, works should be limited to stage 3 (non-native undertsory vegetation removal)



Measured at 35m from the outer wall of the dwelling house or from the edge of an attached approved/certified structure

Figure 8 Example A - 35m buffer assessment (residential dwelling)



Measured at 35m from the edge of the common use area boundary

Figure 9 Example B - 35m buffer assessment (common use area for sensitive receptor such as school or kindergarten)

9.5.1 Monitoring

Council undertakes regular (quarterly) monitoring of several known roosts across the region. Roosts which are wholly on private land, and which are unable to be accessed or viewed publicly are not monitored unless landholder consent is provided to access and monitor. Council is supportive of extending monitoring of roosts to additional roosts across the region and encourages residents to contact Council to notify of any unrecorded roosts.

Council monitors roosts to maintain an understanding of roost dynamics, local breeding observations and potential impacts to the community which allows for informed management decisions to be made. As more roosts are recorded across the region these are to be added to the existing quarterly monitoring schedule.

Data collected by Council officers is provided to the State Government and recorded by the National Flying-Fox Monitoring Viewer.

9.5.2 Engagement with impacted parties (Landholders)

Council will seek to respond and engage proactively with landowners and residents concerned about flying-foxes. Council will share information on flying-fox ecology, roosts and management with concerned parties. Questions or concerns regarding human health and flying-foxes will be referred to Queensland Health and Biosecurity Queensland where detailed advice is sought.

Council will provide advice to landowners and residents on options they may take to mitigate impacts of nearby flying-fox roosts or individual flying-foxes. Options for residents to consider include fruit tree netting, car and vehicle covers, building treatments (glazing improvements), air conditioning, bringing the washing in at night, trimming of trees, clearing of roofs and water tanks and landscaping which does not attract or support flying-fox roosting behaviour.

9.5.3 Minor vegetation management (Weed management)

Minor vegetation management may occur to modify edges of roosts or to increase separation between roosts and sensitive receptors. Minor vegetation management is limited to non-native vegetation within the understory layers and trimming of roost trees (less than 10% of canopy). Minor vegetation management is unlikely to require State or Commonwealth approval. Examples of works include:

- Control of non-native understorey species (e.g. slashing or spraying);
- Removal and disposal of non-native tree saplings; and
- Minor trimming of native and non-native roost trees (in accordance with low-impact guidelines).

Minor vegetation management works are to be designed to reduce densities of flying-foxes in proximity to sensitive receptors or to modify understory vegetation to minimise suitable roost habitat features in buffer areas. Flying-fox roosts are highly sensitive and measures will be undertaken to avoid significant reduction in roosting habitat where no suitable replacement habitat is available as this may splinter roosts. This may include completing weed management works over a staged period, allowing for establishment of alternative native roosting habitat within areas with greater separation from sensitive receptors. Impacts to microclimates in respect to heat-stress management should also be considered when planning works, with significant modification of understory vegetation potentially increasing risk of heat stress within roosts.

9.5.4 Moderate vegetation management

Council may conduct moderate vegetation management works to deliberately modify roost environments to create buffers or areas which support lower densities of flying-foxes in proximity to sensitive receptors. Moderate vegetation management actions include removal of non-native vegetation (all stratum) and removal of native understory vegetation. Moderate vegetation management may require approval and conditions set by either the State or Commonwealth Governments depending on the extent of works. Examples of works include:

- Removal of portions of understorey vegetation (native/non-native);
- Removal of saplings (native/non-native);
- Removal of canopy tree species (non-native); and
- Major trimming of native and non-native roost trees.

Moderate vegetation management actions are likely to impact roosting habitats within sites and are to be undertaken in a strategic manner, minimising impacts to vegetation values which provide ancillary environmental benefits such as creek bank stabilisation. At this level of works potential for unintended impacts is readily present and roosts may splinter or change location. Consideration of potential heat stress impacts from vegetation removal is recommended to be made at this stage of works.

9.5.5 Major vegetation management

Major vegetation management may occur to significantly modify roost extent and to create cleared buffers in proximity to sensitive receptors. This may also include 'nudging' of flying-fox roosts to a preferred roost extent location. Major vegetation management actions include removal of native and non/native vegetation over all strata. These works do not have the objective of destroying a roost and are predominately in relation to creating cleared buffers, allowing for nudging of roosts to achieve greater separation distances. Major vegetation

management may require approval and conditions set by either the State or Commonwealth Governments. Examples of works include:

- Removal of all understory vegetation (native/non-native);
- Removal of saplings (native/non-native);
- Removal of canopy tree species (native/non-native); and
- Pollarding or major trimming of native and non-native roost trees.

Following major vegetation works, actions are to be undertaken to establish a native understory cover inconsistent with flying-fox roosting (such as a native grassland or low height shrub layer).

Major vegetation works are likely to result in high levels of disturbance to flying-foxes, potentially resulting in shifting or long-term changes to roost population and dynamics. At this level of on-ground works significant impacts to a roost microclimate are likely, with potential heat stress event impacts.

Buffers requiring major vegetation works will be extended to maximum width of 35m. Site-specific factors may result in the use of reduced buffer distances when regulatory, environmental or riverine clearing restrictions limit clearing within the roost footprint.

9.6 Timing of Vegetation Management Works

9.6.1 Requirements of Codes of practice

Works within roosts conducted under the DES code of practices may occur at any time of the year. However, the person in charge must consider avoiding the activities where these may negatively impact on the breeding or survivability of the species.

Council will generally not conduct vegetation management works within the roost footprint at the following times:

- when females are in the late stages of pregnancy or there are dependant young (e.g. crèched young, pups) that cannot sustain independent flight
- during or immediately after climatic extremes, or weather events that may cause food shortages, such as periods of unusually high temperatures or humidity, cyclones, fires or during a declared drought

Council gives due consideration of the likely and potential impacts of works and will ensure works are undertaken in a manner which minimises potential to negatively impact the

conservation of flying-fox species which are listed as threatened wildlife under the *Nature Conservation Act 1992*.

Officers should familiarise themselves with the requirements of the codes of practice in relation to the prescribed methods for management actions and prescribed methods for low impact activities.

9.7 Creation of Alternative, Low Conflict Roosting Habitats

Council supports the establishment or expansion of alternative roosting sites to encourage flying-foxes to camp in areas that will not affect residents. Council will investigate opportunities to integrate roost rehabilitation and establishment actions at suitable locations in a strategic and balanced manner.

While subject to previous research no single factor has been determined to conclusively draw flying-foxes to roost locations. Establishment of new roost sites accordingly is a challenging and potentially frustrating exercise for land managers. Where Council seeks to establish or improve potential roost locations this will be conducted in a manner which allows for a suite of potential biodiversity outcomes. Additionally, Council will seek to protect existing low-conflict roosts, and enhance and expand roost locations which are considered to be viable in the long-term.

9.7.1 Criteria for low-conflict roost areas

Suitable features which may support the establishment of roosting habitat include the following:

- Be sited to adjoin a waterway or permanent water feature.
- Be within a vegetated area (or is able to be revegetated) of sufficient size to allow the roost population to expand and contract, and to shift around the site as vegetation is structurally degraded and naturally regenerated
- Appropriate vegetation type and height, generally with a canopy of at least 20m, and a mid-dense to sparse understory
    - Where revegetation of an area is proposed, alignment with the pre-clear regional ecosystem is broadly recommended. Use of 'wetter' species may also support establishment of a more typical flying-fox roost, noting that roosts can occur over a broad range of habitat types. Consideration of planting of food trees for flying-foxes within these roosts is also recommended.
- Be proximal to food resources (i.e. national parks or large intact forests)
- Maintain appropriate separation from sensitive receptors (the closest possible extent of roost area should not extent closer than 150m from a sensitive receptor), and should ideally

be in an open space, environmental management, rural or in some cases large lot rural-residential zoned precincts.

Roosts within conservation managed private properties (i.e. nature refuges, special wildlife reserves, voluntary conservation agreements (covenants) or land for wildlife) are likely to be highly compatible with the long-term management intent. Council will support the long-term management of these roosts for conservation purposes and will investigate opportunities to assist landowners with providing a long-term management framework. Council may also support requests for funding of flying-fox conservation activities through the State's grant funding programs where these are available.

9.7.2 Preliminary assessment of alternate roost locations

A preliminary assessment of Council-owned or managed lands that may contain suitable areas for establishment of alternative low-conflict roosting habitat was conducted. This assessment identifies potential areas for integration into Council land management programs, potentially providing sources of alternate low-conflict roosting habitat for flying-fox populations.

Further analysis of existing local flying-fox roosts is required to refine this analysis.

9.8 Ongoing Community Education

Ongoing community education on flying-fox ecology is likely to lead to greater long-term acceptance of the role of flying-foxes within healthy ecosystems. Typical community education on flying-foxes has been limited to targeted letter box drops around high-conflict roost locations.

The following community education strategies present opportunities to achieve enhanced community environmental awareness:

- Proactive newsletter or roost status letter updates to nearby residents during periods of high occupancy, discussing local flowering species or breeding patterns
- Engagement with local schools and the broader community to provide informative, targeted education on flying-foxes. This could be through print resources (e.g. No me, No tree stickers) or integrating with relevant classes such as environment, geography and biology
- Broad active engagement including community seminars, workshops and information stalls at local markets and events
- Information workshops for conservation landowners across the region to build knowledge among landowners on flying fox habitats and foraging resources (engagement with Land for Wildlife community)

- Media engagement during large influxes, reinforcing messaging on the temporal nature of large congregations and the ecological reasons for visiting the region (large amounts of foraging resources).
    - This could be facilitated through print media, radio and television interviews or short videos on various platforms.

9.9 Council Support for Research

Support for ongoing research into flying-fox ecology by scientific research institutions (Universities and CSIRO) continues to enhance land managers' understanding of flying-fox roost dynamics, locations and impacts across the region. Where possible Council will seek to support research projects which align with Council's strategic priorities through in-kind and grant support (where available). Priority research items to support enactment of recommendations of the plan are identified in section 6.5 of this FFMP.

10. Response to Heat Stress Events

10.1 Impacts of Heat Stress Events

As temperatures exceed 38°C and approach 42°C flying-foxes suffer extreme impacts to their health and survival. In the local context, Black and Grey-headed flying-foxes are more likely to be impacted by periods of extreme hot weather, with Little Red flying-foxes often displaying greater tolerance.

As temperatures approach and exceed these levels flying-foxes ability to thermoregulate themselves diminish. Individuals will display cooling behaviours including wing fanning, clustering, salivating and panting behaviour. As the temperature rises flying-foxes can begin clustering at the base of large trees (where available) as they attempt to cool themselves, potentially leading to decreased cooling as they form dense clumps. Heat stress mortalities may occur prior to flying-foxes reaching the final stage symptoms of heat-stress.

Flying-fox heat stress events have occurred across the Region over the preceding 10 years and are expected to continue. Where Council conducts roost management actions these will not be undertaken during extended periods of high temperatures (exceeding 36° or above). Low impact works (i.e. mowing or regular weeding) may also be temporarily suspended during these periods to reduce disturbance to stressed animals.

10.2 Approach by Council

Council will seek to provide leadership during flying-fox heat stress events to facilitate humane care of flying-foxes in distress by experienced wildlife carers, and to ensure that public amenity is maintained during these periods.

Council has an established procedure for management of flying-fox heat stress events, hereafter the 'heat event response plan'. As part of the heat event response plan the following key stages of management are identified:

1. Disaster Management and/or Bureau of Meteorology alerts for high fire risk and/or high temperature
2. Communications with relevant stakeholders to advise of upcoming potential for heat stress events
3. Preparation of resources at Council depots
4. Heat event - management of event in collaboration with wildlife carers and landowners

a. Council's role during these events is limited to facilitating site access, arranging access to water supplies (where available) and managing stakeholder interactions (neighbours, landowner and wildlife carers).

b. Council Officers shall not handle, touch or treat live flying-foxes. Under the direct supervision and direction of a suitably qualified and experienced wildlife carer Council Officers may support immediate response (spraying or misting of flying-foxes) utilising Council spray assets.

c. Treatment of flying-foxes is to be undertaken by vaccinated wildlife carers. Where a suitably qualified and experienced Council representative is present technical assistance in determining the stage of heat stress may be provided. Council Officers are not responsible for determining the appropriate stage for treatment of flying-foxes.

Noting the potential significant overlap between high-risk bushfire events and flying-fox heat stress events Council is unable to guarantee the supply of water transport and spray units. In the first instance Council's immediate priority is to respond to imminent threats to life and property posed by bushfire events.

5. Clean up and disposal of deceased flying-foxes

6. Post event review by Responsible Officers

Further specific details on the stages of enacting heat stress response actions are provided in the heat event response plan (ECM2470401).

10.1 Liaison with Wildlife Carers

During heat stress events Council will liaise with wildlife carers to facilitate access to impacted roosts for immediate treatment and care of impacted flying-foxes. Where a roost is located on private land Council will seek permission from the landowner for Council staff and wildlife carers to access the property and provide support.

Council will provide water resources to assist with care where available, noting that heat stress events may coincide with high-risk bushfire weather.

10.2 Waste Disposal

During heat stress events Council will seek to isolate deceased or heat-impacted flying-foxes from publicly accessible areas to minimise potential for community interaction with stressed flying-foxes.

Following completion of a heat stress event Council will seek to undertake removal of deceased flying-foxes. Council will seek to assist impacted landowners and landowners with flying-fox

roosts on their properties, however priority for immediate clean-up will be Council managed lands.

Where landowners provide consent to access for management of heat stress events Council will seek to assist within clean-up of deceased flying foxes.

11. Evaluation and Review

The regional Flying-fox Management Plan (FFMP) establishes a framework for long-term, holistic management of roosts in a whole-of-region context. The FFMP is informed by Council Policy and is a tool to assist decision makers make informed decisions on flying-fox roost management opportunities and constraints.

Council shall undertake regular review of regional flying-fox management programs at least once every five (5) years. In completing this evaluation and review Council is to review and update the following components:

- Relevant ecological, behavioural and social information provided within this plan
    - A review of significant research outcomes in relation to flying-fox management practices is recommended to be undertaken
- Roost location information, and updates to roost extent mapping
    - Where additional roosts are identified, these are to be incorporated into this plan to ensure a whole-of-region approach to management is maintained
- A review of the management framework for flying-fox roosts throughout the region. The review should ensure the following outcomes are being achieved:
    - Flying-fox management is undertaken in a considered, well-planned, long-term approach
    - Management intents are clearly identified for roosts across the region
    - Management of roosts maintains a broad level of community support
    - Management frameworks provide for maintenance and improvement of public safety, amenity and critical infrastructure
    - Actions undertaken by Council support the effective long-term conservation of flying-foxes at a state-wide level
    - That the plan be consistent with guidance from the Department of Environment and Science Flying-fox Roost Management Guideline, and complies with relevant codes of practice

12. Key Recommendations

In preparing this regional FFMP recommendations have been developed to assist in prioritising short-medium and long-term management actions. Council may undertake delivery of the identified actions where resources are available and will seek to facilitate cost sharing arrangements with the State, research partners and industry where possible to deliver the recommendations of the FFMP.

12.1 Short to Medium-term Recommendations

Short to medium-term actions are actions identified as priority works for completion or scheduling within 1-3 years of endorsing this plan. Priorities for individual recommendations are likely to alter as roost dynamics shift on a seasonal basis with on-ground works for conflict mitigation (reactive measures) prioritised.

Conflict resolution

- Laidley Roost - Engage with the owner of private lands containing the Laidley roost to develop a site-specific roost vegetation management plan to deliver a stage 3 roost management approach.
    - It is recommended that a 20m understory vegetation management area be established to the rear of adjacent residential properties. Given the narrow width of the corridor and setback of dwellings from rear boundaries, furthermore intensive vegetation management works are not recommended
    - Council is to investigate opportunities to deliver these works under the State flying-fox roost management grants program, noting that community benefit is likely to be achieved through supporting works on public and private lands

Education

- The installation of interpretive signage at high visibility roosts (Laidley)
- Delivery of regional flying-fox education workshops targeted at impacted residents, interested residents and conservation partners across the region
- Flyer drops to residents adjacent to major roosts during periods of significant population increases at urban roost locations
- Investigate opportunities to develop guidance material on suitable local revegetation options for flying-fox foraging habitats and roosts, for example through Land for Wildlife program

Alternative long-term low-conflict roost habitats

- Review of identified potential suitable alternate low-conflict roost habitat establishment areas, and/or investigate requirements for further detailed assessment

Research

- Support the delivery of a regional or bioregion-based flying-fox roost mapping program through use of GPS tracking collars.
    - Identification of adjacent partner Councils is recommended to allow pooling of resources and sharing of research outcomes
    - The Queensland Government flying-fox roost management grants may support delivery of these project works
- Implement a quarterly monitoring survey of all identified roosts across the region, maintain a roost monitoring register and provide data to the Department of Environment and Science

12.2 Long-term Recommendations

Long-term recommendations are actions identified to be undertaken over an extended period of time (1-5 years) to provide long-term management outcomes. Identified actions are likely to be delivered in association with regional delivery of additional conservation and operational programs

Conflict Management

- Establish and maintain a level of regular written and oral communication with residents adjacent to flying-fox roosts under Council management, providing updates on any roost management actions and seasonal influxes

Education

- Partner with local universities and schools to identify opportunities to provide environmental education outcomes, reinforcing the key ecological function of flying-foxes

Alternative long-term low-conflict roost habitats

- Investigate opportunities to deliver roost habitat establishment at identified areas through Council conservation programs. This action should focus on integration of revegetation actions into strategic Council programs to leverage additional environmental outcomes.
- Investigate opportunities to support the protection, enhancement and establishment of suitable alternative roost sites on private and public conservation properties through a local grants program

- Following prioritization of identified low-conflict, long-term alternative roost sites (short-moderate term recommendation), develop rehabilitation plans for proposed alternative locations and enact plans

Research

- Support delivery of bioregion scale (whole of SEQ) research programs through in-kind support, with priority in supporting the following research priorities:
  - The creation of suitable alternative roost habitat areas
  - Foraging habitat (including mapping of seasonal habitat areas)
  - Habitat impact assessment
  - Roost management and conflict mitigation actions
  - Education programs and stakeholder engagement approaches

13. References and Resources

Australian Bat Lyssavirus, viewed 3 November 2022, Queensland Health, Brisbane, <http://conditions.health.qld.gov.au/HealthCondition/condition/14/217/10/australian-bat-lyssavirus>.

Bradford, M Venz, M, Bell, K Hogan, L Smith, G Eby, P Eyre, T Mckewown, A Vanderduys, E Macdonald, S & Westcott, D 2022, 'The diet of a specialist nectarivore in Australia: The little red flying-fox (Pteropus scapulatus, Pteropodidae)', *Austral Ecology*, vol. 47, no. 3, pp. 619-628.

Churchill, S 2008, *Australian Bats*. Second Edition. New Holland Press, Sydney

DAFF 2013, Cocos or Queen palm Fact Sheet, The State of Queensland, Department of Agriculture, Fisheries and Forestry, <https://www.daf.qld.gov.au/__data/assets/pdf_file/0019/52831/IPA-Cocos Queen-Palm-PP73.pdf. Accessed 09 February 2016>.

Eby, P 1991, 'Seasonal movements of grey-headed flying-foxes, Pteropus poliocephalus (Chiroptera: Pteropodidae), from two maternity camps in northern New South Wales', *Wildlife Research*, vol. 18, no. 5, pp. 547–559.

Eby, P 1995, 'The biology and management of flying-foxes in NSW', Species management report number 18. Llewellyn, L. (ed). NPWS, Hurstville.

Flying foxes, viewed 3 November 2022, Moreton Bay Regional Council, <https://www.moretonbay.qld.gov.au/Services/Environment/Local-Wildlife/Flying-Foxes>.

Fujita, M & Tuttle, M 1991, 'Flying Foxes (Chiroptera: Pteropodidae): Threatened Animals of Key Ecological Importance', *Conservation Biology*, vol. 5, no.4, pp. 455-463.

Hall, L & Richards, G 2000, 'Flying Foxes: Fruit and Blossom Bats of Australia', University of New South Wales Press, Sydney.

Hall, L 2002, 'Management of flying-fox camps; what we have learnt in the last twenty-five years', pp. 215-224 in: Managing the Grey-headed Flying-fox as a Threatened Species in NSW, Royal Zoological Society of NSW, Mosman NSW

Harden, G Fox, M & Fox, B 2004., 'Monitoring and assessment of restoration of a rainforest remnant at Wingham Brush, NSW' *Austral Ecology*, vol. 29, pp. 489–507

Hendra Virus Infection, viewed 3 November 2022, Queensland Health, Brisbane, <http://conditions.health.qld.gov.au/HealthCondition/condition/14/217/363/hendra-virus-infection>.

Lane 1984, Going in to Bat for Queensland Flying-Foxes', *Australian Natural History*, vol. 21, no. 7, pp. 306-307.

Markus, N. & Blackshaw, J 2002 ‘Behaviour of the black flying fox Pteropus alecto: 1. An ethogram of behaviour, and preliminary characterisation of mother-infant interactions’, *Acta Chiropterologica*, vol. 4, no. 2, pp. 137–152.

McConkey, K. Prasad, S Corlett, R Campos-Arceiz, A Brodie, J Rogers, H & Santamaria, L 2012, *Biological Conservation*, vol. 146, no. 1, pp. 1–1.

Roberts, B Catterall, C Eby, P & Kanowski, J 2012, 'Long-Distance and Frequent Movements of the Flying-Fox Pteropus poliocephalus: Implications for Management' *PLoS ONE*, vol. 7, no, 8.

Roberts, B Mo, M, Roache, M & Eby, P 2021, ' Review of dispersal attempts at flying-fox camps in Australia', *Australian Journal of Zoology*, vol. 68, no. 6, pp. 254-272.

Rose D 2011, 'Flying Foxes: Kin, Keystone, Kontaminant. Australian Humanities Review', 50, special issue: ‘Unloved Others: Death of the disregarded in the time of extinctions’, Deborah Rose & Thom Van Dooren (eds), ANU E Press, Canberra, ACT.

Vardon, M & Tidemann C 1999, 'Flying-foxes (Pteropus alecto and P. scapulatus) in the Darwin region, north Australia: patterns in camp size and structure', *Australian Journal of Zoology*, vol. 4, pp. 411-423.

Welbergen, J Klose, S Markus, N & Eby, P 2008, ‘Climate change and the effects of temperature extremes on Australian flying-foxes’, Proceedings of the Royal Society B’, vol. 275, no. 1633.

Westcott DA, Dennis AJ, Bradford MG, McKeown A, Harrington GN, 2008, 'Seed dispersal processes in Australia’s Wet Tropics rainforests. In: Stork N and Turton S, Living in a dynamic tropical forest landscape', Blackwells Publishing, Malden. pp. 210-223.

Westcott, D Caley, P Heersink, D & McKewown, A 2018) ‘A state-space modelling approach to wildlife monitoring with application to flying-fox abundance’, *Scientific reports*, vol. 8, no. 1, pp. 1–9.

13.1 Further information and resources

Roost Management - codes of practice and guidelines

Department of Environment and Science 2020, *Code of Practice Ecologically sustainable management of flying-fox roosts Nature Conservation Act 1992*, Queensland Department of Environment and Science, Brisbane.

Department of Environment and Science 2020[1], Code of Practice Ecologically sustainable management of flying-fox roosts Nature Conservation Act 1992, Queensland Department of Environment and Science, Brisbane.

Department of Environment and Science 2020[2], *Flying-fox Roost Management Guideline, Wildlife and Threatened Species Operations*, Department of Environment and Science, Brisbane.

Department of Environment and Science, Queensland Parks and Wildlife Service and Partnerships 2021, *Interim policy for determining when a flying-fox congregation is regarded as flying-fox roost under section 88C of the Nature Conservation Act 1992*, Department of Environment and Science, Brisbane.

Education

Department of Environment and Science Frequently Asked Questions (FAQs), https://www.qld.gov.au/environment/plants-animals/animals/living-with/bats/flying-foxes/about-flying-foxes/questions-and-answers

Southern Queensland Flying-fox Education Kit 2022, Burnett Mary Regional Group, < https://www.allaboutbats.org.au/education/flying-foxes/>.

Sunshine Coast Council 2022, BatPod podcast, https://www.sunshinecoast.qld.gov.au/Environment/Native-Animals/Flying-Foxes/Education-and-events/BatPod-Podcast

Heat Stress

Flying-fox heat Stress Forecaster, https://www.animalecologylab.org/ff-heat-stress-forecaster.html

Department of Environment and Science 2022, Interim flying-fox heat stress guideline, Department of Environment and Science, Brisbane.

Department of Environment and Science 2022[1], Technical appendices - Interim flying-fox heat stress guideline, Department of Environment and Science, Brisbane.

Roost Vegetation Management and Revegetation

Management and Restoration of Flying-fox Camps 2012, SEQ Catchments, https://www.environment.nsw.gov.au/resources/animals/flying-fox-2014-subs/flyingfoxsub-jenny-beatson-part3.pdf

Appendix A: Urban Flying-fox Management Area

N

SOMERSET REGIONAL

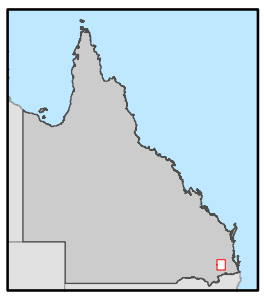
Buaraba South
Churchable
Fifteen Mile
White Mountain
Spring Creek
Lockyer Waters
Murphys Creek
Seventeen Mile
Vinegar Hill
Lynford
Kentville
Ballard
Upper Lockyer
Morton Vale
Lockrose
Lockyer
Helidon
Adare
Lake Clarendon
Brightview
Grantham
Ringwood
Glenore Grove
Postmans Ridge
Regency Downs
Kensington Grove
Withcott
Helidon Spa
Lawes
College View
Crowley Vale
Placid Hills
Gatton
Hatton Vale
Plainland
Blanchview
Forest Hill
Derrymore
Iredale
Carpendale
Veradilla
Silver Ridge
LOCKYER VALLEY REGIONAL
Lower Tenthill
Woodlands
Laidley North
Summerholm
Lilydale
Glen Cairn
Upper Flagstone
Flagstone Creek
Laidley Heights
Preston
Laidley
Stockyard
Upper Tenthill
Ropeley
Blenheim
Laidley Creek West
Rockmount
Laidley South
Egypt
Mount Whitestone
Caffey
Rockside
IPSWICH CITY
Mount Berryman
Fordsdale
Mulgowie
Mount Sylvia
Ingoldsby
West Haldon
Woodbine
Lefthand Branch
Thornton
Junction View
TOOWOOMBA REGIONAL
East Haldon
SCENIC RIM REGIONAL
Black Duck Creek
Townson
SOUTHERN DOWNS REGIONAL

LOCKYER VALLEY REGIONAL

Legend

- Urban Flying-Fox Management Area
- Local Government Area
- Road

0 1.25 2.5 5 7.5 km



Urban Flying-Fox Management Area

COORDINATE SYSTEM: GCS GDA 1994
HORIZONTAL DATUM: GDA 1994

MAP PRODUCTION
29 July 2013
Nature Conservation Services
Department of Environment and Heritage Protection

Queensland Government

Appendix B: Extent of Roosts

Appendix B1 - Laidley (Roost 372) extent

Appendix B2 - Gatton (Roost 347) extent

Appendix B3 - Helidon (Roost 570) extent

Further information on roost locations and extents is available on request from Lockyer Valley Regional Council.

Appendix B1 Laidley (Roost 372) extent

Project: Flying-fox Management Plan

Client: Lockyer Valley Regional Council

Project No.: J000875

Compiled by: HB Date: 08/11/2022
Approved by: WG Date: 08/11/2022

0 50 100 Metres

Legend

Laidley (Roost 372)

Source: Cadastral data sourced from DNRME (2021)

N

range environmental consultants

Appendix B2 Gatton (Roost 347) extent

Project: Flying-fox Management Plan

Client: Lockyer Valley Regional Council

Project No.: J000875

Compiled by: HB Date: 08/11/2022
Approved by: WG Date: 08/11/2022

0 50 100 Metres

Legend

Gatton (Roost 347)

Source: Cadastral data sourced from DNRME (2021)

N

range environmental consultants

Appendix B3 Helidon (Roost 570) extent

Project: Flying-fox Management Plan

Client: Lockyer Valley Regional Council

Project No.: J000875

Compiled by: HB Date: 08/11/2022
Approved by: WG Date: 08/11/2022

0 75 150 Metres

Legend

Helidon (Roost 570)

Source: Cadastral data sourced from DNRME (2021)

N

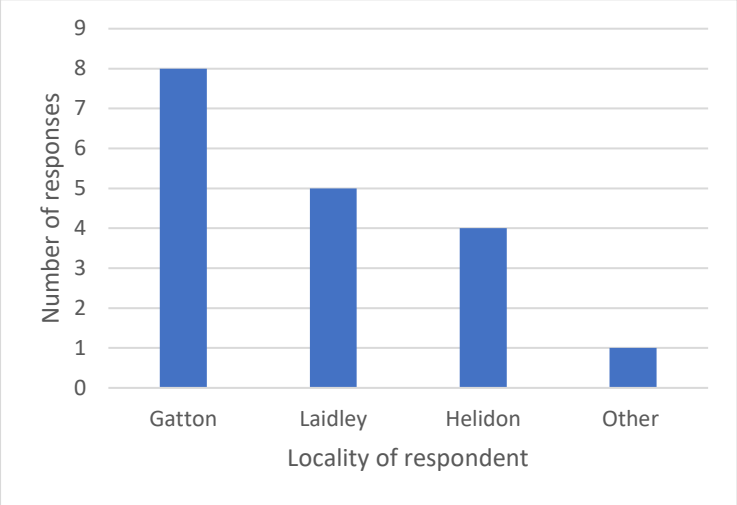
range environmental consultants

Appendix C: Community Survey Results and Consultation Resources

Lockyer Valley Regional Council Flying-fox Community Consultation

Q1 What locality do you live in? (Suburb)

Answered: 18 Skipped: 0



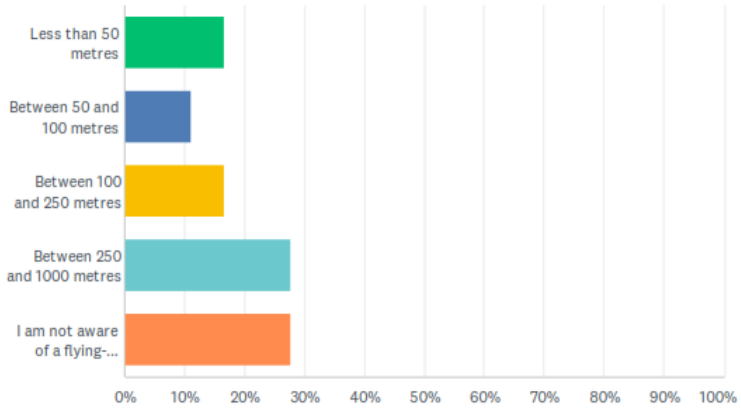
Q2 What is your residential address? (Street address)

Answered: 17 Skipped: 1

Data withheld – confidential

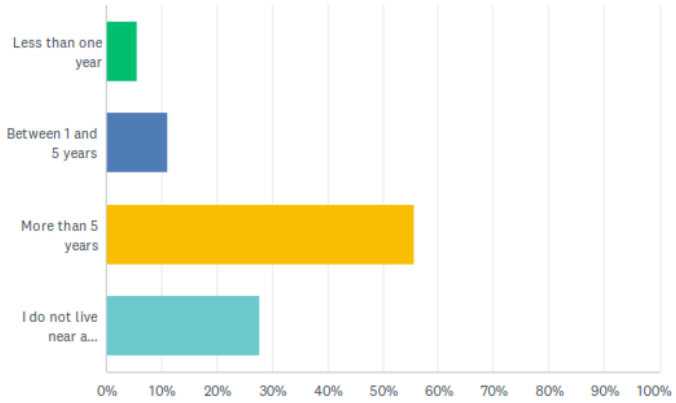
Q3 Approximately how close is your house to a flying-fox camp (a tree, or patches of trees where flying-foxes congregate during the day)?

Answered: 18 Skipped: 0



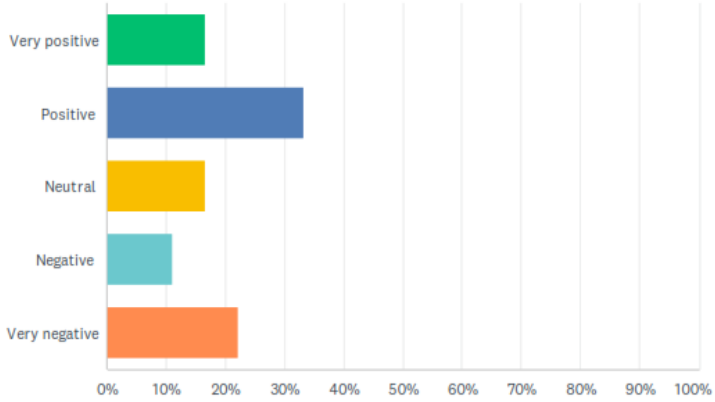
Q4 If you live near a flying-fox camp, how long have you lived near it?

Answered: 18 Skipped: 0



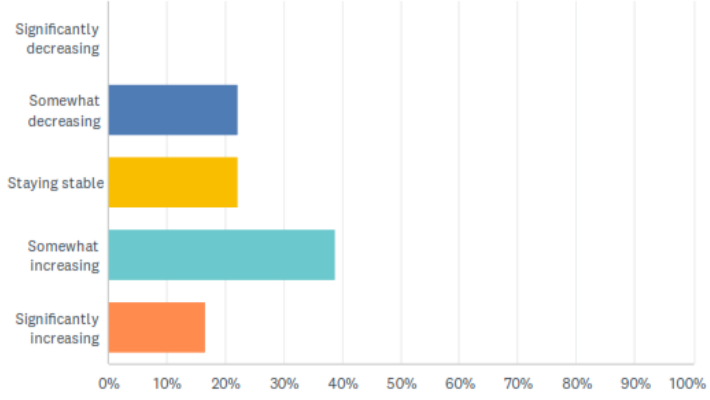
Q5 Overall, do you believe that flying-foxes have a positive or negative impact on the natural environment?

Answered: 18 Skipped: 0



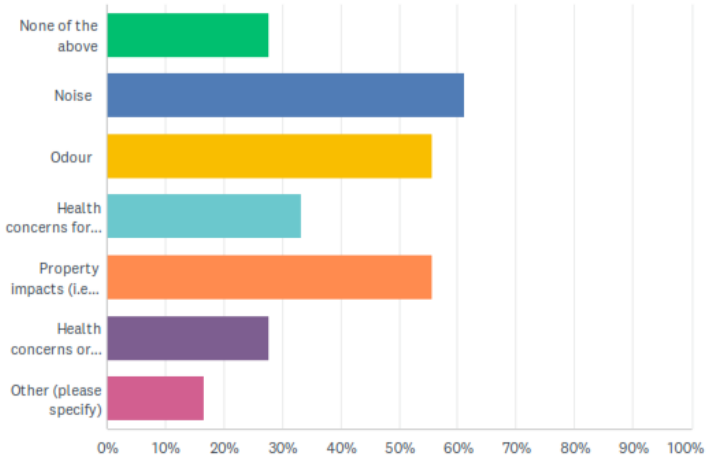
Q6 Do you think flying-fox populations are increasing or decreasing in your local area?

Answered: 18 Skipped: 0



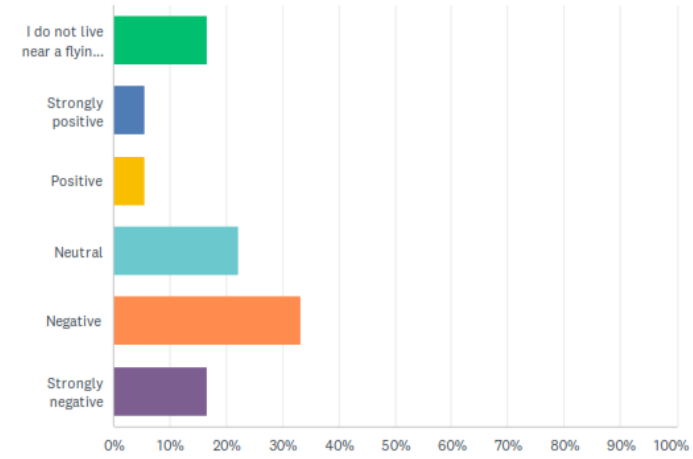
Q7 What impacts from flying-fox camps have you, your family or property experienced? (Select all that apply)

Answered: 18 Skipped: 0



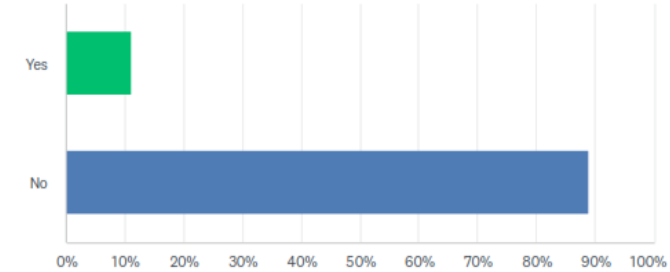
Q8 What is your overall attitude to living near a flying-fox camp?

Answered: 18 Skipped: 0



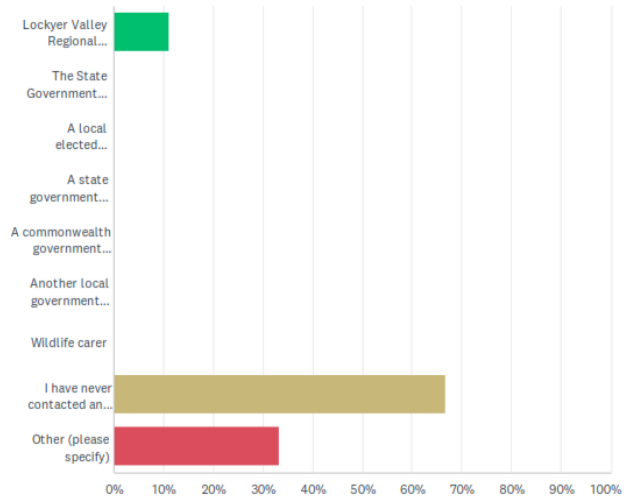
Q9 Have you ever contacted an authority about flying-foxes?

Answered: 18 Skipped: 0



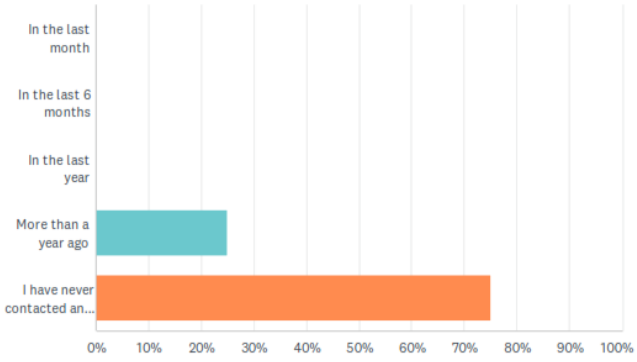
Q10 Who did you contact?

Answered: 9 Skipped: 9



Q11 When did you contact this authority?

Answered: 12 Skipped: 6



Q12 Why did you contact this authority?

Answered: 4 (1 non responsive) Skipped: 14

1. Filled in a survey
2. Health risk to the community specially the children at the school.
3. Our trees were dying. The paint on our car was damaged. The smell and noise was becoming unbearable. Tank water contaminated.

Q13 What was the outcome of your contact with an authority?

Answered: 4 (1 non responsive) Skipped: 14

Individual responses:

1. Tree being cut down.
2. Took many written complaints before anything was done. Eventually they chopped the trees back.
3. We were told the Bats were protected and there was nothing they could do.

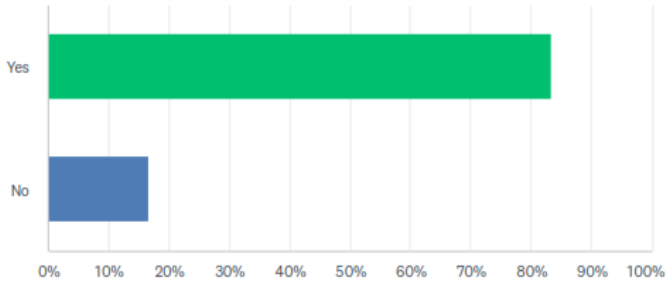
Q14 Were you satisfied with the outcome?

Answered: 4 (1 non responsive) Skipped: 14Individual responses:

1. No, because it did not solve the problem in the long term.
2. Yes

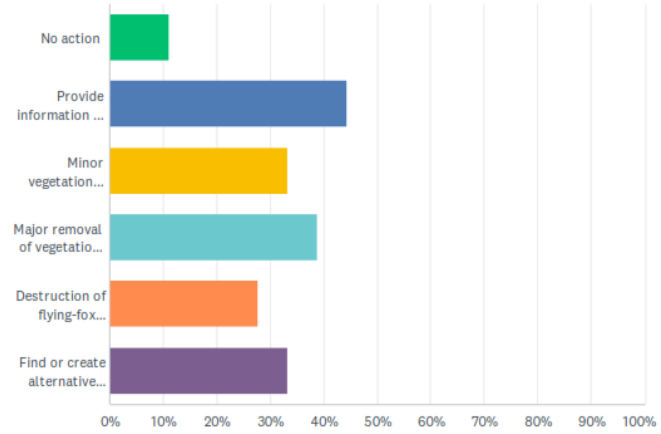
Q15 Do you think Council should have an obligation to manage flying-fox camps on Council owned and managed lands (such as Council parks or facilities, libraries, child care centres, pools, gyms, depots or similar) if nearby residents are impacted by the presence of the camp?

Answered: 18 Skipped: 0



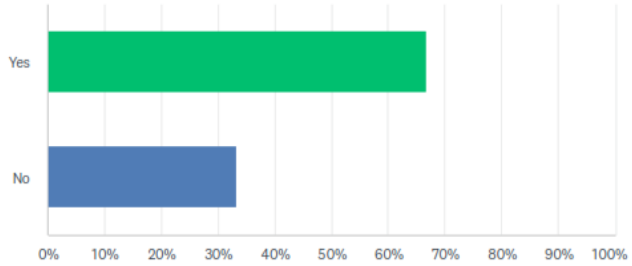
Q16 Which of these actions do you think Council should undertake (select all that apply)?

Answered: 18 Skipped: 0



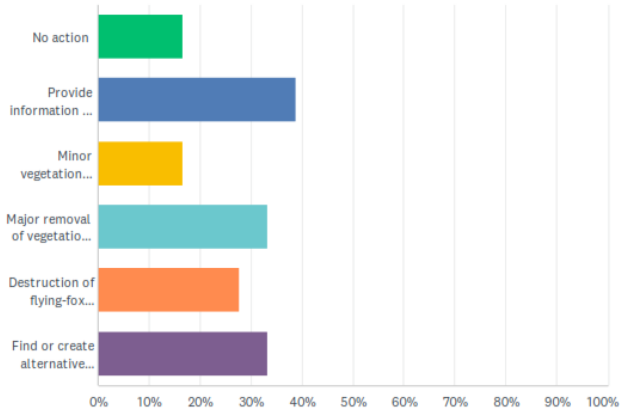
Q17 Do you think Council should have an obligation to manage flying-fox camps on private or state lands (such as land owned by you or your neighbour, public or private schools, kindergartens or similar) if nearby residents are impacted by the presence of the camp?

Answered: 18 Skipped: 0



Q18 Which of these actions do you think Council should undertake? (select all that apply)

Answered: 18 Skipped: 0



Q19 Do you have any other comments regarding flying-foxes or suggestions on how Council should manage flying-foxes at a regional scale?

Answered: 10 Skipped: 8

Individual responses:

1. Remove them from every community.
2. I think they should not be a protected species as there are hundreds of thousands in single colonies these days and should be thinned out so that we can do live with these animals
3. We have many animals, such as bats, possums and bandicoots, that are protected. Bats and possums cause damage and health problems, yet we are not allowed or given means to move them on, without penalty to us. Councils are paid rates for our land, but do not give support to us to monitor and control unhealthy situations regarding animals. We need support and professional advice.
4. I'm sure the Council could spend the funds for dealing with these animals on something more useful. There must be a list.
5. Communication is the most important. When people aren't told what is happening, they assume the worst. They become fearful and when fear lies at the base of a situation, then nothing good can come from it. In an effected area, there should be regular letter drops, there should be someone people can contact, there should be a personal visit to those who are being the most effected, and there should be a plan of action that can be communicated to the residents. There needs to be assurances given to residents that the flying- foxes will be, if all else fails, dispersed. Then regular updates as to where along this process the situation is at. Have a register of flying-fox camps that can be accessed in a manner that enables people who are buying houses/land, as to whether or not there is an active flying-fox camp in that area.
6. Flying foxes are awesome. I was very sad when I had to remove one caught on a neighbours barbed wire fence. They are gorgeous critters ❤
7. Stop clearing native vegetation i.e. cutting down trees, clearing forests and bushland habitats
8. Allow land holders or those affected to take action to-deter them flying into trees at night that are close to houses.
9. If they a causing a problem in a particular area, provide suitable alternative sources of a food, water and shade nearby for them to move to.
10. Good luck. It seems they will come back to the area despite moving them away.

Lockyer Valley Regional Council is currently in the process of developing a Flying-fox Management Plan and updated Statement of Management Intent to clarify Councils role in guiding management of flying-foxes across the region.

In developing this management strategy, Council is seeking feedback from the community on their views on flying-foxes and how best to manage them.

Funding to develop this management strategy and associated plans was awarded to Council under the Queensland Government's Flying-Fox Roost Management – Local Government Grants Program (Round 1).

Council asks that you complete the survey even if you don't have strong views on flying-foxes or their management – all feedback helps us better understand what our community's views are.

The survey is being conducted via an online platform.

Please scan the QR code with your phone to access the survey.

The survey can also be accessed at https://www.surveymonkey.com/r/G7K78NH or collected from Council's Customer Contact Centres in both Gatton and Laidley.

The survey closes at 4pm, Wednesday 31 August 2022.

Should you have any questions or need help completing the survey please contact **Range Environmental Consultants** on 4588 6711.

Lockyer Valley Regional Council Flying-fox Community Consultation

Project Background

Lockyer Valley Regional Council is undertaking a review of the management of flying-fox camps across the Lockyer Valley local government area. As part of this review, Council is developing a flying-fox management plan to provide clarity on Council's obligations and legislative requirements under the Nature Conservation Act 1992 (State of Queensland), and the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth of Australia).
In developing this plan, Council is providing an opportunity for residents to outline their experiences with flying-foxes and any recommendations for Council to consider.
In developing this plan Council hopes to balance human-wildlife conflict, which can sometimes be associated with flying-fox camps, and the long-term conservation of flying-fox species.

This survey and the subsequent Flying-Fox Management Plan is being developed with funding support from the Queensland Government's Local Government Flying-Fox Roost Management Grants Program.

* 1. What locality do you live in? (Suburb)

2. What is your residential address? (Street address)

3. Approximately how close is your house to a flying-fox camp (a tree, or patches of trees where flying-foxes congregate during the day)?

- ◯ Less than 50 metres
- ◯ Between 50 and 100 metres
- ◯ Between 100 and 250 metres
- ◯ Between 250 and 1000 metres
- ◯ I am not aware of a flying-fox camp within 1000 metres of my house

4. If you live near a flying-fox camp, how long have you lived near it?

- ◯ Less than one year
- ◯ Between 1 and 5 years
- ◯ More than 5 years
- ◯ I do not live near a flying-fox camp

5. Overall, do you believe that flying-foxes have a positive or negative impact on the natural environment?

- ◯ Very positive
- ◯ Positive
- ◯ Neutral
- ◯ Negative
- ◯ Very negative

Comments

6. Do you think flying-fox populations are increasing or decreasing in your local area?

- ◯ Significantly decreasing
- ◯ Somewhat decreasing
- ◯ Staying stable
- ◯ Somewhat increasing
- ◯ Significantly increasing

7. What impacts from flying-fox camps have you, your family or property experienced? (Select all that apply)

- [ ] Noise
- [ ] Odour
- [ ] Health concerns for people (i.e. disease or other sickness)
- [ ] Property impacts (i.e. droppings on car or washing, eating of fruit from fruit trees or damage to vegetation)
- [ ] Health concerns or impacts on pets and livestock
- [ ] Other (please specify)

- [ ] None of the above

8. What is your overall attitude to living near a flying-fox camp?

- ◯ I do not live near a flying fox camp
- ◯ Strongly positive
- ◯ Positive
- ◯ Neutral
- ◯ Negative
- ◯ Strongly negative

Comments

9. Have you ever contacted an authority about flying-foxes?

- ◯ Yes
- ◯ No

10. Who did you contact?

- [ ] Lockyer Valley Regional council
- [ ] The State Government (i.e. Department of Environment of Science, Queensland Parks and Wildlife)
- [ ] A local elected councilor
- [ ] A state government elected representative
- [ ] A commonwealth government elected representative
- [ ] Another local government (Council)
- [ ] Wildlife carer
- [ ] I have never contacted any authority
- [ ] Other (please specify)

11. When did you contact this authority?

- ◯ In the last month
- ◯ In the last 6 months
- ◯ In the last year
- ◯ More than a year ago
- ◯ I have never contacted an authority

Comments

12. Why did you contact this authority?

13. What was the outcome of your contact with an authority?

14. Were you satisfied with the outcome?

15. Do you think Council should have an obligation to manage flying-fox camps on Council owned and managed lands (such as Council parks or facilities, libraries, child care centres, pools, gyms, depots or similar) if nearby residents are impacted by the presence of the camp?

- ◯ Yes
- ◯ No

16. Which of these actions do you think Council should undertake (select all that apply)

- ☐ No action
- ☐ Provide information on living with flying-foxes to nearby residents (education)
- ☐ Minor vegetation management of roosts to shift camps or increase separation from residents (non-native vegetation only)
- ☐ Major removal of vegetation to shift camps or increase separation distance from residents (native and non-native vegetation)
- ☐ Destruction of flying-fox roost - actions to remove a flying-fox camp from an area (dispersal)
- ☐ Find or create alternative roosting sites to encourage flying-foxes to camp in areas that will not affect residents

Comments

17. Do you think Council should have an obligation to manage flying-fox camps on private or state lands (such as land owned by you or your neighbour, public or private schools, kindergartens or similar) if nearby residents are impacted by the presence of the camp?

- ◯ Yes
- ◯ No

18. Which of these actions do you think Council should undertake? (select all that apply)

- ☐ No action
- ☐ Provide information on living with flying-foxes to nearby impacted residents (education)
- ☐ Minor vegetation management of roosts to shift camps or increase separation from residents (non-native vegetation only)
- ☐ Major removal of vegetation to shift camps or increase separation distance from residents (native and non-native vegetation)
- ☐ Destruction of flying-fox roost - actions to remove a flying-fox camp from an area (dispersal)
- ☐ Find or create alternative roosting sites to encourage flying-foxes to camp in areas that will not affect residents

Comments

19. Do you have any other comments regarding flying-foxes or suggestions on how Council should manage flying-foxes at a regional scale?

For more information on flying-foxes, visit:

https://www.lockyervalley.qld.gov.au/our-services/environment-and-pest-management/wildlife

For any queries regarding this survey, please contact Range Environmental Consultants Tel: 07 4588 6711.

This survey may be returned to a Lockyer Valley Regional Council Service Centre by 31st August 2022 or mailed to Range Environmental Consultants

Mailing address: Office A, 189 Hume St, Toowoomba QLD 4350

Office Only

Return completed survey to Range Environmental Consultants corrie.vanbrooks@rangeenviro.com.au

Ph: (07) 4588 6711