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WALLACE PARK FLYING-FOX MANAGEMENT PLAN

November 2022

NOOSA SHIRE COUNCIL

Acknowledgement

We acknowledge the Traditional Owners of this country and pay respect to all Aboriginal and Torres Strait Islander peoples. The Traditional Owners and original custodians of the Noosa region were the Kabi Kabi / Gubbi Gubbi peoples. We acknowledge the Elders past, present and emerging and acknowledge the spirits and ancestors of the Clans that lived in this area.

This roost management plan was developed with funding support from the Queensland Government's Local Government Flying-Fox Roost Management Grants Program.

Acronyms and abbreviations

ACP Act	*Animal Care and Protection Act 2001* (Queensland)
AEC	Animal Ethics Committee
BFF	Black flying-fox (*Pteropus alecto*)
CDC	Centre of Disease Control and Prevention
CMS	Canopy-mounted sprinklers
Council	Noosa Shire Council
DCCEEW	Department of Climate Change, Energy, the Environment and Water (Commonwealth)
DES	Department of Environment and Science
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
FF	Flying-fox
FFMP	Flying-fox Management Plan
FFRMP	Flying-fox roost management permit
GHFF	Grey-headed flying-fox (*Pteropus poliocephalus*)
LGA	Local Government Area
Low Impact COP	*Code of Practice – Low impact activities affecting flying-fox roosts*
LRFF	Little red flying-fox (*Pteropus scapulatus*)
MNES	Matters of National Environmental Significance
NC Act	*Nature Conservation Act 1992*
NICA	Noosa Integrated Catchment Association
NPA	Noosa Parks Association
QLD	Queensland
Roost Management COP	*Code of Practice – Ecologically sustainable management of flying-fox roosts*
SoMI	Statement of Management Intent
the Plan	Wallace Park Flying-fox Management Plan
UFFMAs	Urban Flying-fox Management Areas

Contents

List of figures

List of tables

1 Introduction

1.1 Background

Local communities within the Noosa Shire have been experiencing conflict with flying-foxes in the area. Noosa Shire Council (Council) has historically received complaints from residents and businesses in relation to the flying-fox roost at Wallace Park, reporting primarily amenity and financial impacts, and to some extent fear of disease. As a result, Council engaged Ecosure to develop a Management Options Report in 2015 (Ecosure 2015) and, subsequently, the Wallace Park Flying-fox Roost Buffer Canopy Sprinklers Operational Plan (Ecosure 2016). Actions implemented from these reports reduced reports of conflict for some years (pers. comm., Noosa Council, 2022), however responses to a recent community survey suggest that conflict may have increased again. This Wallace Park Flying-fox Management Plan (the Plan) aims to consolidate the Options Report and provide an ongoing plan to mitigate community conflict, while ensuring conservation of the three flying-fox species that visit the area and the critical ecosystem services they provide – black flying-fox (*Pteropus alecto*; BFF), grey-headed flying-fox (*P. poliocephalus*; GHFF) and little red flying-fox (*P. scapulatus*; LRFF).

In addition to Council, there are a number of stakeholders with a keen interest in Wallace Park and the flying-fox roost. These stakeholders include:

- surrounding residents
- surrounding businesses, including the bowling club, resort and hospital
- Noosa Parks Association (NPA), including the NPA Botany Group and Bird Observers Group
- Noosa Integrated Catchment Association (NICA)
- Wallace Park Bushland Care Association
- Bat Rescue Inc.
- Flying-fox Rescue and Release Noosa Inc.
- Ringtail Creek Flying-fox Sanctuary.

1.2 Legislation

There are four species of flying-fox found on mainland Australia and three (BFF, GHFF and LRFF) occur at times within the Noosa Shire Council Local Government Area (LGA). As native animals, all flying-foxes and their roost habitat are protected under various national and state legislation. Details of relevant legislation are provided below.

Commonwealth

The Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999) provides protection for the environment, specifically Matters of National

Environmental Significance (MNES). A referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) is required under the EPBC Act for any action that is likely to significantly impact on an MNES. The GHFF is listed as a vulnerable species under the EPBC Act, meaning it is classified as an MNES.

The Wallace Park flying-fox roost contained >10,000 GHFF in two months in 2014, meaning it meets the first criteria for a nationally important roost. As such, any management activity will need to be in accordance with the *Referral guideline for management actions in GHFF and SFF camps*, and some activities may require referral to DCCEEW.

State

All flying-foxes and their roost habitat are protected under the Queensland *Nature Conservation Act 1992* (NC Act).

The Wallace Park roost is located within an Urban Flying-fox Management Area (UFFMA). As such, Council has an 'as-of-right' authority to undertake roost management activities in accordance with the *Code of Practice – Ecologically sustainable management of flying-fox roosts* (Roost Management COP) (DES 2020a). Council must notify the Department of Environment and Science (DES) prior to any planned management actions being undertaken. Notification is by means of a completed 'flying-fox management notification form' via the DES website, submitted at least two business days prior to commencing any management actions. Notification is valid for all notified management actions within a four-week timeframe.

Local governments may also choose to, with the relevant landholder's permission, exercise their as-of-right authority on private land. In cases where flying-foxes are roosting on private land, Council will work with landholders to determine what may be undertaken under Council's as-of-right authority, and whether a flying-fox roost management permit (FFRMP) may be required for some actions. Certain low impact activities (e.g. mowing, minor tree trimming) do not require approval if undertaken in accordance with the *Code of Practice – Low impact activities affecting flying-fox roosts* (Low Impact COP) (DES 2020b). Activities that do require approval include:

a) destroying a flying-fox roost
b) drive away, or attempt to drive away, a flying-fox from a flying-fox roost ('drive away' is defined to mean "cause the flying-fox to move away from the roost; or if the flying-fox has moved away from the roost, deter the flying-fox from returning to the roost'); and/or
c) disturb a flying-fox in a flying-fox roost
d) trimming more than 10% of the total canopy of a roost.

In addition, the *Animal Care and Protection Act 2001* (ACP Act) applies to all living vertebrate animals, including wildlife. To comply with the ACP Act, flying-fox management actions must not cause mental or physical suffering, pain or distress to any vertebrates.

Native vegetation is also protected under various legislation, including the NC Act, the

Vegetation Management Act 1999 and the *Planning Act 2016*. Permits may be required for trimming or clearing protected plants.

Local

The Flying-fox Roost Management Guideline (DES 2020c) has been developed to provide local government with additional information that may assist decision making and management of flying-fox roosts. Furthermore, councils are required to apply for a FFRMP for management options not specified in the Roost Management COP.

Council has developed a Statement of Management Intent (SoMI) to articulate the approach that will be taken to manage flying-fox roosts in the Noosa LGA. The intent is to manage flying-fox roosts on Council-owned or managed land. Council does not undertake management actions on private land, however may provide advice and assistance to residents and landowners affected by a flying-fox roost. Where a roost crosses Council and non-Council land, Council will work cooperatively with landowners to develop mitigation actions.

2 Wallace Park flying-fox roost

2.1 Site location and description

Wallace Park is located approximately 1.2 km to the west of the township of Noosaville on the Sunshine Coast (Figure 1). The site consists of Council-managed reserve and free-hold land (including Noosa Leisure Centre and Library), and is surrounded by residential properties, a bowls club and resort to the north, and Noosa Hospital to the south-west.

Wallace Park contains both core and locally refined koala habitat. The site is also mapped as Environmental Management and Conservation zone (majority of roosting area) and Community Facilities zone (vegetation adjacent to Community Centre) under the Noosa Plan 2020.

2.2 Flying-fox occupancy

The Wallace Park flying-fox roost was first officially recorded and counted in 2013, although anecdotal records date back much further. All three flying-fox species found in Southeast Queensland have been known to use the roost, though GHFF and BFF are more commonly recorded, with LRFF recorded during seasonal influxes. The roost generally fluctuates from several hundred to 31,000 individuals. However, an influx of approximately 465,000 LRFF in February 2014 saw numbers peak at almost 468,000. A second peak of 506,000 LRFF was recorded in February 2016. Another large influx of 167,000 LRFF was recorded in February 2021. Residents reported another large influx of approximately 500,000 flying-foxes between 2021 and 2022, however this was not captured during regular monitoring conducted on behalf of Council or quarterly monitoring as part of the National Flying-fox Monitoring Program.

Flying-foxes used to occupy the entire portion of vegetation north of the community centre. However, since large influxes of predominantly LRFF, there has been vegetation damage to the Melaleuca forest in the northern portion of the park, which appears to have deterred frequent roosting in those areas while vegetation recovers. In more recent years, flying-foxes have primarily occupied the southern portions of the park, close to the community centre.

2.3 Community impacts

Noise, smell, and faecal drop were the primary causes of concern reported to Ecosure during initial consultation with residents in 2015. Residents reported a lack of sleep and associated impacts on their well-being, as well as a loss of amenity (especially in outdoor areas). Residents are most impacted during periods of large influxes, and seasonally when flying-foxes are reported to shift to the eastern side of the park (assumedly in response to prevailing weather conditions).

Faecal drop from fly-in and fly-out, and the associated financial impacts of cleaning and replacing outdoor furnishings, were also a concern for both residents and the nearby bowling club. A concerned resident is unwilling to use an installed rainwater tank with fear of disease,

and others concerned about faecal drop into swimming pools. The bowls club is significantly impacted by faecal mess from transiting animals during influxes, estimating that one hour per day is required to clean outdoor areas, as well as staining and/or permanent damage to shade sails that require replacement. Faecal mess on the bowling greens also raises concern for patrons, with fear of hygiene/disease risk associated with potential transfer to bowling balls. It is important to note that there is no known risk of contracting bat-related viruses from contact with faecal drop or urine (Queensland Health 2020).

There is potential for the roost to impact on the nearby Noosa Hospital, particularly during periods of large influxes. Vegetation surrounding the hospital is less favoured by roosting flying-foxes; however, during large influxes they have been known to spill over into this area. Council may provide advice and assistance to the Noosa Hospital (and any other business operations) potentially affected by a flying-fox roost. Flying-fox count data will be made available on Council's website to inform Hospital helicopter operators in their management of strike risk. Where a roost crosses Noosa Council and non-Council land, Council will work cooperatively with landowners to develop mitigation actions.

2.4 Previous management activities

Council has developed a flying-fox fact sheet and has had ongoing discussions with neighbouring residents and businesses. Prior to 2015, Council had also selectively removed and trimmed trees at the western edge of the site to make less attractive habitat to roosting flying-foxes immediately adjacent to residents. Following the development of the Wallace Park Flying-fox Management Options Paper (Ecosure 2015), canopy-mounted sprinklers (CMS) were installed in accordance with the Wallace Park Flying-fox Roost Buffer Canopy Sprinklers Operational Plan (Ecosure 2016) along the southern, western and north-western boundaries of the park to increase the buffer between flying-foxes and residential properties. Council also offered a subsidies program to affected residents, which was well-received by residents and appears to have alleviated some issues arising from flying-fox conflict.

Wallace Park flying-fox roost location

Maximum flying-fox roost extent

Noosa Shire Council

Wallace Park Flying-fox Roost Management Plan

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Job number: PR7104
Revision: 0
Author: EK
Date: 13/05/2022

0 20 40 80
Metres

GDA 1994 MGA Zone 56
Projection: Transverse Mercator
Datum: GDA 1994
Units: Meter

PR7104_WallacePark
A4

3 Potential management actions

3.1 Management actions for Wallace Park

Based on a site-specific analysis of available flying-fox impact management options, long-term management actions will aim to continue to reduce conflict between residents and flying-foxes at Wallace Park. Management actions will focus on ongoing monitoring, maintaining current buffers through vegetation trimming and CMS maintenance where necessary, and increase flying-fox community awareness through tools such as education sessions and signage around the park. Planned management actions are outlined below, with Appendix 1 providing a brief description of a range of management options available to Council.

3.1.1 Maintaining buffers between roost and residential properties

3.1.1.1 Maintain buffers through selective tree trimming where necessary

Minor vegetation trimming and weed management may be undertaken on the perimeter of the roost, particularly along the western edge, to maintain the buffer of less attractive flying-fox habitat directly adjacent to residential homes. It is recommended that buffers of up to 10 m from property boundaries be maintained through selective trimming/removal, with the aim of retaining mature trees. Any vegetation management must consider the limitations with regards to the roost being mapped as core and locally refined koala habitat.

3.1.1.2 Ensure canopy-mounted sprinklers continue to maintain buffer

CMS are currently installed along the southern, western and north-western boundaries of Wallace Park and are operated by Council as appropriate, during large influxes of flying-foxes. The sprinkler system should be serviced regularly to ensure an effective buffer between flying-foxes and residential properties. It should be noted that access to the western sprinklers (adjacent to Sunrise Avenue) is restricted during wetter periods, with standing water and soft ground limiting the access of plant and equipment required to maintain the sprinklers. Council should evaluate the potential option of installing a row of mid-storey sprinkler heads to ensure sufficient vertical canopy coverage. This may increase the effectiveness of the sprinklers system, particularly during larger influxes of little red flying-foxes which have previously occupied mid-storey vegetation at Wallace Park. Sprinklers must not be used on hot, humid days where they have the potential to exacerbate heat stress events. Council should continue to liaise with affected residents to evaluate the ongoing effectiveness of the deterrent system.

3.1.2 Subsidies program

Council previously implemented a subsidies program to support impacted residents living near the Wallace Park flying-fox roost. Focusing funds towards manipulating the existing built environment can reduce the need for modification and removal of vegetation, while reducing negative impacts experienced by residents and can increase tolerance of living close to a flying-fox roost.

Council should review the efficacy of the current program and consider expanding the program to cover additional items in consultation with property owners. Expansion of the current subsidy program may also be investigated for residents that have not previously received assistance through such program. If the subsidy program warrants further expansion, the delegation of funding will be based on site specific factors affecting residents, the availability of funding, the maximum amount of funding available per property and what modifications are most appropriate/necessary at each property.

3.1.2.1 Property modifications

Providing subsidies to residents for property modifications can be used to manage the impacts of the flying-foxes. Council currently provides aid to eligible residents (based on the proximity of properties to flying-fox roosts) in the form of odour neutralising canisters, covers for items, and pressure cleaner hire to alleviate impacts of flying-fox excrement on residents' properties. Council may consider further expanding this subsidies program to include aid for impacts experienced by residents in the form of property modification.

Double glazing windows on properties adjacent to the roost can be effective in alleviating noise disturbance experienced by some residents. Double glazing windows could be installed on the windows facing the roost at a minimum, and for maximum noise attenuation could be fitted across the entire home.

If residents do not have sufficient infrastructure to avoid excrement on their clothesline or cars, such as car ports/garages, Council may consider subsidising clothesline and car covers for residents to alleviate this impact. As above, if a subsidies program is approved, Council may consider retrospectively subsidising the costs of car covers, clothesline covers, and other purchases residents have made to reduce impacts associated with the roost.

3.1.2.2 Service subsidies

A range of service subsidies may alleviate impacts experienced by residents. The types of services that could be subsidised include clothes washing, cleaning outside areas, solar panel and roof cleaning, car washing or removing exotic trees. Service subsidies may encourage tolerance of living near a roost, promote conservation of flying-foxes, can be undertaken quickly, will not impact on the roost site, and would reduce the need for property modification.

If the subsidy program warrants further expansion to include allowances for service subsidies, the delegation of funding will be based on a range of factors including: site-specific factors affecting residents, availability of funding, the maximum amount of funding available per property, and the type of modifications most appropriate/necessary for each property.

3.1.3 Indoor odour neutralising pots

Odour neutralising systems (which modify odour-causing chemicals at the molecular level rather than just masking them) are commonly used in contexts such as waste management, food processing, and water treatment. They have the potential to be a powerful tool for managing odour impacts associated with flying-foxes. A Hostogel™ pot containing a gel-

based formula has been trialled for neutralising indoor odour. These are inexpensive, only require replacement every few months, and may be sufficient to mitigate odour impacts in houses affected by flying-fox roosts. Initial results from the trial suggest there may be a positive localised effect in reducing flying-fox odour within homes. This option may be useful for affected residents, as residents could choose whether or not they wish to have a gel-pot in their living space and can simply put the lid back on the pot when the odour is not impacting on them. If residents rely on keeping windows open for airflow in warmer months, this may be ineffective in minimising odour, nonetheless, it is a potential option to investigate.

3.1.4 Vegetation management

Due to the dense roosting behaviour (particularly of LRFF), areas of Wallace Park have sustained significant vegetation damage during large influxes. Some sections of vegetation in the roost are yet to recover which diminishes the amenity and natural values of the site. Removing fallen debris from within the roost and undertaking assisted regeneration or revegetation in damaged areas can improve site amenity and natural values of the site. Improving vegetation health is important to provide suitable habitat to all wildlife species in the area. Improving vegetation health within the roost can also allow flying-foxes to move around within the site and may reduce overall density in specific areas, allowing for vegetation to recover more rapidly. Improving vegetation health in the centre of the roost is also useful to encourage roosting in these lower conflict locations and provide a buffer between flying-foxes and adjacent residents/businesses.

3.1.5 Education

3.1.5.1 Continue ongoing consultation with impacted community

Council will continue to regularly liaise with impacted residents and businesses at Wallace Park. Impacts are generally greater during influxes and therefore ongoing engagement should be commensurate with the size of the roost, with increase communication with impacted residents and businesses during influxes. Community notices (such as bulletin notices at the local library, social media posts and letter drops) should be utilised to communicate with the wider community, especially during summer months and leading up to periods of historical large influxes (especially February), in order to inform the community of potential increases in experienced impacts and how they could reduce these impacts. These notices should also outline actions currently being undertaken by Council to ensure transparency with the community.

Educational materials, such as a fact sheet or brochure, may be developed for residents outlining general information about flying-foxes, including impact mitigation options available at a property level and corresponding legislative requirements. Additional fact sheets could provide information on flying-fox ecology and behaviour, which may assist residents to understand when and why they may experience different impacts (e.g. increasing noise impacts during hot weather, increased odour impacts during the breeding season, when influxes may be expected etc.). Such education material could be distributed from the library directly adjacent to the roost site and be included on Council's website.

Wallace Park currently has two interpretive signs conveying information regarding flying-fox ecology, behaviour, and conservation. Council should consider installing additional signs along high-traffic walkways and at the bowls club. Educational material should aim to cover key messages in a way that educates and informs, rather than cause alarm e.g. emphasising that there is little to no risk associated with living or playing near a flying-fox roost (Queensland Government 2021) – 'no touch, no risk'. Signs could also provide QR codes that link to websites and fact sheets for further information (e.g. developed by Council, DES, Queensland Health etc.).

3.1.6 Regular flying-fox monitoring

Regular monitoring of the roost by suitably experienced personnel is required to better understand trends of the roost extent, population numbers, species present and timing of occupation on a seasonal basis. Regular monitoring is vital to inform when management actions can be undertaken and inform the effectiveness of management actions that are implemented. Regular monitoring should continue at Wallace Park, ideally on a monthly basis, and more frequently during large influxes. Council should share monitoring data by uploading to Council's website to ensure Noosa Hospital and the community have access to current numbers and trends at Wallace Park. Fly-in and fly-out counts during large influxes at Wallace Park can also provide valuable information on flight paths of flying-foxes. This information should also be made available through Council's website or direct communication to Noosa Hospital to allow helicopter operators to make safe and informed decisions on patient transport.

3.2 Potential action summary

Table 1 provides an overview of potential management actions detailed above. Note approvals are required for some actions.

Table 1 Wallace Park flying-fox potential management action summary

Action	Responsible
Vegetation works (minor tree trimming where necessary) to maintain buffer between roost and adjacent residential properties (particularly on western edge).	Council
Regularly monitor and service existing CMS to ensure they are maintaining a sufficient buffer during influxes. It should be noted that access to the western sprinklers (adjacent to Sunrise Avenue) is restricted during wetter periods, with standing water and soft ground limiting the access of plant and equipment required to maintain the sprinklers. Council should also evaluate the potential option of installing a row of mid-storey sprinkler heads to ensure sufficient vertical canopy coverage.	Council
Continue to offer subsidies program for primary affected residents, including property and service-based subsidies. Investigate the need to expand the program.	Council
Vegetation management to improve the natural values and amenity of the site.	Council
Distribute and/or provide information regarding indoor odour-neutralising pots to primary affected residents to alleviate odour impacts.	Council, private landholders
Continue (and during large influxes, increase) consultation with residents and other	Council

Action	Responsible
stakeholders (e.g. Noosa Hospital, Noosa Leisure Centre) and providing up-to-date educational material. Post updates on Council's website when and where management actions are undertaken to ensure transparency in the community about current management actions. Provide information to residents on the purpose and function of the CMS buffer system, including updates on maintenance and installation. Install additional interpretive signage along high-traffic walkways surrounding Wallace Park.	
Consider educational signage at the bowls club explaining there are no known risks of Lyssavirus/Hendra virus from contacting flying-fox excrement, and continue general hygiene practices (including ongoing provision of hand sanitising gel).	Bowls club
Continue regular monitoring of Wallace Park roost to understand trends of the roost extent, population numbers, species present and timing of occupation on a seasonal basis, and ideally flight paths from fly-in/fly-out monitoring during large influxes. Monitoring should also be increase during peak influx periods.	Council

4 Community engagement

Effective community engagement and education has benefits for both communities and land managers. These benefits include increasing community understanding and awareness of flying-foxes, their critical ecological role, and factors that need to be considered in developing a management approach to reduce community conflict.

Council has sought feedback with the surrounding community to understand how residents and businesses perceive management to date, to convey their opinion of the revised draft Wallace Park Management Plan (2022) and gauge community understanding of Council's SoMI (2022).

The 'Your Say Noosa' feedback opportunity was advertised through:

- mailbox letter drops to around 70 properties positioned one property (or unit) back from Wallace Park.
    - This method strategically targeted residents located one block back from Wallace Park – ensuring residents which are impacted the most by flying-foxes have the opportunity to provide a proportional amount of feedback on the past, current and future management of the Wallace Park flying-fox roost.
- in-person consultation with the Bowls Club, Noosa Hospital, Noosa Library and other organisations and businesses along Wallace Drive.
- social media posts and through the Noosa Council website, targeting the wider community.

In total, 18 participants completed the survey. Ecosure and Council's responses to community feedback are summarised below in Section 4.1.

4.1 Survey results and addressing community feedback

Eighty three percent of the respondents answered that they had read Councils SoMI, and when asked if the policies regarding flying-fox management were clearly explained in the SoMI, 77.8% agreed or somewhat agreed, 5.6% disagreed, and 16.7% did not provide an answer. When respondents were asked if the SoMI provided adequate initial guidance on available flying-fox management methods and how individuals should manage flying-foxes 55.6% agreed or somewhat agreed, 27.8% disagreed, and 16.7% did not provide an answer.

When respondents were asked to consider if Council's flying-fox subsidy program was an effective tool to reduce some of the impacts from flying-foxes 61.1% disagreed, 33.3% somewhat agreed, and 5.6% agreed. When respondents were asked if they would personally benefit from increased education and information on the ecology, behaviour and management of flying-foxes, 77.8% disagreed, 11.1% somewhat agreed, 5.6% agreed, and 5.6% did not provide a response.

When respondents were asked if they believed that the fire trail and sprinkler system buffer

had been effective in reducing flying-fox noise and odour impacts 61.1% disagreed, 22.2% somewhat agreed, 5.6% agreed, and 11.1% did not live close to the roost and therefore did not have an opinion. Many residents also noted they were uncertain if sprinklers had been regularly used or maintained.

Respondents were also given the opportunity to provide a freeform answer to express their comments on the draft Wallace Park Flying-Fox Management Plan. Comment themes are summarised below.

- Health concerns from water pollution and impacts experienced by the community for constant cleaning due to faecal drop.
- Uncertainty that the sprinkler system is being maintained or fully utilised, and has not been installed in all of the areas outlined in the Operational Plan. There were also several mentions that the sprinklers were not effective in reducing numbers.
- Several respondents mentioned the want for management of damaged vegetation after large influxes, and restoration to enable other wildlife to return to Wallace Park. Alternatively, multiple respondents expressed the desire for vegetation to be thinned within the roost to make it less desirable for flying-foxes.
- Concern about impacts associated with changes to Noosa Hospital operations during large influxes.
- Ongoing mental health impacts associated with a range of flying-fox impacts
- Concerns that resident hardships are not being taken seriously by Council and request for additional consultation.
- A wider than 10 m buffer, especially in the western section, is desirable, with mentions of up to a 25 m buffer by three respondents.
- Multiple comments regarding flying-foxes not being suitable to roost in an urban environment, and that flying-foxes are 'invading' our urban spaces.
- Concern that during a peak influx of LRFF flying-foxes were causing branches to fall to the ground resulting in deaths of flying-foxes.
- The need for further education to understand the importance of flying-foxes and the need for a paradigm shift in the community perception of living with flying-foxes.

Table 2 Ecosure and Council's response to community feedback

Key Topic	Community Concern or Perception	Council's Response
CMS	Concerns raised of the maintenance and operation of the CMS	Council should provide up-to-date information on Council's website outlining the purpose of the CMS buffer system so that effectiveness is evaluated within the context of the objective of CMS, ensure residents are updated on the maintenance of the CMS system, and Council's approach of how often the CMS will be utilised (i.e. how long residents can expect to see the sprinklers being used during influxes compared to non-peak times).
	The residents may not understand the purpose of the CMS	
Flying-fox wellbeing during	Anecdotal reports of the death of flying-foxes due	There are no known records of flying-foxes dying in mass numbers in Wallace Park during peak influxes due to breaking branches, or

Key Topic	Community Concern or Perception	Council's Response
large influxes	to falling branches	outside naturally occurring rates of mortality. Flying-foxes are susceptible to extreme temperatures (Welbergen et al. 2008) and, as a result of sustained high temperatures, some deaths within summer months can be expected. Residents should report concerns of flying-fox injuries or mortality to Flying-Fox Rescue and Release Noosa Inc and Wildlife Noosa to ensure formal reports and suitable response.
Natural damage to native vegetation from large influxes of flying-foxes	Degraded habitat values for other wildlife	Damage to natural vegetation during large influxes is a natural process which is far outweighed by the important ecological values that flying-foxes provide to the Noosa region. Council and an active BushCare community group periodically undertake ecological restoration works within Wallace Park Reserve.
Vegetation management (thinning)	Some residents believe that vegetation should be thinned within the roost to reduce how desirable the site is to flying-foxes.	Thinning of vegetation within the roost would reduce the likelihood of other wildlife utilising the area and is in opposition to the majority of respondents wishes (this type of management is also not in line with relevant legislation or Council policy). Further, vegetation thinning may not result in a reduction of the number of flying-foxes roosting at Wallace Park, and may instead increase odour and noise impacts due to a more open canopy and reduced barrier.
Weed Management	Weed management should be undertaken to increase the overall ecological condition of Wallace Park	Council will continue to undertake their existing Natural Areas Ecological Restoration Program within Wallace Park. Council also supports an active Wallace Park Bushcare Community Program, who undertake weed management and environmental restoration works. The 10 m wide fire trail is slashed and maintained periodically on the western side of Wallace Park (subject to machinery access during wetter periods).
Health concern	Health concerns from faecal drop where again raised by resident surrounding Wallace Park	Council will continue to provide links to Queensland Health websites. Though health risks of living around flying-foxes is low (Queensland Health 2020), liaison with affected residents and businesses should continue (and increase during large influxes) to ensure the community is informed regarding simple measures to ensure human and animal safety (e.g. no touch, no risk).
Flying-fox monitoring data	Some residents expressed concerns over the potential impacts of flying-foxes on the operation of the Noosa Hospital	Council will continue to work closely with the Noosa Hospital. Council will provide data online when regular monitoring occurs to ensure Noosa Hospital is aware of influxes and helicopter operators ensure safe patient transfer. If a critical patient is requiring air transport during a fly-in/fly-out period while there is a large influx in Wallace Park, the Noosa Hospital is responsible to ensure that they have alternative nearby helicopter landing zones.
Communication and engagement	Residents would benefit from increased communications and engagement during periods of large influxes	Community engagement will be commensurate to the size of the roost i.e. during periods of larger influxes, community consultation should be increased.
Flying-foxes in urban areas	Some residents believe flying-foxes should be moved on from urban areas	Dispersals are often ineffective (refer to Appendix 2 for further information), are extremely resource intensive, and often result in roosting in multiple locations. For these reasons, Council's policy position as outlined in the SoMI is that dispersal of flying-fox roosts is not supported.

5 Evaluation and reporting

5.1 Evaluation and review

A review of the Wallace Park Flying-fox Management Plan should be scheduled annually or as needed, with community consultation and expert input sought as required. The Plan shall remain in force until a revised version is adopted by Council.

The following may trigger an earlier Plan update:

- changes to relevant policy/legislation
- new management techniques becoming available
- outcomes of research that may influence the Plan
- incidents associated with the roost.

The progress, priority, and effectiveness of management actions in the Plan will be evaluated annually by Council.

5.2 Reporting

Council will complete the DES evaluation form for actions under its as-of-right authority, returned within six weeks of the date of actions being completed, and will comply with any reporting obligations under other permits or approvals obtained to implement the Plan.

References

Department of Environment and Science (DES) 2020a, *Code of Practice Ecologically sustainable management of flying-fox roosts*, Queensland Government, <https://environment.des.qld.gov.au/__data/assets/pdf_file/0033/89853/cp-wl-ff-roost-management.pdf>.

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Appendix 1 Management options

Management option	Brief description
Education and awareness programs	This option involves comprehensive and targeted flying-fox education and awareness program to provide accurate information to the local community about flying-foxes including information about managing impacts and alleviating concern about health and safety issues associated with flying-foxes, options available to reduce impacts from roosting and foraging flying-foxes, and information about flying-fox numbers and flying-fox behaviour at the roost. Redland City Council has a long history of managing flying-foxes through education and community engagement to foster awareness and understanding, with the approach being recognised in the Queensland Department of Environment and Science Best Practice Guidelines.
Property modification	Property-level impact mitigation is one of the most effective ways to reduce amenity impacts to residents living adjacent to a flying-fox roost. Examples of property modifications include vehicle covers, carports, clothesline covers, clothes dryers, pool/spa covers, shade cloths, rainwater first-flush diverters, high-pressure water cleaners, air conditioners, fragrance dispensers or deodorisers, double-glazing of windows, door seals, screen planting, tree netting, and lighting (to discourage flying-foxes). Opportunities for funding assistance (e.g. subsidy programs – see below) may be available for management activities that reduce the need to actively manage a roost.
Subsidy program - property modification / item	Providing subsidies to property owners for property modifications can be used to manage the impacts of the flying-foxes. Examples of property modification subsidies are listed above. Focusing funds towards managing impacts on a property-level can reduce conflict between residents and flying-foxes and reduce the need for modification and/or removal of vegetation.
Subsidy program - services	This management option involves providing property owners with a subsidy to help manage impacts on the property and lifestyle of residents. The types of services that could be subsidised include clothes washing, cleaning outside areas and property, solar panel cleaning, car washing, removing exotic trees, or contributing to water/electricity bills. Service subsidies may encourage tolerance of living near a roost, promote conservation of flying-foxes, can be undertaken quickly, will not impact on the roost site, and would reduce the need for property modification.
Routine roost maintenance and operational activities	All persons are authorised to undertake low impact activities at roosts in accordance with the Code of practice - Low impact activities affecting flying-fox roosts (DES 2020a). Protocols should be developed for carrying out operations that may disturb flying-foxes, which can result in excess roost noise and risk flying-fox pup mortality. Such protocols may include limiting the use of disturbing activities to certain seasons or times of the day, as is adopted by Council.
Alternative habitat creation	This management option involves revegetating and managing land to create alternative flying-fox roosting habitat through improving and extending existing low-conflict roosts or developing new roosting habitat in areas away from human settlement. Potential habitat mapping using roost preferences and suitable land tenure can assist in initial alternative site selection. A feasibility study would then be required prior to site designation to assess likelihood of success and determine the warranted level of resource allocated to habitat improvement.
Provision of artificial roosting habitat	Artificial structures can be constructed to augment roosting habitat in current roost sites or to provide new roosting habitat. Trials using suspended ropes have had limited success as flying-foxes only used the structures that were very close to the available natural roosting habitat. It is thought that the structure of the vegetation below and around the ropes is important.

Management option	Brief description
Protocols to manage incidents	This management option involves implementing protocols for managing incidents or situations specific to particular roosts. Such protocols may include monitoring at sites within the vicinity of aged care or child care facilities, management of compatible uses such as dog walking or sites susceptible to heat stress incidents (when the roost is subjected to extremely high temperatures leading to flying-foxes changing their behaviour and/or dying).
Research	Participating in research is important to improve knowledge of flying-fox ecology to address the large gaps in our knowledge about flying-fox habits and behaviours and why they choose certain sites for roosting. Research should also aim to investigate the efficacy of new, innovative management technique, such as odour-neutralising technology. Further research and knowledge sharing at local, regional, and national levels will enhance our understanding and management of flying-fox roosts.
Appropriate land-use planning	Land-use planning should be used to ensure adequate distances are maintained between future residential developments and existing or historical flying-fox roosts. While this management option will not assist in the resolution of existing conflict, it is critical to avoiding future conflict. Incorporating roost locations into the planning scheme and property documentation would also assist avoiding future conflict.
Property acquisition	Property acquisition may be considered if negative impacts cannot be sufficiently mitigated using other measures. This option will generally be cost prohibitive but may be considered.
Buffers through vegetation removal	Vegetation removal can be used to create a buffer between residential properties and roosting flying-foxes to reduce noise, smell, and visual impacts. Vegetation removal aims to alter the area of the buffer habitat sufficiently so that it is no longer suitable as a roost. The amount required to be removed varies between sites and roosts, ranging from some weed removal to removal of most of the canopy vegetation.
Buffers without vegetation removal	Permanent or semi-permanent deterrents can be used to make buffer areas unattractive to flying-foxes for roosting, without the need for vegetation removal. This is often an attractive option where vegetation has high ecological or amenity value. Buffer options include visual deterrents, noise emitters, smell deterrents, canopy-mounted sprinklers (CMS), and screening plants. CMS are the most commonly implemented and effective of these options.
Noise attenuation fencing	Noise attenuation can be installed adjacent to residential properties to reduce noise and potentially odour where the roost is close to residents. Although expensive to install, this option could negate the need for habitat modification, maintaining the ecological values of the site, and may be more cost-effective than ongoing management. Perspex fencing could be investigated to assist fence amenity.
Early intervention before a new roost is established	This management option involves monitoring potentially suitable areas and investigating community feedback for signs of flying-foxes beginning to roost (in the daylight hours) and then managing habitat (e.g. weed removal) or otherwise deterring a permanent roost from establishing.

Appendix 2 Dispersal summary results

Roberts and Eby (2013) summarised 17 known flying-fox dispersals between 1990 and 2013, and made the following conclusions:

- In all cases, dispersed animals did not abandon the local area[1].
- In 16 of the 17 cases, dispersals did not reduce the number of flying-foxes in the local area.
- Dispersed animals did not move far (in approx. 63% of cases the animals only moved < 600 metres from the original site, contingent on the distribution of available vegetation). In 85% of cases, new roosts were established nearby.
- In all cases, it was not possible to predict where replacement roosts would form.
- Conflict was often not resolved. In 71% of cases, conflict was still being reported either at the original site or within the local area years after the initial dispersal actions.
- Repeat dispersal actions were generally required (all cases except where extensive vegetation removal occurred).
- The financial costs of all dispersal attempts were high, ranging from tens of thousands of dollars for vegetation removal to hundreds of thousands for active dispersals (e.g. using noise, smoke, etc.).

Ecosure, in collaboration with a Griffith University Industry Affiliates Program student, researched outcomes of management in Queensland between November 2013 and November 2014 (the first year since the current Queensland state flying-fox management framework was adopted on 29 November 2013).

An overview of findings[2] is summarised below.

- There were attempts to disperse 25 separate roosts in Queensland (compared with nine roosts between 1990 and June 2013 analysed in Roberts and Eby (2013)). Compared with the historical average (less than 0.4 roosts/year) the number of roosts dispersed in the year since the framework was introduced has increased by 6250%.
- Dispersal methods included fog[3], birdfrite, lights, noise, physical deterrents, smoke, extensive vegetation modification, water (including cannons), paintball guns and helicopters.

[1] Local area is defined as the area within a 20-kilometre radius of the original site = typical feeding area of a flying-fox.
[2] This was based on responses to questionnaires sent to councils; some did not respond and some omitted responses to some questions.
[3] Fog refers to artificial smoke or vapours generated by smoke/fog machines. Many chemical substances used to generate smoke/fog in these machines are considered toxic.

- The most common dispersal methods were extensive vegetation modification alone and extensive vegetation modification combined with other methods.
- In nine of the 24 roosts dispersed, dispersal actions did not reduce the number of flying-foxes in the LGA.
- In all cases, it was not possible to predict where new roosts would form.
- When flying-foxes were dispersed, they did not move further than six kilometres away.
- As at November 2014 repeat actions had already been required in 18 cases.
- Conflict for the council and community was resolved in 60% of cases, but with many councils stating they feel this resolution is only temporary.
- The financial costs of all dispersal attempts were considerable, regardless of methods used, ranging from $7500 to more than $400,000 (with costs ongoing).

Newly published research investigating the effectiveness of dispersal attempts (Roberts et al. 2021) has shown similar findings which are summarised below.

- Of the 48 roost dispersals attempted, only 23% were deemed a success at reducing conflict with communities, and this generally only occurred after extensive destruction of roost habitat.
- No project with a budget less than A$250,000 was deemed successful.
- Repeat actions were required in 58% of cases, some for months and years following the initial activities.
- In 88% of cases, replacement roosts were established within one kilometre of the original roost, transferring conflict to neighbouring communities.

Revision History

Revision No.	Revision date	Details	Prepared by	Reviewed & approved by
00	13/05/2022	Wallace Park Flying-fox Management Plan draft	Ellie Kirke, Wildlife Biologist	Jess Bracks, Principal Wildlife Biologist
01	24/06/2022	Wallace Park Flying-fox Management Plan draft R1	Ellie Kirke, Wildlife Biologist	Jess Bracks, Principal Wildlife Biologist
02	13/10/2022	Wallace Park Flying-fox Management Plan October 2022	Tegan Dinsdale, Wildlife Biologist	Jess Bracks, Principal Wildlife Biologist
03	08/11/2022	Wallace Park Flying-fox Management Plan November 2022	Tegan Dinsdale, Wildlife Biologist	Jess Bracks, Principal Wildlife Biologist
04	24/11/2022	Wallace Park Flying-fox Management Plan Final 2022	Ellie Kirke, Wildlife Biologist	Jess Bracks, Principal Wildlife Biologist

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Copy #	Date	Type	Issued to	Name
1	24/11/2022	Electronic	Noosa Shire Council	David O'Gorman
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