



Goondiwindi
REGIONAL
COUNCIL



REGIONAL FLYING-FOX MANAGEMENT PLAN

Goondiwindi Regional Council

CLIENT: GOONDIWINDI REGIONAL COUNCIL

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Review and Community Consultation

In recognition of the evolving impact and behaviours of wildlife and the community, this plan will be reviewed regularly having regard for contemporary research and feedback received from the community.

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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 and 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.

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

There are five (5) current and historic roost locations recorded across the Goondiwindi region (broadly across two local centres), known to Council through access to the National Flying-fox Monitoring Viewer and engagement with residents. The region currently contains two (2) known permanent roosts which are regularly inhabited, being the Macintyre River (Goondiwindi) and Inglewood Apex Park Roosts.

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

1.1 Objectives of FFMP

The FFMP was developed to provide effective, long-term management of flying-fox roosts, particularly in potential and realised high-conflict areas. The key objective of the FFMP is to balance community expectations of Council, public amenity and conservation of flying-fox species across the region. This FFMP has been informed by a Statement of Management Intent (SOMI), which outlines Council's framework for management of roosts. The SOMI has been incorporated into this document and is outlined in Section 8.

This FFMP provides an overview of the following relevant information:

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

1.2 Management Responsibilities

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

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

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

1.3 Management Approach

Given the significant level of uncertainty of management success and high financial costs associated with management of flying-fox roosts, Council's position is to avoid and minimise interference with flying-fox roosts, with significant roost management actions only undertaken where a clearly unacceptable impact to public health, amenity or environmental values can be demonstrated.

2 Definitions

2.1 Flying-fox Roosts

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

Council's position is that an area which contains a congregation (grouping of at least 50 flying-foxes) 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 a 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 | <ul style="list-style-type: none"> Means a tree or other place where flying-foxes congregate from time to time for breeding or rearing their young. |
| Permanent Roost | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> A site that has been destroyed either legally/illegally or destroyed through natural events (e.g. cyclone, fires etc) and is no longer being occupied by flying-foxes, and not capable of being occupied by flying-foxes. |

2.2 Council Definitions

| Term | Definition |
|---|--|
| Codes of Practice | |
| Low impact activities | Means mulching, mowing, weeding, watering under or near roost trees, minor trimming of roost trees, and installation, maintenance or removal of infrastructure, where the activities are not directed at destroying a flying-fox roost, driving away, or attempting to drive away, a flying-fox from a flying-fox roost, or disturbing a flying-fox in a flying-fox roost. |
| Management actions | Means non-lethal actions intended to stop flying-foxes from making use of a site or part of a site, and include destroying and/or trimming vegetation at a site, as well as coordinated action to drive flying-foxes away from a site or move flying-foxes within a roost site. |
| Additional terms | |
| As-of-right authority | In the context of flying-fox roost management, is a legal right to carry out a flying fox roost management activity, provided the activity is carried out in accordance with the relevant Australian Government and Queensland Government legislation, codes and guidelines. The current Code of Practice for management of a flying-fox roost commenced in 2020. |
| Buffer zone | Refers to physical separation between humans and flying foxes (such as an area cleared of roost trees) |
| Flying-fox roost | Refers to a discrete spatial area where flying-foxes (50 or greater) congregate during the hours of 6am to 6pm, regardless of breeding or temporal status. |
| Common use area | Refers to areas of a property which are accessed and/or actively used by residents, visitors or occupants, for example outdoor seating areas or veranda areas. Common use areas do not include backyards associated with a dwelling. |
| Containment | Refers to management actions (such as creation of cleared buffer zones) which are aimed at containing flying-foxes within an area of a roost which reduces the impact of the roost on sensitive receptors. |
| Commonwealth-owned or Commonwealth-managed land | Is property which is under Australian Government control. |
| Council land | Is property which is under Council control. |
| Creche | Is a tree or other place where females leave dependent young (ie those unable to fly independently) |
| Dispersal | Refers to management actions which result in temporary or permanent relocation of flying-foxes to alternative roosts |
| 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 8) |
| State-owned or State-managed land | Is property which is under Queensland Government control |
| UFFMA | Refers to the Queensland Government Urban Flying-Fox Management Area (Appendix A). An UFFMA delineates where a local government maintains as 'as of right authority' to undertake flying-fox management actions |

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

3 Legislation and Other Requirements

3.1 State and Local Legislative Considerations

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

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

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

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

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

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

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

3.2 Federal Legislative Considerations

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act 1999)* protects the environment in relation to Matters of National Environmental Significance (MNES) which include listed threatened species and ecological communities. This includes the Grey-headed flying-fox, which is listed as 'vulnerable' under the Act.

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

The EPBC Act Policy Statement: *Referral guideline for management actions in 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 or 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 Goondiwindi 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 Goondiwindi 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 Goondiwindi 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 Goondiwindi region in the warmer summer months as flowering eucalypts provide a ready source of foraging resources. During this period, they may temporarily join camps of Grey-headed or Black flying-

foxes, appearing suddenly in large numbers and remaining from a few days to several months. As Little Red flying-foxes roost in dense clusters on individual branches, considerable damage to trees may occur. Where large congregations of this species occur significant community concern can arise, with populations of roosts quickly increasing in size, with corresponding intensification of noise and odour impacts to nearby residents.

4.2 Flying Fox Ecology and Impacts

4.2.1 Roosts

A flying-fox roost is a discrete spatial area where flying-foxes congregate during the hours of 6am to 6pm, regardless of breeding or temporal status. Flying-fox roosts typically are located within vegetation adjacent to watercourses, typically with a dense (but often sparse or absent) understory. Across the region flying-fox roosts have predominantly been recorded along creeks with a mix of dense understory vegetation and open woodland environments.

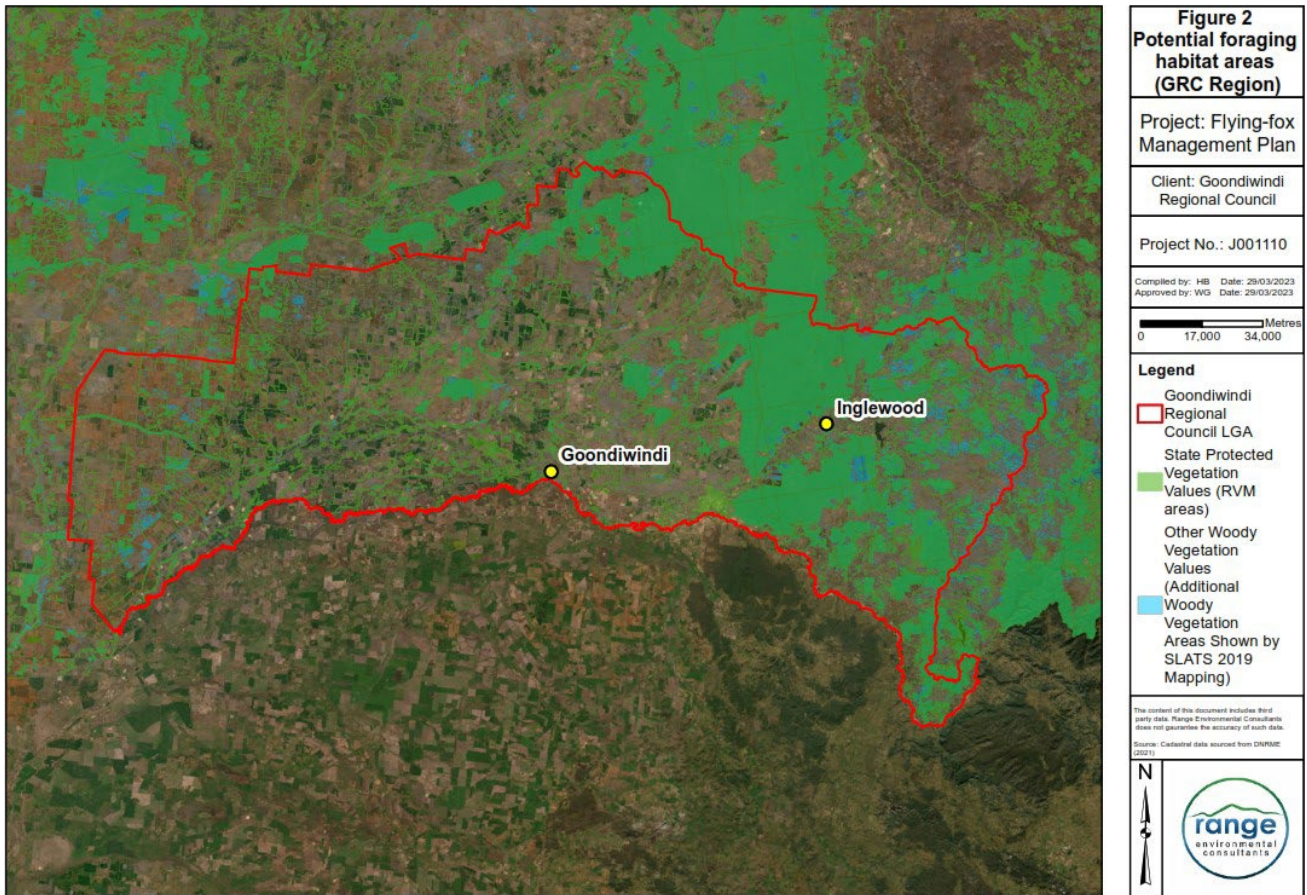
4.2.2 Ecological Importance

Flying-foxes are pollinators, 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 2 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 eastern forests much of which is conserved by State Forests. Boondandilla, Kumbarilla, Western Creek and Dunmore State Forests are likely to provide a ready source of flowering eucalypts to flying-foxes across the Goondiwindi and Toowoomba regional areas. The majority of these vegetation values are within mapped State Regulated Vegetation areas.

Figure 2: Potential foraging habitat areas (Goondiwindi Region)



4.3 Flying Fox Movements

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

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

4.4 Flying Fox Breeding Cycles

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

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

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

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|-------------|-------|-------|--------|--------|------|-------|-------|--------|-------|--------|--------|-------|
| BFF | Green | Green | Yellow | Yellow | Grey | Grey | Grey | Yellow | Red | Red | Green | Green |
| GHFF | Green | Green | Yellow | Yellow | Grey | Grey | Grey | Yellow | Red | Red | Green | Green |
| LRFF | Grey | Grey | Yellow | Red | Red | Green | Green | Green | Green | Yellow | Yellow | Grey |

| Key | Stage of breeding |
|--------------|------------------------------------|
| Yellow | Peak conception |
| Light Yellow | Late-stage pregnancy |
| Red | Birthing and young under wing |
| Grey | Pregnant |
| Light Green | Young crèched at roost |
| Green | Young capable of short flight |
| White | Period of least impact on breeding |

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

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

4.5 Threats

4.5.1 Loss of foraging Habitat

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

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

4.5.2 Roost fragmentation

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

4.5.3 Heat stress and climate change

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

From the three (3) flying fox species found in the Goondiwindi 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 controlled through education, basic hygiene measures, management protocols and Personal Protective Equipment (PPE).

4.6.1.1 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.

4.6.1.2 Queensland Health advice on Hendra virus (Queensland Health 2022¹)

Hendra virus was discovered following an outbreak of illness in horses in a large racing stable in the suburb of Hendra, Brisbane in 1994. The natural host for Hendra virus is the flying fox. The virus can spread from flying foxes to horses, horses to horses and rarely, from horses to people.

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

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

4.6.2 Noise

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

4.6.3 Odour

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

4.6.4 Droppings

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

4.6.5 Vegetation Damage

Where flying-foxes roost in large numbers, impacts to vegetation values have been recorded. Impacts typically consist of temporary defoliation (loss of leaf cover) and damage (cracking or snapping of branches). Concern generally is raised where impacts to heritage or locally significant values (i.e. street trees) are observable. However, flying-foxes often adjust their core roosting locations within permanent roosts. Within intact forest, damage to vegetation opens the canopy, and

initiates a natural cycle of vegetation regeneration in the impacted area (SEQ Catchments 2012). In small remnant vegetation patches with edge effects, damage to vegetation caused by flying-fox activity may increase the impact of invasive weeds within the site (particularly vines) (SEQ Catchments 2012).

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

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

4.7 Historic Management of Flying-fox Roosts

4.7.1 Dispersal of Flying-fox Roosts

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

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

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

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

5 Goondiwindi Region Roost History and Community Impacts

5.1 Overview of Roost History

A total of five (5) flying-fox roost locations have previously been recorded within the GRC 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.

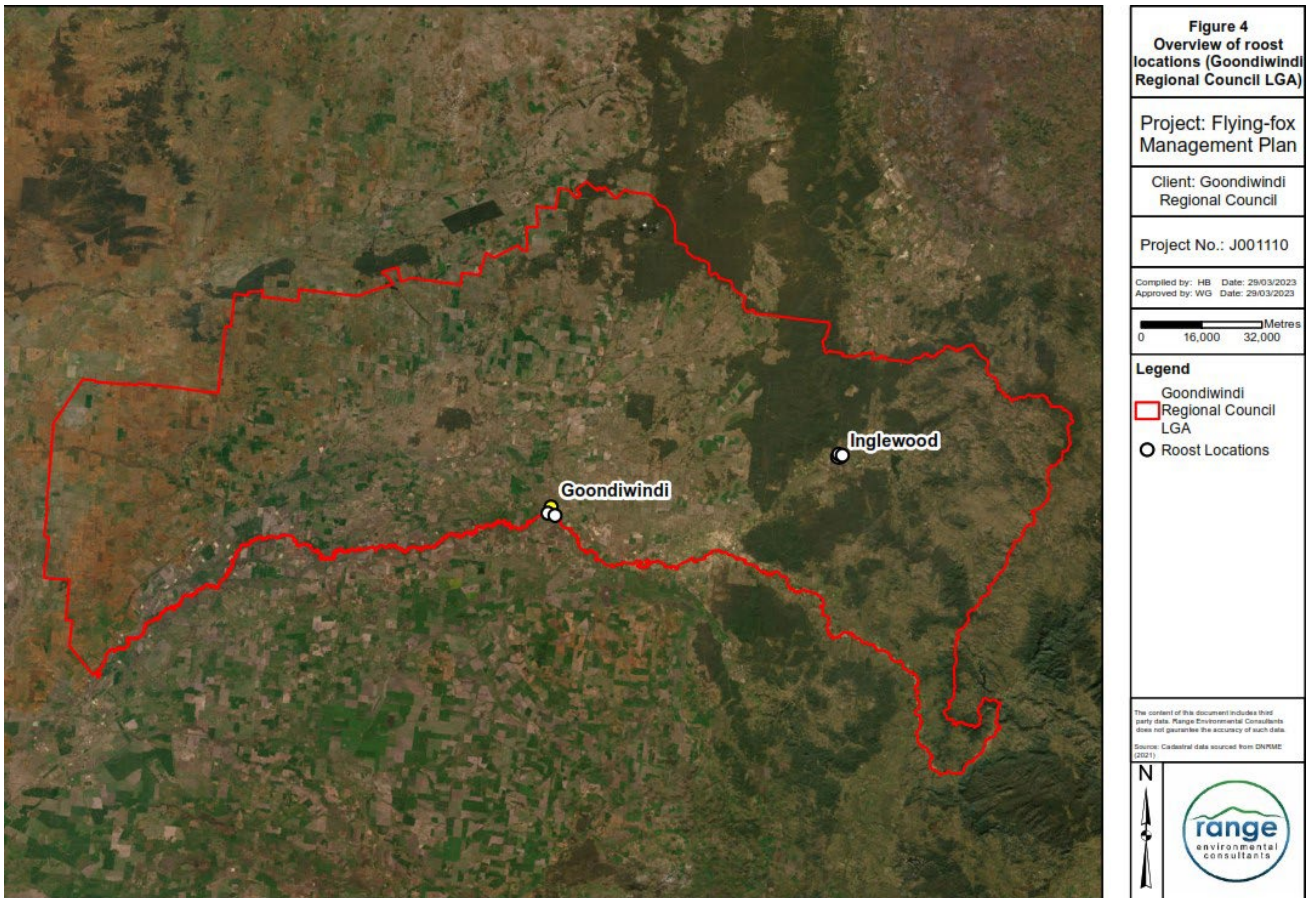
The extent of known current and historical roosts is provided in Figure 4 and tabulated in

Table 2. Individual roost maps for the Goondiwindi and Inglewood roosts are provided at Appendix B.

Table 2: Known roost locations across the region

| DES Roost identification number | Roost | CSIRO NFFMV identification number | Classification | BFF | GHFF | LRFF |
|--|----------------------------------|-----------------------------------|---|--------------|--------------|--------------|
| Active Roosts | | | | | | |
| 57 | Goondiwindi | 547 | Permanent | ✓ | Not recorded | ✓ |
| 485 | Inglewood (Lovell Crossing Road) | Not recorded | Seasonal | Not recorded | Not recorded | ✓ |
| 486 | Inglewood (Apex Park) | Not recorded | Permanent | ✓ | Not recorded | Not recorded |
| Historical Roosts (natural dispersal and forced) | | | | | | |
| 69 | Inglewood (Frey Street) | 548 | Historical (last recorded presence in 2019) | ✓ | Not recorded | ✓ |
| Unknown Status | | | | | | |
| 58 | Goondiwindi (Herbert Street) | Not recorded | Unknown | Unknown | Unknown | Unknown |

Figure 4: Overview of roost locations (Goondiwindi Regional Council LGA)



5.2 Roosts

5.2.1 Goondiwindi (Roost 547)

The National Flying-fox Monitoring Viewer records a roost location at the end of Sandalwood Drive, with monitoring data recorded in 2012 and 2016. The Sandalwood Drive location is the same roost mentioned as Cairns Street. This roost is located along the Macintyre River, with flying-foxes moving location up and down the river. Little Red Flying-foxes were first recorded at this roost in 2008, with regular roost occupation by both Black and Little Red Flying-foxes since 2011. The Macintyre River is the boundary between Queensland and New South Wales. When the flying-foxes roost on the NSW side of the river, they are located outside of GRC's jurisdiction and fall under the relevant New South Wales legislation (including, but not limited to, the Office of Environment and Heritage (OEH) Flying-fox camp Management Policy (OEH 2015)).

This roost predominantly occurs within mature eucalypts with associated mid and understory vegetation. Suitable alternative vegetation occurs upstream and downstream of this location.

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 Macintyre River.

Flying-foxes were recorded at this location at the time of preparation of this document.



Photograph 1: Goondiwindi Roost viewed from Queensland side of Macintyre River

5.2.2 Goondiwindi (Herbert Street) (Roost 58)

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

5.2.3 Inglewood, Lovells Crossing Road (Roost 485)

Flying-foxes have previously been recorded utilising a roost across Lovell Crossing Road, Inglewood. Sited along Canning Creek and intersecting Lovells Crossing Road. This roost, is straddling Council controlled land and private land. In 2021 the roost was first recorded, and was occupied by approximately 15,000 individual LRFF between (-28.4095659, 151.0790873 to -28.410854, 151.076241). The roost is nearby a water inlet for the Inglewood water treatment plant which is understood to have raised community question into suitability for human consumption. Water testing by Council is understood to have addressed this community concern.

Flying-foxes have continued to roost at this site. A permanent source of water is available at this roost in association with Canning Creek.

Flying-foxes were not recorded at this location at the time of preparation of this document.

5.2.4 Inglewood (Roost 548 and 486)

Flying-foxes have been consistently recorded utilising this roost across three sites (approximate total of 1.5 km distance) back to at least 2008, with Little Red flying-foxes and Black flying-foxes recorded regularly. Sited along Canning Creek at the end of Frey Street, Macintyre Brook and Inglewood Apex Park. This roost, and its various locations, is straddling Council controlled land and private land. In 2008 the roost was first recorded at Frey Street (-28.41600814, 151.0736175), and in 2019 the roost moved to Apex Park (-28.412473, 151.086426).

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 the Macintyre Brook.

The roost is predominantly comprised of mixed native/non-native vegetation including river red gum (*Eucalyptus Camaldulensis*), river she-oak (*Casuarina cunninghamiana*), *Angophora sp.*, Chinese elm* (*Ulmus parvifolia*), Sally wattle (*Acacia salicina*), thin pepper* (*Schinus molle*), broad-leaved pepper* (*Schinus terebinthifolius*), *Leucaena sp.**, Groundsel bush* (*Baccharis halimifolia*) and wild tobacco* (*Solanum mauritianum*). Non native species are marked with '*'.

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



Photograph 2: Inglewood roost viewed from west of roost extent

6 Management of Flying-fox Populations

6.1 Whole of LGA Management Approach

Goondiwindi 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

In accordance with the relevant legislation, Council does not propose undertaking active management of 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.

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

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

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

6.4 Support for Additional Research

Council supports additional research to fill knowledge gaps in flying-fox ecology, roost choice behaviours and management strategies. In response to requests, Council will 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;
- Detailed further assessment and modelling of long-term, low-conflict alternative roost locations.

7 Community Engagement

7.1 Engagement with Council Staff

Range Environmental, in preparing this FFMP has engaged with Goondiwindi Regional Council to gain an understanding of historic management of flying-fox roosts across the region, and Council's engagement with residents.

Based on consultation with Council staff no formal community engagement was undertaken due to the relatively low extent and location of roosts across the region.

Where Council seeks to undertake any future management of flying-fox roosts in accordance with the framework set out under this plan Council's environmental staff will engage with Council operational teams to allow for operational input.

7.2 Engagement with relevant parties

Where Council seeks to undertake any future management of flying-fox roosts in accordance with the frameworks set out under this plan Council will undertake targeted community engagement with landowners and the community to ensure community views are fully considered in the decision-making process.

8 Statement of Management Intent

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
- 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.

8.3 Approach to Colony Management on Council Managed Land

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

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

See sections 8.5.3, 8.5.4 and 8.5.5 for further detail on the tiers of vegetation management.

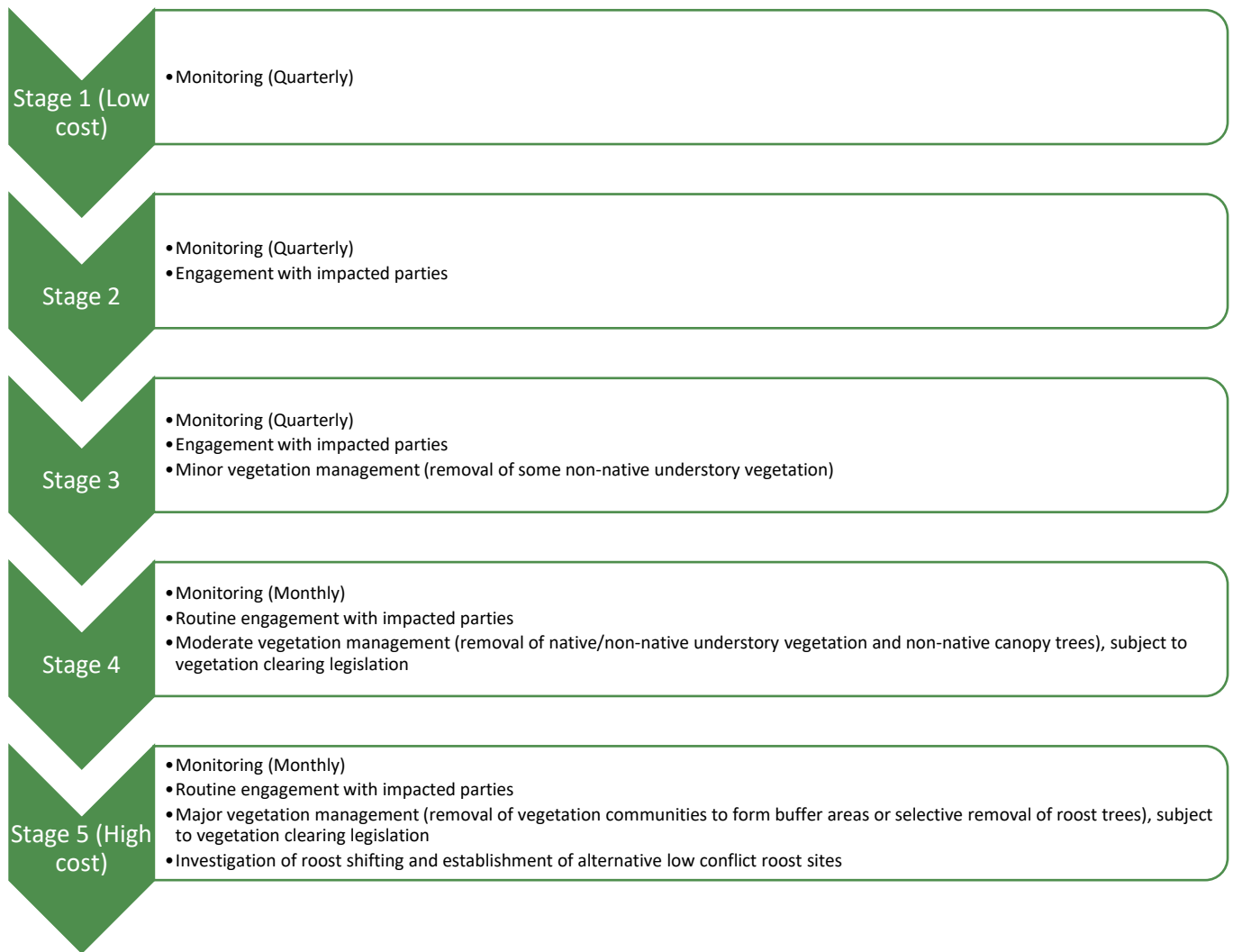


Figure 5: Staged management approach to flying-fox roost management

8.4 Considerations for Management Approach

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

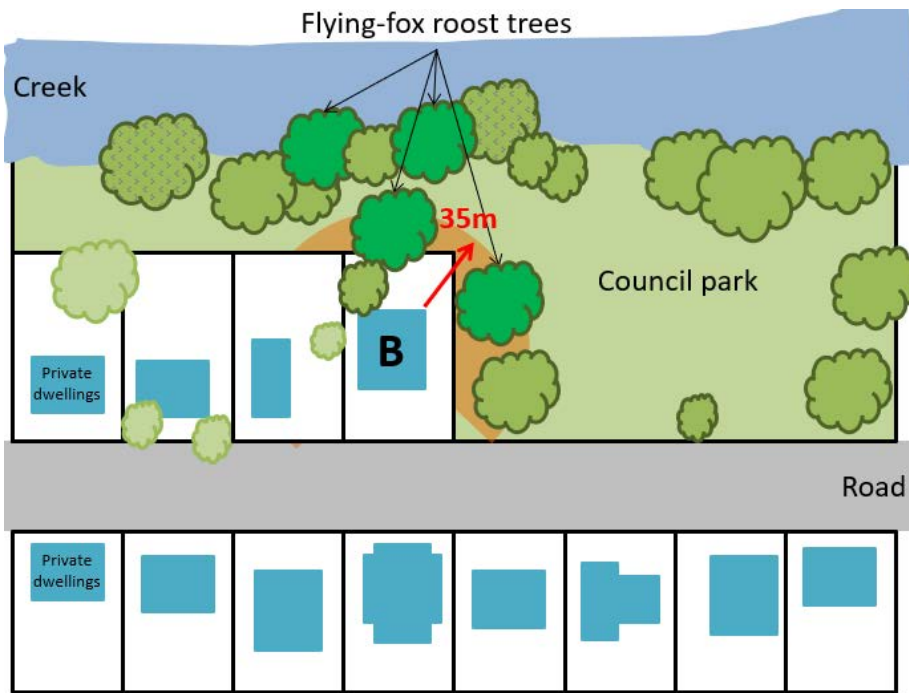
- Whether a roost is permanently occupied or seasonal
- The period of occupancy, and roost dynamics (do populations naturally fluctuate significantly in size, extent or location)
- The proximity of sensitive receptors/sites
- The level of impacts to adjacent sensitive receptors/sites
- The probability 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

8.5 Management Decision Support Tool

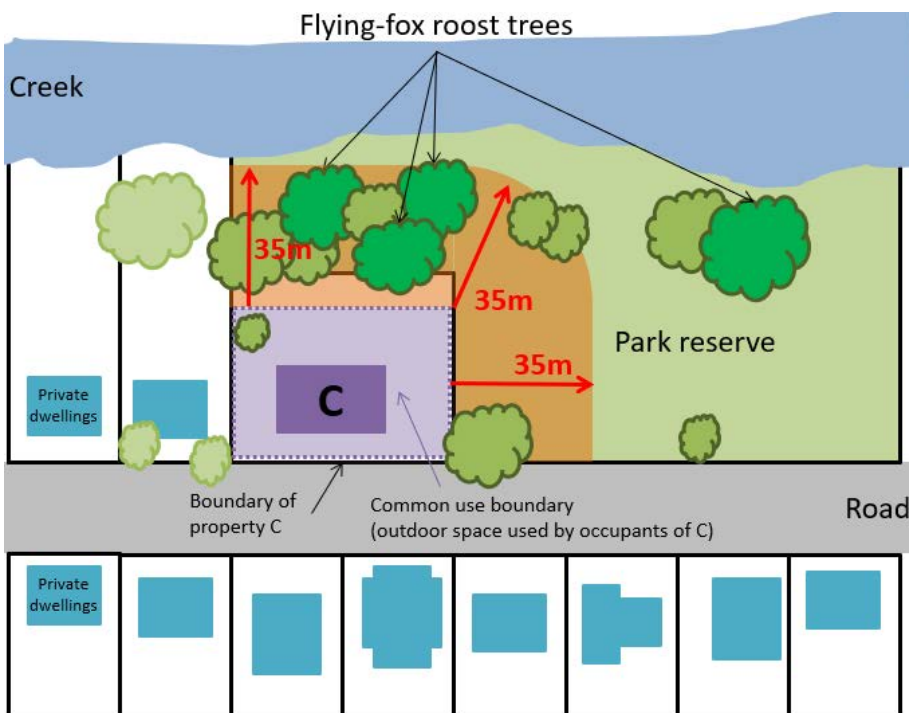
Dependent on a range of factors Council will provide an appropriate response to educate, provide advice and where appropriate, deliver actions to manage the impacts of flying-foxes on communities. Council will also seek to work with infrastructure asset managers to manage impacts of flying-foxes on critical infrastructure services.

Where Council becomes aware of a clearly unacceptable risk to health or amenity Council will investigate opportunities to establish managed buffers between flying-fox roosts and sensitive receptors. Examples of a buffer management approaches are demonstrated in Figures 6 and 7.



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

Figure 6: Example A - 35m buffer assessment (residential dwelling)



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

Figure 7: Example B - 35m buffer assessment (common use area for sensitive receptor such as school or kindergarten)

8.5.1 Monitoring

Council seeks to undertake regular (quarterly) monitoring of 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 regional roost dynamics, local breeding observations and potential impacts to the community which allows for informed management decisions to be made.

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

8.5.2 Engagement with impacted parties (Landholders)

Council will seek to respond and engage proactively with landowners and residents concerned about impacts of 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.

8.5.2.1 Council web content

Council will seek to ensure an appropriate webpage providing information on flying-foxes in the Goondiwindi Regional Council Local Government Area is maintained to provide a ready access to information for local residents.

A copy of this plan and any relevant Council Policy on the management of flying-fox impacts will be made available on this page.

8.5.3 Minor vegetation management (Weed management)

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

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

Minor vegetation management works are to be designed to reduce densities of flying-foxes in proximity to sensitive receptors or to modify understory vegetation to minimise suitable roost habitat features in buffer areas.

8.5.4 Moderate vegetation management

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

- Removal of portions of understorey vegetation (native/non-native);
- Removal of saplings (native/non-native);

- Removal of canopy tree species (non-native); and
- Major trimming of native and non-native roost trees.

Moderate vegetation management actions are likely to impact roosting habitats within sites and are to be undertaken in a strategic manner, minimising impacts to vegetation values which provide ancillary environmental benefits such as creek bank stabilisation.

8.5.5 Major vegetation management

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

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

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

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

8.6 Timing of Vegetation Management Works

8.6.1 Requirements of Codes of practice

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

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

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

Council gives due consideration of the likely and potential impacts of works and will ensure works are undertaken in a manner consistent with relevant codes and legislation .

Officers and contractors 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.

8.7 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:

- Maintenance of a up to date web page on flying-foxes in the Goondiwindi Regional Council Local Government Area.
- Engagement with local schools and the broader community to provide informative, targeted education on flying-foxes.
- Broad active engagement including community seminars, workshops and information stalls at local markets and events.
- 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).

8.8 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. When requested and possible, Council will support research projects which align with Council's strategic priorities. Priority research items to support enactment of recommendations of the plan are identified in section 6.4 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 (if available), and to ensure that public amenity is maintained during these periods.

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. 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 and managing stakeholder interactions (neighbours, landowner and wildlife carers).
 - b. Council Officers shall not handle, touch or treat live flying-foxes.
 - c. Treatment of flying-foxes is to be undertaken by vaccinated wildlife carers. Council Officers are not responsible for determining the appropriate stage for treatment of flying-foxes.
 - d. Clean up and disposal 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.

These recommendations are made on the basis of the existing extent of flying-fox roosts. Where significant changes in circumstances (location or extent of roosts) occurs Council shall engage with suitably qualified experts to identify refined management actions.

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 conflict mitigation such as education prioritised.

Conflict Management

- Council develops an up-to-date webpage providing information on flying-foxes in the Goondiwindi Regional Council Local Government Area, including information of flying-fox ecology, known roost locations and options for residents to mitigate impacts of flying-foxes
- Council provides timely response to any customer queries or requests relating to flying-fox ecology or impacts
- Council minimises disturbance of existing roost locations to minimise potential for unintended roost shifting

Monitoring of flying fox roosts

- Implement a quarterly monitoring survey of all identified roosts across the region, maintain a roost monitoring register and provide data to the Department of Environment and Science

Education

- The installation of interpretive signage at high visibility roosts (Inglewood)

Research

- Support the delivery of a regional or bioregion-based flying-fox roost mapping program through use of GPS tracking collars by partner organisations such as the Department of Environment and Science, CSIRO and other Councils.
 - 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

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
- Council continue to manage Inglewood Apex Park in accordance with the Queensland Government; Code of Practice - Low impact activities affecting flying-fox roosts

Research

- Where requested support delivery of bioregion scale (whole of Brigalow Belt) research programs 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

12 References and Resources

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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.

Department of Environment and Science 2020¹, *Code of Practice Ecologically sustainable management of flying-fox roosts Nature Conservation Act 1992*, Queensland Department of Environment and Science, Brisbane.

Department of Environment and Science 2020², *Flying-fox Roost Management Guideline, Wildlife and Threatened Species Operations*, Department of Environment and Science, Brisbane.

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

Education

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

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

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

Heat Stress

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

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

Department of Environment and Science 2022¹, 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-subsub/flyingfoxsub-jenny-beatson-part3.pdf>

Appendices

Appendix A Urban Flying-fox Management Area

Appendix B Extent of Roosts

Appendix B1 - Goondiwindi (Roost 547) extent



Appendix B2 - Inglewood Apex Park (Roost 486) extent



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



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