REGIONAL FLYING-FOX MANAGEMENT PLAN

Maranoa Regional Council

CLIENT: MARANOA REGIONAL COUNCIL

PROJECT NO.	J001326
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Document Control

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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 Range Environmental Consultants (hereafter 'Range Environmental'), in partnership with Balance! Environmental was engaged by Maranoa Regional Council (hereafter 'Council') to assist in the development of a Flying-Fox Management Plan (FFMP) for the Maranoa Region, providing a long-term, strategic management framework for the region-wide management of flying-fox roosts.

There are four (4) current and historic roosts across the Maranoa region, known to Council through access to the National Flying-fox Monitoring Viewer, engagement with residents and review of flying-fox tracking data recorded across the region. The region currently contains three (3) known seasonal roosts which are regularly inhabited, being the Balonne River (Surat), Bungil Creek (Roma) and Neil Turner Weir (Mitchell) Roosts. The status of the fourth known roost (Surat Parknook), located on private property is not well documented.

Impacts of shifting climate, 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.

This report was developed with the support of the Queensland Government's 2022-24 Flying Fox Roost Management in Queensland Program (Round 4) in association with Maranoa Regional Council.

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 minimise interference with flying-fox roosts where possible (such as where flying-foxes are well setback from the community), 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, 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. Where this plan refers to a 'roost' the council defined term is to be utilised.
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 (i.e. those unable to fly independently)
Dispersal	Refers to management actions which result in temporary or permanent relocation of flying-foxes to alternative roosts
Shifting	Refers to management actions which move flying-foxes further away from high-conflict areas without dispersal ('pushing' of a flying-fox roost along a waterway corridor)
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 Climate Change, Energy, the Environment and Water (DCCEEW) for assessment against the Act.

The EPBC Act Policy Statement: *Referral guideline for management actions in Grey-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 Maranoa region, 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-headed Flying-fox (*Pteropus poliocephalus*)

Little Red Flying-fox (*Pteropus scapulatus*)

Figure 1 Flying-foxes of the Maranoa Region and their national geographic distribution (shown in green) (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 Maranoa 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 Maranoa 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 camps 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 Camps and roosts

A flying-fox 'camp' is a discrete spatial area where flying-foxes congregate during the hours of 6am to 6pm, regardless of breeding or temporal status. Flying-fox camps typically are located within vegetation adjacent to watercourses, typically with a dense (but often sparse or absent) understory.

Across the region, flying-fox camps have predominantly been recorded along creeks with a mix of dense understory vegetation and open woodland environments. Historic locations of flying-fox camps across the region have also included large areas of semi-evergreen vine thicket ("dry rainforest" or "vine scrub").

The Queensland Government defines a flying fox 'roost' under the *Nature Conservation Act 1992*. Legislative requirements in Queensland relating to management of a 'roost' under the *Nature Conservation Act 1992* rely on the definition of a roost in section 88C of the Nature Conservation Act 1992. This definition is provided in Table 1 (Definitions) of this report. It is noted that the legislative definition of a 'roost' considers the temporal status of the roost (i.e. that it occurs from time to time), and that it is a tree or area utilised for breeding or rearing of young.

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 forests much of which is conserved by State Forests. Carnarvon National Park, Belington Hut State Forest, Gurulmundi State Forest, and Orkadilla State Forest are also thought to provide a ready source of flowering eucalypts to flying-foxes across the Central Highlands, Banana Shire, Western Downs Regional and Murweh Shire areas.

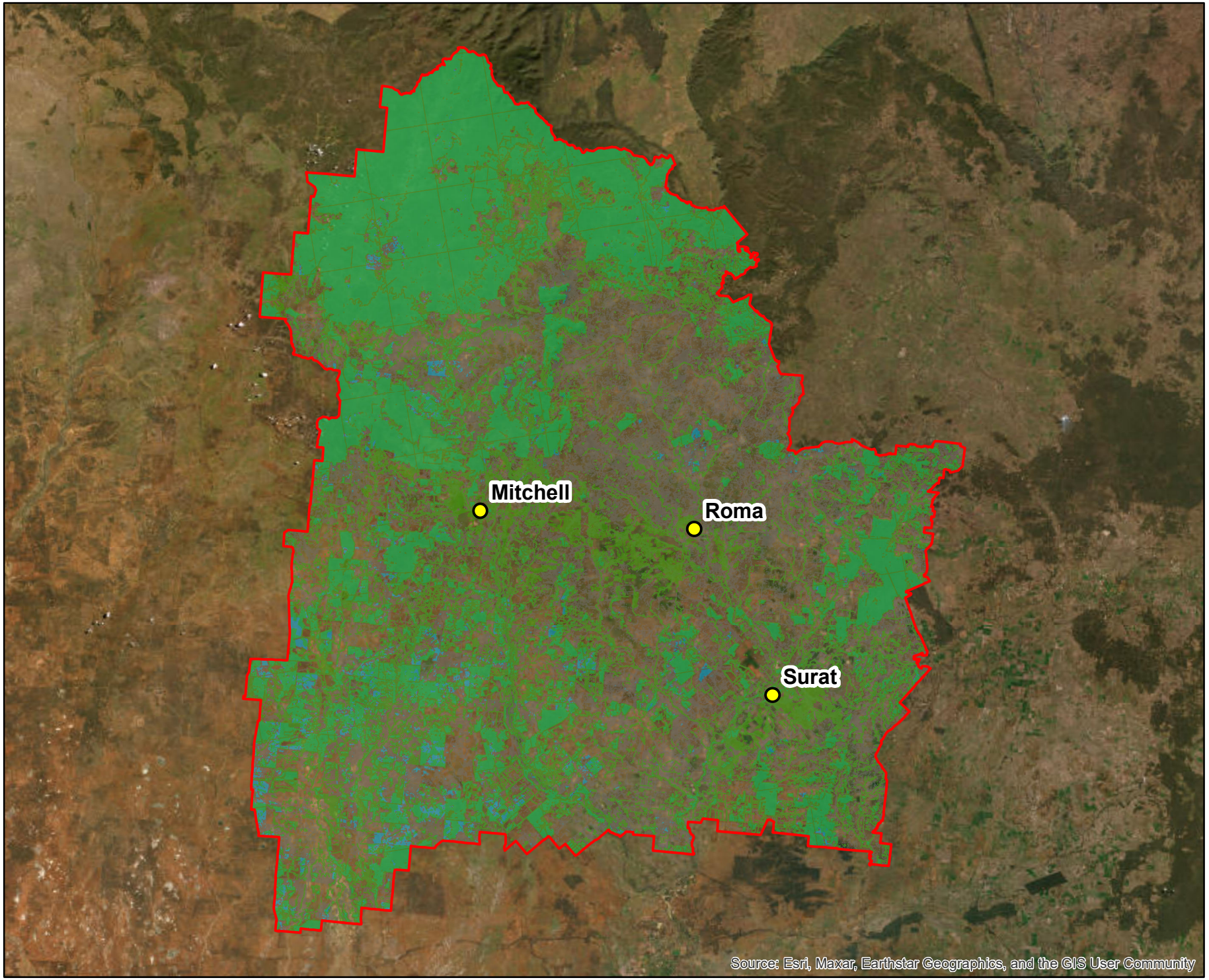

Figure 2
Potential foraging habitat areas (MRC Region)

Project: Flying-fox Management Plan

Client: Maranoa Regional Council

Project No.: J001326

Compiled by: HB Date: 26/05/2023
Approved by: WG Date: 26/05/2023

Metres
0 25,000 50,000

Legend

- Maranoa 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 flying-foxes , Black flying-foxes and Little Red flying-foxes are understood to visit the region from the months of August to December. 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 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 flying-foxes give birth to only one young per year, as do other flying-fox species. The timing of births varies considerably based on location. Around South East Queensland most births occur between October and November (Vardon & Tidemann 1998). Generally the peak birth rates for black flying-foxes are strongly associated with maximum food availability however other environmental factors may also be influential (Vardon & Tidemann 1998).

Grey-headed flying-fox females generally have a single offspring annually around September to October. After the first few weeks young are left in camps while females leave to forage at dusk.

The mating season of little red flying-foxes also differs from the other species, with the majority of mating occurring in November-December (O'Brien 1993). Gestation periods usually last 5 months with young being born in April and May (O'Brien 1993).

The following table is based on Birt (2005) and shows the critical periods in the lifecycle of local flying-fox species. Disturbance, particularly sustained, in the form of shifting or relocation attempts should be avoided during mating and birthing seasons to avoid lifecycle impacts. However, breeding cycles may be varied in response to environmental conditions and nutritional stress, so site specific assessment is important prior to planning any management action.

Little red flying-foxes are not known to birth within the Maranoa Regional Council local government area.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
BFF												
GHFF												
LRFF												

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 when roosts are not occupied. If all three species are present at a camp year round, works should 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 Maranoa 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 which may occur in the Maranoa region, 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, shifting 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.

Maranoa Regional Council has previously attempted roost dispersal attempts in Surat in an attempt to provide enhanced community amenity outcomes in association with the occurrence of a significant little red flying-fox roost. Attempts included the use of the following mechanisms to attempt to shift the roost:

- Smogging / fogging using mechanical mobile equipment, in and around the roosting area on the Balonne River
- Smogging / fogging as well as gas guns noise (gas noise guns) and other practical noise
- Vegetation removal works
- The flying of eagle kites
- Deployment of a high-pitched sonar noise system
- Deployment of strobe lights

Roost dispersal attempts were ultimately unsuccessful in shifting or dispersing the roost and attempts were discontinued after three months.

5 Maranoa Roost History and Community Impacts

5.1 Overview of Roost History

A total of three (3) flying-fox roosts have previously been recorded within the MRC 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 region's roosts are provided at Appendix B.

Table 2 Known roost locations across the region

Maranoa Roost number	Roost	CSIRO NFFMV identification number	Classification	BFF	GHFF	LRFF
Known active Roosts						
1	**Roma**	295	Seasonal	Limited data	Limited data	✓
2/4	**Surat (Balonne River)**	277/1004	Seasonal	Limited data	Limited data	✓
3	**Mitchell**	Unknown	Seasonal	Limited data	Limited data	✓
Additional roost – limited information available						
5	**Surat Parknook**	1129	Unknown	Unknown	Unknown	✓

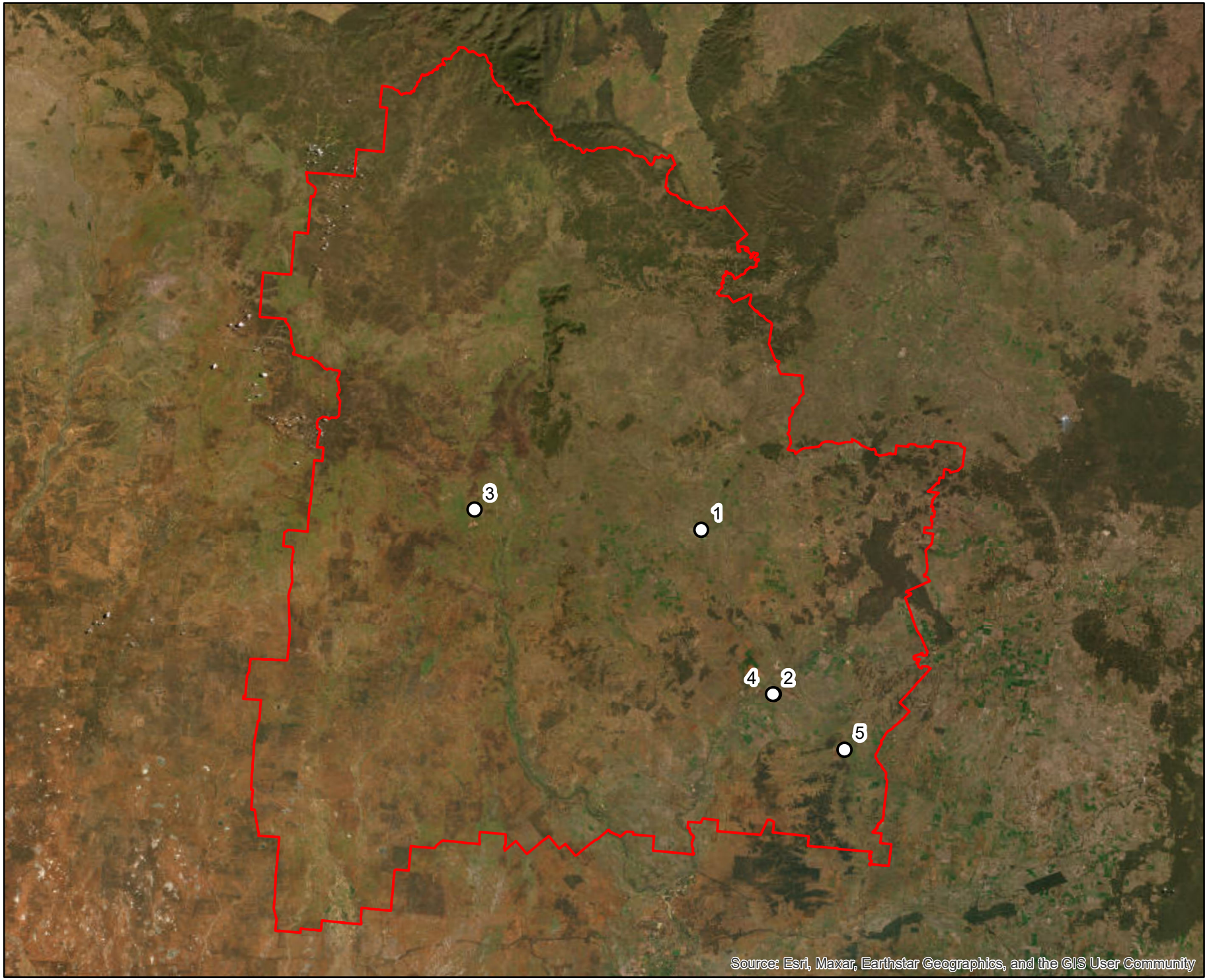


Figure 4
Overview of roost locations (Maranoa Regional Council LGA)

Project: Flying-fox Management Plan

Client: Maranoa Regional Council

Project No.: J001326

Compiled by: HB Date: 16/08/2023
Approved by: WG Date: 16/08/2023

Metres
0 25,000 50,000

Legend

- Maranoa Regional Council LGA
- Roost Locations

Source: Cadastral data sourced from DNRME (2021)

N

range environmental consultants

5.2 Roosts

5.2.1 Roma (Roost 295)

Flying-foxes have been consistently recorded utilising this site back to at least 2014, with the earliest record dating back to 2003. Little-red flying-foxes are the only recorded species to be locally present at this roost. Sited along Bungil Creek and straddling Council controlled land and private land the Roma Roost has potential to be a source of long term human/wildlife conflict. However, due to adequate separation between residential dwellings (approximately >300m at the closest extent) and commercial properties this roost is considered low conflict and has not historically been the cause for any contention. In late October 2022, little-red flying-foxes began feeding in trees behind 'The Big Rig', a tourist and educational facility in Roma, for approximately a week. During this time there were some concerns regarding the smell of flying-foxes and the impact this may have on facility operations.

As the roost is largely located on Walkabout Park, Council continue to maintain the Council managed land by mowing the areas away from the roost and leaving an unmown buffer around the roost trees to avoid human disturbance, particularly during summer. 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 Bungil Creek.

Photograph 1 Roma Roost viewed from south of roost extent

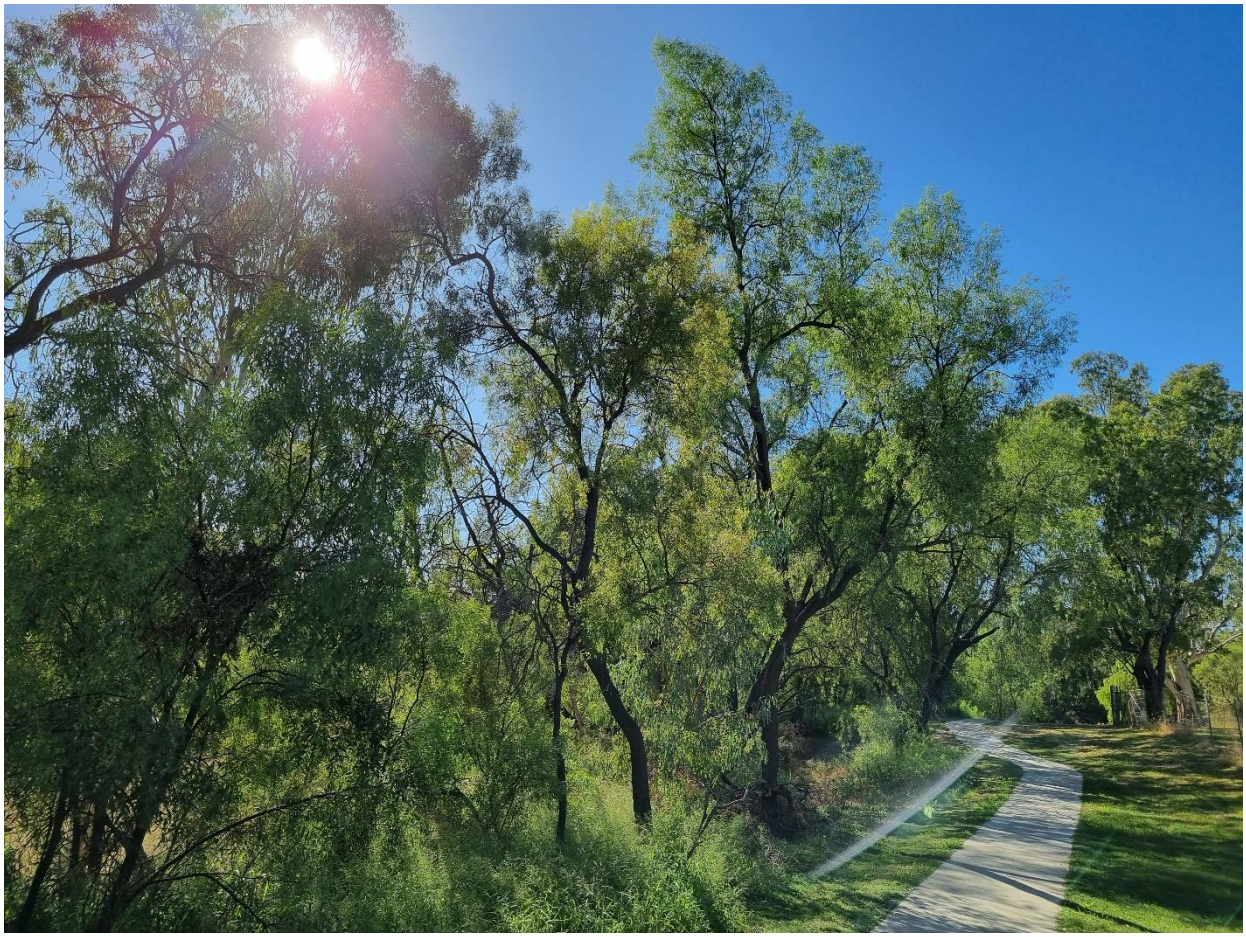
5.2.2 Surat (Balonne River) (Roost 277/1004)

Flying-foxes were recorded occupying this site located along the banks of the Balonne River back to at least 2013. This roost is recorded as a seasonal Little Red flying-fox roost, with no recorded numbers of Black and Grey-headed flying-foxes. This roost is considered to be high-conflict, due to

the significant size of the roost, the tendency for flying-foxes to forage on urban feed trees, the proximity between where flying-foxes are roosting and the uptake for the town's water supply and concerns about general impacts to town amenity during periods of flying-fox influxes. Previous efforts have been employed to attempt dispersal of flying-foxes, with limited success. Attempts included the use of the following mechanisms to attempt to shift the roost:

- Smogging / fogging using mechanical mobile equipment, in and around the roosting area on the Balonne River
- Smogging / fogging as well as gas guns noise (gas noise guns) and other practical noise
- Vegetation removal works
- The flying of eagle kites
- Deployment of a high-pitched sonar noise system
- Deployment of strobe lights

Roost dispersal attempts were ultimately unsuccessful in shifting or dispersing the roost and attempts were discontinued after three months.



Photograph 2 Surat Roost viewed from west of roost extent

5.2.3 Mitchell

There is no official record of a flying-fox in the town of Mitchell. However, local knowledge has confirmed that for several decades, each year, flying-foxes return along the Maranoa River behind the Mitchell Racecourse. This roost is understood to have limited potential for conflict due to the large separation between the roost and town facilities and residents.

Photograph 3 Mitchell Roost viewed from east of roost extent

5.2.4 Surat Parknook (Roost 1129)

Range Environmental is aware of a little red flying-fox roost located on private property approximately 35 kilometres southeast from Surat. Vegetation at this roost is mapped as Regional Ecosystems (RE) 11.9.5 *Acacia harpophylla and/or Casuarina cristata open forest to woodland on fine-grained sedimentary rocks* and 11.7.1 *Acacia harpophylla and/or Casuarina cristata and Eucalyptus thozetiana or E. microcarpa woodland on lower scarp slopes on Cainozoic lateritic duricrust*. RE 11.7.1 mapped areas can also be associated with areas of semi evergreen vine thicket.

Further assessment of this roost location is proposed to be undertaken (where access is available) in association with regional roost monitoring works.

6 Conservation of Flying-fox Populations

6.1 Whole of LGA Management Approach

Maranoa 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 an approach which minimises management 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 supportive of a long-term approach which seeks to create greater separation between large, disruptive flying-fox roosts and the community. Where Council seeks to undertake management actions of roosts this will be conducted in a strategic manner informed by best practice advice, with due regard for efficient use of available funds and where a genuine and realistic outcome which reduces community conflict, impacts or provides public health benefits is likely to be achieved.

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). Large rural properties which contain flying-fox roosts may also be identified at a regional level as low-conflict and desirable for long term retention. 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;
- Methodologies for shifting of flying-fox roosts, including through the use of aerial drones and other emerging technologies;
- 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 has undertook the following community engagement actions at the time of report preparation:

- Report consultation with Councillors and Officers (conducted during preparation of SOMI and FFMP).

7.2 Initial Councillor Consultation

In preparation of the FFMP, Range Environmental has engaged with MRC councillors to discuss impacts of flying-foxes in the region.

Feedback from Council highlighted a long-term desire to 'shift' flying-foxes from the township of Surat (an area of high-conflict) to a low-conflict area further down the river. The roosts at Roma and Mitchell currently are understood to have limited community conflict due to the separation from residential dwellings and businesses and the flying-foxes. The highest levels of conflict between residents and flying-foxes is understood to be related to smell, noise, damage to property and local perception of impacts to water quality.

7.3 Management of Flying Fox Roosts Policy

Council has not previously developed an endorsed 'Management of Flying-Fox Roosts' Policy or Flying-Fox Management Plan which outlined the management actions that Council may undertake to reduce the impact of flying-fox roosts in the Maranoa region. It is anticipated that this Flying-Fox Management Plan will inform a subsequent Policy document for the management of flying-fox roosts.

8 Statement of Management Intent

Council's approach to human / flying-fox conflict management is undertaken in a holistic and strategic approach and is not limited to any one individual management action. The suite of conflict and impact management approaches includes:

- Ongoing monitoring of flying-fox roosts
- Roost specific management actions
- The identification and establishment of alternate, long-term, low-conflict roost locations
- Community education and engagement
- The investigation and implementation of preferred foraging tree replacement programs
- The investigation and implementation of preferred research programs

8.1 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 8.3). 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.

8.2 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

Where relevant, 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.

8.3 Approach to Colony Management on Council Managed Land (Management Actions)

Council will implement a staged approach to conflict management where it identifies a clearly unacceptable impact to community health, wellbeing, public amenity or environmental values. Consideration of what constitutes a clearly unacceptable impacts to community health, wellbeing, public amenity or environmental values is assessed on a case-by-case basis by Council Officers however the following criteria broadly describe the parameters which are considered in this deliberation:

- Is the roost occurrence known or likely to be resulting in any direct public health impacts (such as impacts to water quality which exceed permitted levels of the Queensland Water Quality Guidelines);
- Is the roost occurrence known or likely to be resulting in a realised exposure to flying-fox associated diseases such as ABLV or Hendra virus;
- The level that the roost occurrence is significantly impeding nearby residents' liveability and use of property (i.e. are noise levels emitted from the roost exceeding reasonable internal building noise criteria);
- The level that the roost occurrence is significantly impacting or degrading heritage or other cultural environmental values.
    - Degradation of native vegetation values in itself is unlikely to be a sufficient justification for the shifting or dispersal of a flying-fox roost. It is understood that flying-fox roosts have historically naturally shifted as vegetation is degraded and no longer provides the preferred structure and microclimate dynamics.

Council will first undertake community engagement actions to understand impacts to residents, 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 8.4.3, 8.4.4 and 8.4.5 for further detail on the tiers of vegetation management. These direct roost management approaches are to be utilised in conjunction with additional flying-fox management techniques such as community education, establishment of alternate roost habitats.

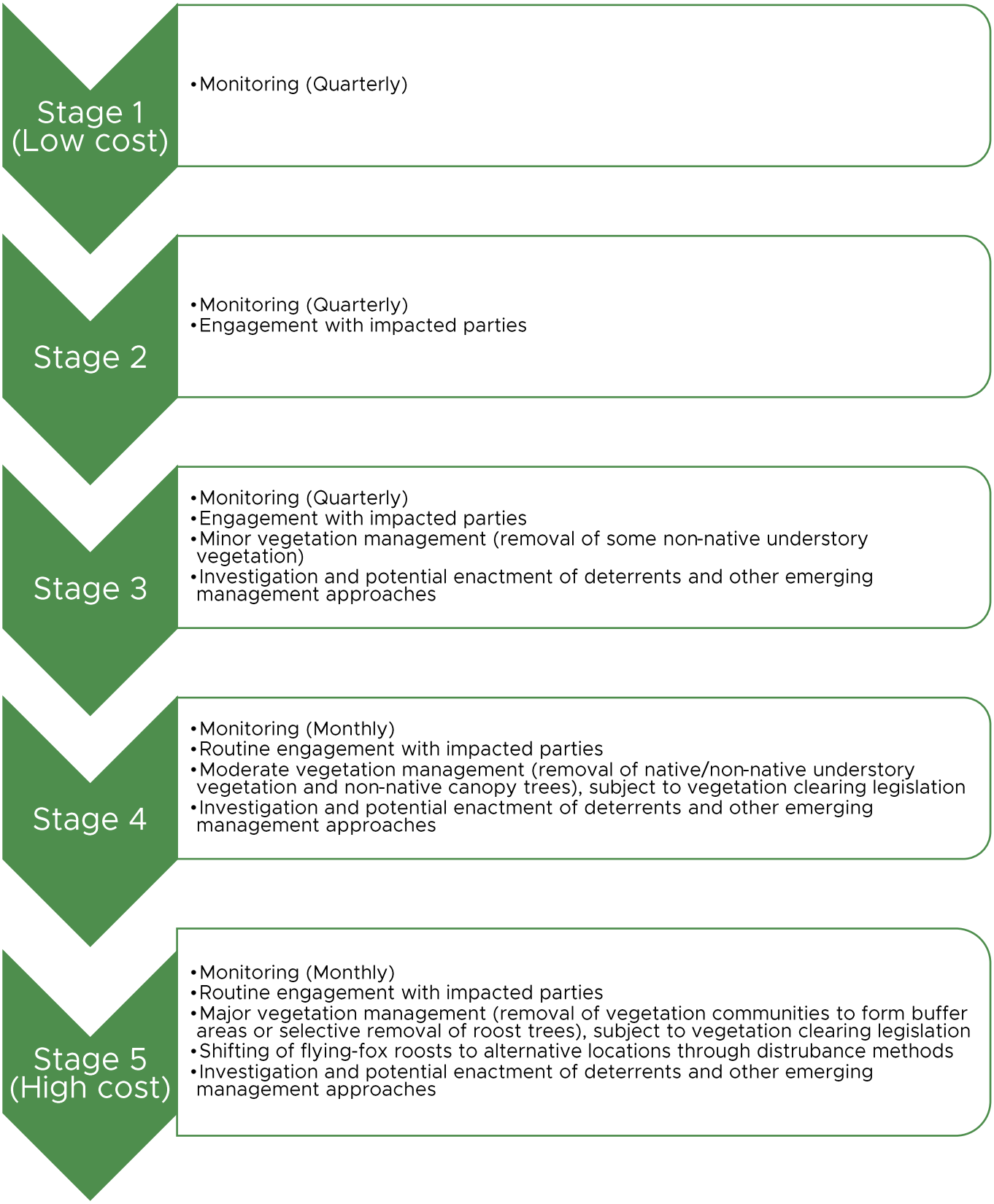


Figure 5 Staged management approach to flying-fox roost management

8.4 Considerations for Roost Management Approach

Council will consider the appropriate management approach suitable for 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

Attempts at shifting will only occur when suitable, alternative roost locations are established with a sufficient structure and microclimate. Following the establishment of alternative roosting sites, attempts to shift a roost may occur to increase distance between flying-foxes roosts and areas of high-conflict.

Reactive dispersal attempts of a flying-fox roosts typically are discouraged 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 without correct long-term planning and implementation.

8.4.1 Monitoring

Council intends to undertake 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 intends to monitor roosts to gain and 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.

8.4.2 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.

8.4.3 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.

8.4.4 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.

8.4.5 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 'shifting' 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 shifting 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.

Site-specific factors may result in significant limitations to implementation of these works when regulatory, environmental or riverine clearing restrictions limit clearing within State regulated areas (i.e. remnant vegetation).

8.4.6 Deterrents

In order to create unsuitable habitat within existing roost extents deterrents may be installed. Such deterrents may include the use of sprinkler systems and novel deterrent devices (e.g. odour, noise or light emitters).

The investigation and potential subsequent installation of deterrents at roost locations is to be assessed on a case-by-case basis and consider best-practice approaches which are supported by the Flying-fox Roost Management Guideline.

In association with the Surat roost it the investigation of opportunities to install canopy sprinklers to the north of the Surat riverwalk has been identified as a recommended short term action.

8.5 Timing of Vegetation Management Works

8.5.1 Requirements of Codes of practice

Management action 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.

8.6 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.

8.6.1 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 dense 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.

8.6.2 Preliminary assessment of alternate roost locations

As a recommendation of this plan two (2) potential alternative roost locations are proposed to be established to the west of Surat as preferred long-term roosting 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. Five (5) roost locations were investigated for their suitability as a flying-fox roost near the township of Surat. These potential roost locations were assessed for their suitability, with results shown below in Table 3 and locations shown in Figure 6.

Table 3 Table of alternate roost suitability

	R				
	1 – current roost extent	2	3	4	5
Does roost location reduce conflict?	No	Partially (roost would be downstream (below weir) of town water supply)	Yes (roost would be downstream (below weir) of town water supply)	Yes (roost would be downstream (below weir) of town water supply)	Yes (roost would remain upstream of town water supply)
Approximate distance from	0 m	700 m	1.4 km	1.6 km	1.7 km

current roost extent?					
Potential for flying-foxes to be shifted?	Current roost extent	Possible	Lower likelihood	Lower likelihood	Lower likelihood
Flood immunity/protection for revegetation works?	Some (some areas are not protected)	Some (some areas are not protected)	Some (some areas are not protected)	Some (some areas are not protected)	Low immunity
Accessible?	Yes	Yes	Yes	Limited	Yes
Council owned or managed land?	Yes	Yes	Yes	Yes	Yes
Permanent water source?	Yes	Yes	Limited – during drought, pockets of narrow and shallow water remain	Limited – during drought, pockets of narrow and shallow water remain	Yes
Existing canopy vegetation?	Yes	Yes	Some – requires enhancement	Some – requires enhancement	Some – requires enhancement
Existing dense midstory vegetation?	Yes	No – requires establishment	No – requires establishment	No – requires establishment	Potentially some – requires establishment
Area of enhancement works?	N/A	Up to 3.5 ha (Both sides of waterway)	0.6-1 ha (northern side of waterway)	Up to 1.8 ha (northern side of waterway)	Up to 8 ha (both side of waterway)

Following this analysis, it is recommended that alternate roost location 2 be prioritised for roost habitat embellishment works on the basis that a future potential roost shifting action would have the highest probability of success at this location. It is acknowledged that while alternate roost location 2 reduces human-wildlife conflict, it will not completely remove conflict, with the alternate roost location achieving a 700m shift from its current location.

It is recommended that alternate roost location 3 is rehabilitated concurrently with alternate roost location 2. By establishing two alternate roost locations with enhanced flying-fox habitat, the option would be available to Council at a future stage to attempt a secondary shifting action achieving a 1.4km shift in the roost location.

8.6.3 Future approach to shifting of flying-fox roost

Following the long-term establishment of an alternate roost location(s) to a sufficient quality and extent which is likely to be conducive to occupation and roosting by flying-foxes (to be assessed by a person knowledgeable about flying-foxes and their habitat), Council is to consider the preparation of a roost relocation management plan. At minimum, the plan is to include the following information: dispersal techniques (i.e. noise, light, movement and smoke), consideration and recommendation of vegetation management opportunities, timing considerations (including legislative considerations) and recommendations for resourcing, scheduling and delivery of works.

It is proposed that the Code of Practice and Roost Management Guideline be reviewed at the time of assessment to identify any emerging or novel approaches to roost relocations, such as the use of drones or attractants.

The roost relocation management plan is to be prepared by persons knowledgeable about flying-foxes and in consultation with the Queensland Department of Environment and Science. Where identified as required at the time of works, appropriate approvals are to be obtained.

8.6.4 Associated recommendations

That Council investigate opportunities to deliver the following identified actions:

- Council undertake roost habitat embellishment works generally in accordance with identified alternate roost locations 2 and 3, as per Figure 6. Council will explore all opportunities for cost sharing arrangements with the Queensland Government under the Local Government Flying-fox Management Grants program.
- Council continues lobbying the Queensland Department of Environment and Science and Local Government Association of Queensland (LGAQ) to expand and fund research into assessment of techniques to effectively nudge or shift problematic flying-fox roosts, including through the use of drones.

Figure 6 Potential alternate roost locations (Surat)

Project: Flying-fox Management Plan

Client: Maranoa Regional Council

Project No.: J001326

Compiled by: SM Date: 15/06/2023
Approved by: WG Date: 15/06/2023

Metres
0 230 460

Legend

- Cadastre
- Roads
- Council Controlled Lands
- Current Roost Location (Surat)
- Alternate Potential Roost Locations

Source: Cadastral data sourced from DNRME (2021)

N

range environmental consultants

8.7 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 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 conservation partners)
- 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.

8.8 Foraging Tree Replacement Works

A range of historically planted urban shade amenity and street trees are understood to be foraging sources across the Surat, Roma and Mitchell townships. In particular, in the township of Surat, Cadaghi (*Corymbia torelliana*) is understood to be a preferred foraging tree during influxes of little red flying-foxes.

Council will seek to investigate opportunities for a potential long-term tree replacement program to assist in removal of trees which may be attracting flying-foxes to forage within the town area.

8.9 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.

9 Response to Heat Stress Events

9.1 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.

9.2 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.

1. Clean up and disposal of deceased flying-foxes
2. Post event review by Responsible Officers

9.3 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.

9.4 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.

10 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

11 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.

11.1 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.

Monitoring

- Council is to implement a quarterly monitoring roster for known roosts across the region.

Education

- The publishing of this flying-fox management plan on Council's website with a webpage accessible with basic information on Council's approach to flying-fox management.
- The preparation of a management action summary document detailing the suite of proposed measures to be implemented to manage flying-foxes and their impacts on the community in Surat.
- Flyer drops to residents adjacent to major roosts during periods of significant population increases at urban roost locations.

Alternative long-term low-conflict roost habitats

- The preparation of an alternate roost habitat establishment management plan document to guide the establishment of alternate roost habitat in Surat.
- The preparation of a grant application to the Queensland Government for the establishment of two (2) alternative low-conflict roost sites to the west of Surat, in accordance with the below.
    - Council undertake roost habitat embellishment works generally in accordance identified alternate roost locations 2 and 3, as per Figure 6 of this plan.
    - Council will explore all opportunities for cost sharing arrangements with the Queensland Government under the Local Government Flying-fox Management Grants program.

Conflict Management

- The investigation of a preferred foraging tree replacement program for impacted townships.
- The continuing maintenance of existing buffer areas (greater than 60 metres between existing roost extents and residential dwellings) through the use of existing parklands comprising largely of mown lawns.
    - Investigation of minor to moderate vegetation management strategies at the existing Surat roost to discourage flying-foxes, through the creation of an less desirable roost habitat directly adjacent to the Surat Riverwalk. These works are to occur in conjunction with the establishment of alternative roost habitats.
        - Such works may include, but not be limited to, the removal of understorey shrubby vegetation and replacement with native groundcover species.
    - It is acknowledged at the time of preparation of this plan that the capacity to significantly increase buffer sizes between existing roosts and residential dwellings is limited, due to the presence of regulated native vegetation values at current known flying-fox roost locations.

- The investigation of opportunities and constraints to installing a canopy tree sprinkler system to the north of the Surat Riverwalk to attempt to minimise encroachment of the flying-fox roost near this public walkway.
- The investigation of opportunities and constraints to installing deterrent devices (e.g. noise or light emitters) at the Surat Riverwalk location.
- Investigate and prepare a roosting deterrence protocol for Surat, including but not limited to the use of smoke, lighting and noise to reduce the attractiveness of habitat at the time of seasonal arrival of little red flying-foxes. This protocol is to consider Councils 'As of right authority' and the requirements of the Code of practice—Ecologically sustainable management of flying-fox roost, and Flying-fox Roost Management Guideline. The protocol is to be prepared by a person knowledgeable about flying-fox behaviour.
- Implement the roosting deterrence protocol for Surat under the supervision of a person knowledgeable about flying-fox behaviour. A Flying-fox roost management notification form must be lodged with the Department of Environment, Science and Innovation at least 2 days prior to the commencement of works and a Flying-fox roost management evaluation form is to be submitted within 6 weeks of the date of the notification.

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.

The above identified recommendations are subject to Council budget approval, and the provision of cost-sharing arrangements with the Queensland Government (where available).

11.2 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.
- Subject to further investigation, the implementation of a of a preferred foraging tree replacement program for impacted townships.
- The continuing maintenance of existing buffer areas (greater than 60 metres between existing roost extents and residential dwellings) through the use of existing parklands comprising largely of mown lawns.
- If determined to be feasible, the modification of understory vegetation directly to the north of the Surat Riverwalk.
- If determined to be feasible, the installation and operation of roost deterrent devices (e.g. sprinkler systems and noise or light emitters).

Education

- Partner with 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

- Subject to the proposed grant funding application to the Queensland Government, implement alternate roost habitat establishment works at identified sites.
- Following the establishment of suitable alternative roosting sites (i.e. through establishment or enhancement), with the correct vegetation composition and structure, the use of shifting methods will be attempted to shift flying-foxes in Surat from their current roosting location to the enhanced alternate roost habitat sites.
    - The completion of these works is subject to the future development of a roost relocation management plan.

Research

- Support for research for further investigation of methodologies for shifting of flying-fox roosts, including through the use of aerial drones and other emerging technologies.
- 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

The above identified recommendations are subject to Council budget approval, and the provision of cost-sharing arrangements with the Queensland Government (where available).

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12.1 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.

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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

Appendices

Appendix A Urban Flying-fox Management Area

N

BLACKALL TAMBO REGIONAL

CENTRAL HIGHLANDS REGIONAL

BANANA SHIRE

MURWEH SHIRE

WESTERN DOWNS REGIONAL

MARANOA REGIONAL

PAROO SHIRE

BALONNE SHIRE

GOONDIWINDI REGIONAL

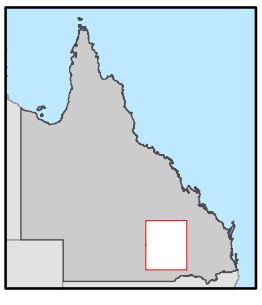
Mount Moffatt
Mount Howe
Westgrove
Upper Dawson
Womblebank
Beilba
Baffle West
Hutton Creek
Simmie
Redford
Injune
Highland Plains
Pony Hills
Mount Hutton
Forestvale
Gunnewin
Cornwall
Bymount
Kilmorey Falls
Durham Downs
Eumamurrin
Tyrconnel
Walhallow
Orallo
Mooga
Pickanjinnie
Wallumbilla North
Jackson North
Yuleba North
Bungeworgorai
Euthulla
Mitchell
Mungallala
Womalilla
Mount Bindango
Orange Hill
Blythdale
Amby
Hodgson
Dargal Road
Roma
Wallumbilla
Yuleba
Jackson
Eurella
Bungil
Muckadilla
Tingun
Wallumbilla South
Yuleba South
Jackson South
Mungallala South
Mount Abundance
V Gate
Warkon
Oberina
Noorindoo
Dunkeld
Ballaroo
Surat
Glenmorgan
Bargunyah
Weribone
Wellesley
Parknook
Begonia
Wycombe
Teelba
Bindebango

0 5 10 20 30 km

MARANOA REGIONAL

Legend

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



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 - Roma (Roost 295) extent

Appendix B2 - Surat (Roost 277 and 1004) extent

Appendix B3 - Mitchell extent

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

Appendix B1 - Roma (Roost 295) Extent

Project: Flying-fox Management Plan

Client: Maranoa Regional Council

Project No.: J001326

Compiled by: HB Date: 16/08/2023
Approved by: WG Date: 16/08/2023

Metres
0 100 200

Legend

Roost Extent

Source: Cadastral data sourced from DNRME (2021)

N

range environmental consultants

Appendix B2 - Surat (Roost 277 and 1004) Extent

Project: Flying-fox Management Plan

Client: Maranoa Regional Council

Project No.: J001326

Compiled by: HB Date: 16/08/2023
Approved by: WG Date: 16/08/2023

Metres
0 100 200

Legend

Roost Extent

Source: Cadastral data sourced from DNRME (2021)

N

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Appendix B3 - Mitchell Extent

Project: Flying-fox Management Plan

Client: Maranoa Regional Council

Project No.: J001326

Compiled by: HB Date: 16/08/2023
Approved by: WG Date: 16/08/2023

0 150 300 Metres

Legend

Roost Extent

Source: Cadastral data sourced from DNRME (2021)

N

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